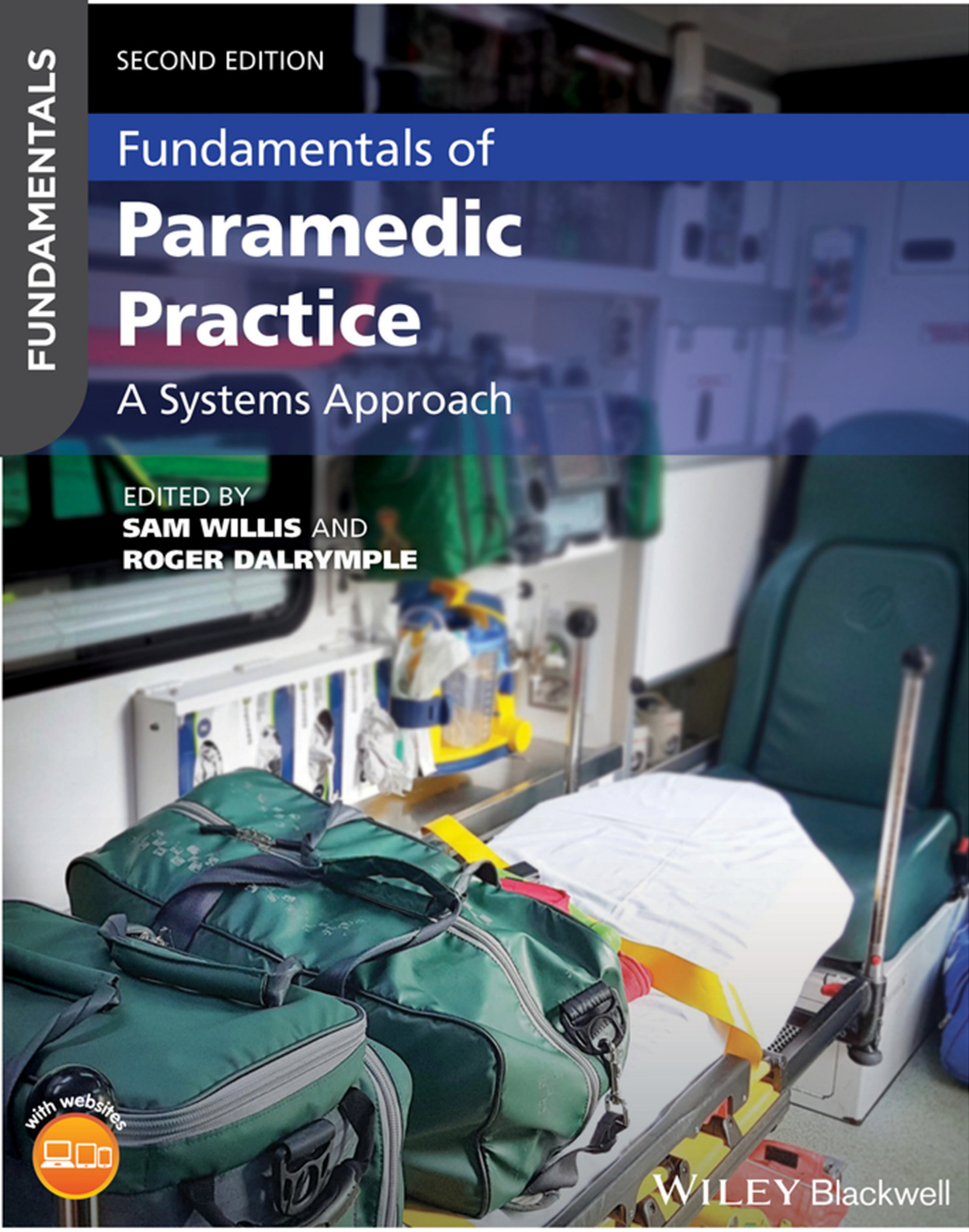
FUNDAMENTALS

SECOND EDITION

Fundamentals of Paramedic Practice

A Systems Approach

EDITED BY
SAM WILLIS AND
ROGER DALRYMPLE



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Fundamentals of Paramedic Practice

Through my many years of teaching and working with students I have witnessed at first hand the personal sacrifices students make to complete their pre-university and undergraduate studies in paramedicine. This book is dedicated to those students who have a deep desire to help people in crisis through working as a paramedic, and are willing to move mountains to succeed in doing so.

Whether you think you can or can't, you're right.
Henry Ford

Fundamentals of Paramedic Practice
A Systems Approach

Second Edition

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Preface

This fully revised second edition is a cause for celebration. It not only builds on the strengths of the first edition, which continues to sell globally, but serves as an acknowledgement of the rapidly changing face of paramedicine. The first edition influenced the paramedic profession in many ways: for instance, it has been adopted as a key text at universities around the world, and it is also used as a go-to guide by many clinicians and educators when they require a brief refresher on a given topic.

The face of paramedicine is rapidly changing. For example in the UK, paramedics are now able to prescribe certain medications, which reduces the burden of patients unnecessarily attending the emergency department. As mental health remains one of the key health priority areas in Australia and the UK, some regions can see specialist paramedics working with registered nurses to provide high-quality care to meet the needs of mental health patients in the community. These examples allow us to see the confidence the medical profession, politicians, and the public have in paramedics. Paramedic education must also continue to evolve to take into account new evidence, as well as changes to clinical practices that are based upon expert opinion, written in the absence of high-quality evidence.

So what is new about this second edition? It has been completely revised to ensure that it not only draws upon the most up-to-date research and evidence, but also reflects global economic and political changes that have impacts on the safe delivery of care by paramedics. Content revisions have occurred in every chapter, bringing them up to date with the most recent evidence.

This second edition also sees several brand new chapters which reflect the emerging developments in prehospital care. These include exciting new chapters on toxicology, medical terminology, and a chapter which acknowledges that ambulance service caseloads have a high incidence of low-acuity situations.

Many of the existing chapters have been almost completely rewritten, some of those by new contributors, giving them a fresh new look. These include chapters on human factors, paramedic skills, trauma, and major incident management, two chapters now covering mental health due to the huge demand for such information, and the leadership chapter incorporates new content on mentorship and professional learning. This time around a number of the chapters feature discussions on the ever-important topic of end-of-life care, something that remains central to paramedic practice.

Many of the chapter case studies have also been completely rewritten, and many of the end-of-chapter learning activities are new. We are also proud that this edition has maintained its strong connections with industry, drawing upon the many years' experience of practising clinicians, mainly paramedics, and we must not forget the enormous contribution made by clinical academics, who teach the next generation of paramedics and undertake research, and who have shared their wisdom and expertise in this edition.

Australian and UK standards of education and clinical practice share huge similarities, with many Australian graduates travelling to the UK to work as paramedics at a number of ambulance services over the past decade. This edition places a wider emphasis on such similarities and will be attractive to those who are studying in the UK and Australia, by including a wider contribution from Australian academics and clinicians. However, the second edition will still be suitable for any student preparing to work in a healthcare system that is similar to those of the UK and Australia.

Overall, the revisions in this second edition provide a contribution to the paramedic literature and will be appealing to student paramedics starting out at university, and may be a gentle refresher to those clinicians who need to get their heads back in the book. It will be particularly useful to mentor paramedics who are tasked with the rewarding but challenging role of developing student paramedics, but cannot find a text that provides simplifications of complex themes in paramedic practice.

Sam Willis

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This second edition received significant support from Abigail Milner, who assisted with collating images, chapter glossary construction, and learning materials.

About the companion website

This book is accompanied by a companion website:

www.wileyfundamentalseries.com/paramedic

The website includes:

- Interactive multiple choice questions
- Case studies to test your knowledge
- 'Label the diagram' flashcards
- Glossary of terms used in each chapter
- Answers to activities

Scan this QR code to visit the companion website:

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Professionalism in paramedic practice

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Fundamentals of Paramedic Practice: A Systems Approach, Second Edition. Edited by Sam Willis and Roger Dalrymple.

Companion website: www.wileyfundamentalseries.com/paramedic

Learning outcomes

On completion of this chapter the reader will be able to:

- Discuss the importance of professionalism in relation to paramedic practice.
- Identify three key themes of professionalism.
- Describe three concepts which influence professionalism.
- Describe how you may learn professionalism.
- Describe the potential outcomes of behaving unprofessionally.

Case study

A paramedic student is on a hospital placement and has been allocated to work in the operating theatre suite. This is her second of four days in this placement and she is anxious about learning airway management. She enters an operating department anaesthetic room where an anaesthetist and an operating department practitioner (ODP) are with a conscious patient, preparing him for imminent anaesthetic for surgery. The paramedic student does not introduce herself to anyone and asks loudly: 'Can I practise intubation on this patient?'

Introduction

Today's paramedic must not only demonstrate extensive clinical knowledge and skills for paramedic practice, but must also demonstrate **professionalism** throughout their daily lives, both on and off duty. This chapter identifies and discusses key aspects of professionalism required by paramedic practice.

Professionalism in paramedic practice

For the paramedic to demonstrate professionalism, they must know what is required of them by their professional statutory regulatory body. In the UK this is the **Health and Care Professions Council (**HCPC**)**. The HCPC provides a professional code of conduct that applies to all registered paramedics. Part of this code relates directly to professional knowledge, skills, behaviour, and attitude, as well as professional clinical performance by being the 'knowledgeable doer' (the term adopted by the United Kingdom Central Council for Nursing, Midwifery and Health Visiting (1986) as a rationale for the Project 2000 curricula) and practising safely within the scope of training and practice. The HCPC (2008) Standard 13 states:

> You must behave with honesty and integrity and make sure that your behaviour does not damage the public's confidence in you or your profession.

Behaving professionally is a standard expected not only by the HCPC and new regulatory bodies of other countries such as Australia, where recent legislation allows paramedics to be a regulated profession (Townsend 2017), but also by patients, co-workers, other healthcare professionals, and the general public. Healthcare professionalism is currently under a great deal of scrutiny, with increasing numbers of **fitness to practise** cases being heard by all healthcare professional statutory regulatory bodies, where issues of inappropriate or unprofessional behaviour are cited. In the UK, paramedic fitness to practise cases heard by the HCPC comprise 33% of the total of 16 professions governed (HCPC 2017). This appears to be a higher rate than for other, more established professions, which may be due to the highly challenging practice environments in which paramedic practice is provided. It is therefore important that all paramedics consider professionalism as a lifelong competence that will require continual demonstration (and development) throughout their careers. To support this, the role that professional associations (such as the British College of Paramedics) provide in supporting and promoting professionalism and ethics is developing (van der Gaag et al. 2017).

In 2011, research was commissioned by the HCPC which explored healthcare professionals' understanding of professionalism. It concluded that the key to professional behaviour is 'the interaction of person and context, and the importance of situational judgement' (HCPC 2014, p. 3). This is particularly relevant to paramedics, where responses to crisis, trauma, and emergency situations involving family and significant others, and the heightened emotion at such times, can result in misperceptions and miscommunication (van der Gaag et al. 2017).

Defining professionalism

So what is professionalism? Defining professionalism is not easy, as it is diverse, multifaceted, and open to individual interpretation. In recent years, there has been an increasing focus in the literature on what constitutes professionalism in healthcare, and the concept is evolving according to societal changes. Sociologists may define 'a profession' in terms of being a vocation with a specific body of knowledge, a defined range of skills, which is inherently trustworthy and ethical, and which provides a service to society (e.g. as usefully summarised in Hugman 1991, pp. 2–9; Johnston and Acker 2016). Other healthcare literature focuses upon values of care and compassion held by the profession itself, and roles undertaken by its registered practitioners, for example developing honest relationships with patients (e.g. Burges Watson et al. 2012), patient advocacy (e.g. Batt et al. 2017), and clinical excellence.

There is an increasing body of knowledge that provides more helpful detail. For example, Bossers et al. (1999) devised useful schemata of professionalism, dividing the concept into three main themes:

- Professional parameters (e.g. legal and ethical aspects)
- Professional behaviours (e.g. discipline-related knowledge and skills)
- Professional responsibilities (e.g. responsibility to patients, oneself, employers, and the public)

Professionalism is now more regarded as a meta-skill, comprising situational awareness and contextual judgement, which allows individuals to draw on the communication, technical, and practical skills appropriate for a given professional scenario (HCPC 2014), rather than it comprising a set of discrete skills. Such professional judgement will be dependent upon the knowledge developed through logic; sensed intuitively; gained through experience, particularly prior experience of similar events; and influenced by education, socialisation, and the human resources of employing organisations (Johns 1992; Gallagher et al. 2016; Brown et al. 2005). In addition to this, the current focus is upon consistently demonstrating of a set of identifiable, positive professional attributes, values, and behaviours. It is this challenge of embedding a discrete body of knowledge into the philosophy and values of a profession which the paramedic profession is still exploring (Donaghy 2013; Johnston and Acker 2016; Givati et al. 2017).

Professionalism as ethical practice

Whatever aspect of healthcare we are in, regardless of the specific engagements within the paramedic role, the nature and practice of healthcare demand that paramedics are concerned with morals and ethics (see Chapter 8, Legal and Ethical Aspects of Paramedic Practice). As this chapter details, what paramedics view ethics to be is important within a professional context. Meta-ethics (what is meant by 'right' and 'wrong'), normative ethics (placing the concepts of 'right' and 'wrong' into professional practice situations), and applying ethics in specialised areas, such as healthcare or public health ethics, are all part of demonstrating professionalism. In a scoping review to outline scales for measuring professional behaviour amongst paramedics, Bowen et al. (2017) identified the key characteristics of professionalism. These include practising within a professional code of ethics. Key principles which underpin professionalism as ethical practice include integrity, honesty, trustworthiness, probity, objectivity, and fairness. These key professional characteristics are also applied as legal principles when determining cases of professional misconduct. Professionalism can thus be regarded as ethical competence in all aspects of professional activity.

Professional identity, socialisation, and culture

Professional identity, professional socialisation, and professional culture will all influence understanding of what professionalism is within particular professions.

Identity

Identification encompasses basic cognitive and social processes through which we make sense of and organise our human world (Monrouxe 2010). Our thoughts, experiences, and reflections create a complex catalogue of who we are as individuals and members of groups (Ashmore et al. 2004). Professional identity is assimilated with other aspects of a personal sense of identity, such as being a student, friend, mother, brother, carer, ambulance technician, or paramedic. **Paramedic professional identity** involves being able to practise with knowledge and skill, demonstrating a commitment to the paramedic profession, and being accountable and responsible for one's own actions (and omissions) through exercising professional judgement. Whilst there are some widely perceived stereotypical 'identities' of paramedics (such as being a hero or a lifesaver), developing honest relationships with patients, patient benefit, and timely treatment/duty to respond are key components of paramedic identity (Burges Watson et al. 2012; Johnston and Acker 2016). The newly emerging professional identity in which there is adaptation to increasing medical roles within the paramedic service is also being adopted as a key component of identity (Burges Watson et al. 2012).

Socialisation

Students learn to think critically within university and practice contexts, and so professional socialisation is a combination of an individual's professional development and a social, acculturation process occurring within a professional group and practice context (Ajjawi and Higgs 2008). Socialisation in a healthcare profession is likely to depend on the individual's past experiences, the reflective nature of the process, and the beliefs and values promoted in their educational programme (Howkins and Ewens 1999), as well as the opportunities for interdisciplinary learning (Brehm et al. 2006) and learning beyond registration. Socialisation is therefore negotiated in both university and practice settings, which shapes individual and collective professional identity and work culture through shared challenges and the values of both educational and vocational experiences (Givati et al. 2017).

Practice insight

Make an effort to communicate with and share aspects of your life with those around you, such as other students, university lecturers, and ambulance service staff. This will increase your opportunities and enhance your working relationships, and is known as 'social capital'.

Another aspect of becoming socialised in the paramedic community is the introduction to the knowledge and expertise of the range of practitioners working within the practice setting. For paramedics, this includes working with ambulance technicians, patient transport services and operational managers, education teams within ambulance services, and a range of professionals in hospital and other community healthcare settings. The relevant hierarchical structure of the organisation of service delivery is also influential in determining the professional behaviour (and attitudes) expected. For example, the power and authority in an organisation (and/or profession) are embedded within job descriptions, forms of address, policies and procedures, and practice standards. As the professionalisation of this profession becomes more widely implemented through education and regulation, there will be challenges of cultural differences of professionalism between degree-educated paramedics and those who qualified through vocational training (van der Gaag et al. 2017; Townsend 2017). The strength of professionalism development will be dependent upon how all registrants can facilitate the change in culture and share best practice in all professional domains.

Professional culture

Historically, the paramedic professional culture has been one of training rather than education, and it has been regarded as 'the trainer's role' to 'instil' professionalism into their learners, rather than to rely on students learning from registered paramedics and qualified mentors. This may now be transferred onto the role of 'the university', as paramedic education moves further into a higher educational structure as part of the development of the profession. It may seem easier to criticise another party, rather than look to your own skills in supporting professional development in students and less experienced colleagues. It is therefore important for the profession to develop confidence in its own ability to develop and assess its own students and registrants, rather than to rely on other professions, such as medicine, to provide this role modelling for them (Figure 1.1). Professional culture can influence and be influenced by the challenges of change and its management. New students and employees are keen to 'fit in' to the work culture, and are aware of being scrutinised by registrants when on placement (Givati et al. 2017). It may often be easy, due to the busy working lives of healthcare professionals,

Figure 1.1 A paramedic lecturer teaching students. Source: N. Raja, Melbourne, Australia, 2014. Reproduced with permission of N. Raja.

to be unwilling to embrace change, especially when time is so limited for reflecting on and thinking of the benefits of implementing the development of professionalism for regulated professions (HCPC 2014; Gallagher et al. 2016). The university may be seen as the 'intruder' who has caused the 'loss of the communal occupational nature of paramedic practice' (Givati et al. 2017, p. 367), but also as a key influencer in the development of professionalism (Givati et al. 2017). The influence of the professional culture may also have an impact upon the contribution to research in practice (Burges Watson et al. 2012).

How do students learn professionalism?

Learning about the concept of professionalism and how to demonstrate competence is achieved throughout the paramedic educational curricula, both campus and practice based. In addition to taught components (such as discussing cases of academic misconduct, developing clinical decision-making, or critical thinking), much of what paramedics learn is through working with clinical mentors and registered paramedics, through role modelling in practice, and within the university setting. Positive and negative **role models** in practice can provide a great influence on the understanding of the concept. Positive role models are widely reported as having excellent interpersonal skills, enthusiasm, commitment to excellence and evidence-based practice, integrity, effective teaching skills, building rapport with students, and being committed to professional development and exceptional clinical skills. Where there are clear policy obligations for practice staff (e.g. mentors) to 'teach', connections between theoretical and practical knowledge are more likely to be made (Peiser et al. 2018). However, there are significant challenges for paramedic staff who support students in practice. In particular, there may be conflict between supporting and assessor roles alongside heavy service delivery workloads (e.g. Johnston and Acker 2016; HCPC 2017) and, where there are only informal requirements for supporting students in practice, staff are 'inclined to attend to the development of contextual knowledge with a consequent disconnect between theory and practice' (Peiser et al. 2018, p. 16). In addition, campus-based teaching may only have a limited effect on learning compared to work-based learning, and role modelling professional attributes appears crucial to developing professionalism in nursing students (Eraut 2007; Felstead and Springett 2016; Nevalainen et al. 2018). Humans unconsciously learn from their environment, but because of extensive information assimilation they may not be aware that they are learning (Scott and Spouse 2013), so paramedic students may find it hard to appreciate their learning from working alongside registered paramedics in busy environments, or may not assimilate learning until further on in their career. In addition, the wealth of knowledge, skill, and behaviours of an experienced role model is often difficult to verbalise until formal recording occurs in writing (Scott and Spouse 2013). Most people know more than they can ever put into words. This tacit knowledge (after Polyani 1958) is also conveyed to learners by positive role models offering solutions in complex and challenging encounters, which can be integrated into the existing knowledge of the paramedic.

Practice insight

Recognise the many different elements of paramedic practice. Be aware that elements of expertise exist due to, in part, experience within the profession. Therefore listen to and embrace aspects of practice that have been shared with you by more experienced clinicians. If you are unsure whether what you are being taught is correct, then investigate the matter further.

There is a need for a contemporary evidence base to learning professionalism. A recent US consensus statement entitled 'Perspective: the education community must develop best practices informed by evidence-based research to remediate lapses of professionalism' (Papadakis et al. 2012) called for the development of an evidence base for teaching and learning healthcare professionalism through socialisation. There is a range of research currently being undertaken to develop this evidence base (e.g. Lloyd-Jones 2013), building upon Roff et al. (2012). Papdakis et al. purport that preregistration professional educational programmes must ensure that learning environments promote 'the development of explicit and appropriate professional attributes'. They refer to 'potent forces' that 'erode' the 'professionalisation that has occurred during training despite countervailing curricula in professionalism and inspiring role models'. When socialisation is described as actively weakening professionalism in this way, it provides a rationale for increasing the focus upon professional parameters, behaviours, responsibilities, and values, so that public confidence in registered professionals is not compromised. Professionalism is a competence that extends beyond registration, and all paramedic professionals must continue to demonstrate it throughout their career.

New technologies are being used to engage students in the activity of learning professionalism and to research the stages of learning professionalism, so that teaching and learning may be informed by a contemporary evidence base. One example is implementing the Dundee Polyprofessionalism e-learning tools for Academic Integrity and Early Clinical Learning (Roff and Dherwani 2011a, 2011b), for completion by groups of pre-qualifying undergraduate health and social care students. These tools are being used to investigate the learning curve from understanding **academic integrity** issues to the 'proto-clinical' (Hilton and Slotnick 2005) stages of learning. Hilton and Slotnick indicate that students move from learning and understanding academic integrity issues (such as plagiarism and other academic misconduct) to the proto-clinical stages of early patient/client exposure in professional practice. They suggest that 'practical wisdom' is only acquired after a prolonged period of experience (and reflection on experience), which occurs alongside the professional's evolving knowledge and skills base.

The Dundee Polyprofessionalism e-learning tools facilitate reflective learning utilising the four principles of feedback recommended by Sargeant et al. (2009). The cycle of response and feedback engages students in reshaping assessment and feedback in classroom seminars by being presented with anonymised results of the seminar group's responses to rating a range of different statements.

Assessment and standards of professionalism

How you need to demonstrate your professionalism is determined by the assessment for your programme or, once qualified and registered, the standards expected by your employer, peers, the HCPC, and professional associations (e.g. professional bodies such as the UK College of Paramedics). Students are assessed by clinical mentors and other colleagues with whom they work in practice. Self and peer assessment, objective structured clinical examinations (OSCEs), direct observation by academic tutors, critical incident reports, and learner-maintained portfolios are some of the ways in which triangulations of assessment can be achieved. Such triangulation is important to reduce the subjectivity of a particular assessor. Any single measure alone is not sufficient (van Mook et al. 2009). Addressing issues of lack of professionalism when employed as a registered paramedic will usually be undertaken by following relevant local policies (e.g. bullying and harassment policies, or grievance procedures). All such policies and processes will require notification to the regulatory body or professional association, as appropriate.

Practice insight

Visit your university website and take a look at the student charter/code of conduct. Also visit the HCPC website and take a look at the student code of conduct, performance, and ethics, to recognise the standards that affect you as a student. You may also be aware of such standards laid out by the ambulance service you practise with. Make sure you are aware of all of these standards from the start of your paramedic programme.

Regulatory areas, fitness to practise processes, and outcomes

There are four main areas of regulation that will apply in paramedic programmes:

- Academic misconduct
- Unprofessional behaviour within university-based settings (including social media)
- Unprofessional behaviour in practice settings (including social media)
- Health-related issues

To ensure public protection as a requirement of health and social care professional regulators, and as a process for maintaining the ethical practice of students, universities are required to have established fitness to practise procedures in place that include standards of conduct and processes for determining the fitness to practise of students. Such procedures tend to mirror professional statutory regulatory bodies' processes for hearing cases of professional misconduct (Figure 1.2). However, as a student, there will also be processes to help in learning what it means to behave professionally.

Whether a student or a registered paramedic, all cases will need to follow an approved process that allows each to be addressed on an individual basis. There is no definitive outcome, as each case will be different; however, panel decisions in hearing cases of alleged misconduct can be broadly classified as:

- No case to answer.
- Minor breaches of conduct.
- Significant breaches of conduct.

Figure 1.2 A student paramedic facing a disciplinary panel. Source: N. Raja, Melbourne, Australia, 2014. Reproduced with permission of N. Raja.

- Serious breaches of conduct, which may result in temporary suspension/withdrawal from the professional register/practice and/or programme. This usually does not exceed 12 months. The individual will need to provide evidence of developments and remediation before being able to return to the programme.
- Major breaches of conduct, which may result in the individual being permanently removed from the professional register or withdrawn from their preregistration programme.

Conclusion

Paramedics must demonstrate professionalism in all aspects of their practice. Guidelines exist that can help the paramedic to achieve this, and this chapter provides an overview of the key issues and principles to help the paramedic understand and demonstrate professionalism in all aspects of their lives, but most importantly in their role in providing emergency patient care.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. What are the three main themes that constitute professionalism?
2. What may influence understanding of professionalism for paramedics?
3. Does behaving professionally apply when you are on duty or when you are off duty?
4. What are the five levels of outcome against which fitness to practise panels judge individual student or registered paramedic cases proven to have behaved unprofessionally?

Activity 1.1

John, a registered paramedic, has just finished a shift and is completing his time sheet. He turns to you and tells you to make sure that you claim an extra hour of overtime even though you do not feel you are entitled to do so. He reassures you by saying: 'It's OK, everybody does, it happens all the time and nobody ever says anything.'

What would you say or do if you were in the coffee room listening to this conversation? What do you think about this?

Activity 1.2

For each of the following questions, state whether it is true or false:

1. The paramedic clinical mentor is the only person who can truly assess a student paramedic's overall development – true or false?
2. Negative role models in paramedic practice do not help the student to learn about professionalism – true or false?
3. As a student paramedic you are not always aware that you are learning – true or false?

Glossary

Academic integrity:	Honesty, responsibility, and rigour in scholarship and research, including avoidance of cheating or plagiarism.
Fitness to practise:	Fitness to practise means to practise in a safe, competent, knowledgeable way, demonstrating a professional attitude through behaviour, so that the public are protected.
Health and Care Professions Council (HCPC):	The professional statutory regulatory body for paramedics in the UK.
Paramedic professional identity:	Paramedic professional identity involves being able to practise with honesty, integrity, and trustworthiness, and with knowledge and skill. It includes demonstrating a commitment to the paramedic profession, and being accountable and responsible for one's own actions (and omissions) through exercising evidence-based practice and professional judgement.
Professionalism:	Knowledge, skills, and attitudes expected from a person on a professional register.
Role model:	A role model is a person who demonstrates good practice and whose behaviour is replicated by others.

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2

Professional health regulation for paramedicine and ambulance prehospital emergency care

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Contents

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Companion website: www.wileyfundamentalseries.com/paramedic

Learning outcomes

On completion of this chapter the reader will be able to:

- Demonstrate an understanding of the key concepts underpinning professionalism.
- Demonstrate an awareness of the contemporary issues relating to the professional regulation of paramedicine and ambulance prehospital care.
- Appraise recent research examining the development of paramedic health professional regulation.

Case study

Donald, a paramedic who attended an emergency call to a patient having a seizure, was the subject of a complaint. The investigating panel received evidence about Patient A's health condition and how it affected her behaviour. One sign was that her behaviour could be disinhibited. Whilst being interviewed during the investigation, the registrant's crewmate, George, said that the patient was singing 'You Sexy Thing' in the company of the paramedics. Also, George noted that Patient A was abnormally loud in her speech when getting out of the ambulance at the hospital. When they returned to the ambulance George had said, 'Oh my God, she's a total nutjob, crackers, mental.' It should have been apparent to Donald that the patient was vulnerable. Despite this, after her release from hospital Donald visited the patient at her home. She had made him a drink, they had chatted, followed by sex. This sequence of events happened a further two times. A complaint was lodged. An investigation into Donald's inappropriate relationship of an intimate and/or sexual nature with a vulnerable patient led to a hearing into possible breaches of professional boundaries. This constituted misconduct, which represented impaired fitness to practise. The complaint was proven and Donald was struck off the register.

Introduction

Paramedics comprise a critical and sizeable component of emergency healthcare systems around the world. Their actions and practice as health **professionals** are fundamental to the health and wealth of individuals and society. This chapter examines professional regulation, the leading global contemporary issue within ambulance and prehospital emergency care, and the implications for professional practice. It reports the findings of leading contemporary research into the global regulation of paramedics; discusses these findings, considering other evidence about health professional regulation; and explores the challenges for paramedicine as an emerging profession.

Principles for paramedic professional health regulation

Globally, there is an unprecedented demand for high-quality and safe healthcare. This demand, particularly for emergency healthcare (Considine et al. 2019; Shaban 2011), drives reform in the healthcare sector (Institute of Medicine 2000; Shaban 2018). The demand for safe and quality healthcare is supported by a variety of changes in the philosophy of healthcare that have put patients at the centre of care. Patients have been encouraged to be 'partners in their own health care' to, amongst other things, improve quality and safety (Australian Commission on Safety and Quality in Health Care 2017). The vision for quality medical care championed by luminaries such as Florence Nightingale, Avedis Donabedian (Donabedian 1966, 1988), and many others over the last hundred or so years has been realised in ways they could not have imagined. The rise of evidence-based practice and the ever-increasing patient and consumer voice are constant reminders to health professionals of the need for, and fundamental right of patients to, high-quality and safe healthcare. Indeed, it is the delivery of safe and quality healthcare that sits as the primary objective of the many different models that regulate healthcare professionals, including paramedics (Office of Queensland Parliamentary Counsel 2009).

At the core of high-quality and safe healthcare, particularly emergency healthcare, is a highly skilled, trained, experienced, and professional workforce. Globally there is a mixture of professional and paraprofessional roles performed by healthcare workers in emergency healthcare systems. Some occupational groups, such as medicine and nursing, have been established universally as a profession. For other groups, such as paramedics, this has been varied. There is a strong global drive to ensure that all occupational groups who operate in the emergency healthcare sphere establish themselves and operate as health professionals (Considine et al. 2019).

Health professional regulation for paramedic professionalism

The terms 'profession', 'professional', and 'professionalisation' are contested and carry different meanings. For the purposes of this chapter we will be discussing 'professionalism' as defined by Freidson (2001, p. 1) to refer to 'a knowledge base of abstract theories and complex skills acquired through higher education, relative self-regulation supported by professional bodies and associations, the need to exercise personal judgement, and perhaps most importantly, a commitment to public service' (see also Kreber 2017). Professionalism is acting 'within a set of norms, principles and standards of conduct and competency' that places the interests of others before oneself (Evetts 2014). The manner in which a group develops as a profession is called professionalisation (Abbott 1988; Professional Standards Council 2018). Australia's Professional Standards Council (2018) specifies the importance of the core elements of integrity, ethics, trust, and expertise as key reference points in the development of emerging professional groups and professions.

The nature of regulation by professionalism adds an extra layer of regulatory responsibility to some occupational groups but not others. For example, the whole population is regulated by criminal and civil laws, but healthcare professionals are also regulated by laws that relate specifically to their work. These laws provide special privileges in exchange for health practitioners meeting particular responsibilities. For example, the laws protect the group from unwanted members and give them the power to establish their own standards of conduct and competence. The privilege can extend to protecting their independence to judge, criticise, or refuse 'employers, patrons and the laws of the state' if it is necessary to protect the patient's best interest (Freidson 2001). This duty exists even in the face of opposition from powerful factions, including the state. If a practitioner fails to meet the required standards of conduct and competence established by the profession – which often reflect community standards – then conditions can be placed on their employment. That is, they may be compelled to undertake more training or, at worst, they may have their licence to practise rescinded.

The best way for paramedics to avoid falling into the latter category is to act with professionalism (see Table 2.1). In short, paramedics need to ensure they are up to date with training, maintaining their competence to practise to the required standard so they can deliver quality and safe care. Additionally, professionalism requires them to work according to a set of agreed values, and to put their patient's interests ahead of their own. These expectations are codified in the various laws that regulate paramedics in the UK and Australia (Health and Care Professions Council [HCPC] 2001; Office of Queensland Parliamentary Counsel 2009). The objective of the legislation is the same in both the UK (Secretary of State for Health 2007) and Australia – to

Table 2.1 The 5 Es of professionalisation.

Education	• Formally accredited, entry-level formal qualifications or certification exist based on identified, specific technical and professional requirements to practise in a discrete area. • There is a requirement for ongoing education and continuing professional development.
Ethics	• Published, prescribed professional and ethical standards that clients can expect their professional to demonstrate, including specific expectations of practice and conduct, and a commitment to a higher duty. • A transparent process through which the professional and ethical standards are generated by the professional community that governs their conduct, with a clear mandate to improve consumer protection that goes beyond reiterating the relevant statutory expectations.
Experience	• The requirement for personal capabilities and experience required to practise as a professional in the discrete area.
Examination	• A fair, transparent, and independent mechanism by which education, ethics, and experience are assessed, validated, and assured to the community. This mechanism includes not only qualification or certification requirements and traditional examinations, but also the requirement for regular validation and assurance, such as by compliance and professional audit expectations.
Entity	• An independent, capable entity to oversee and administer professional entry, professional standards, and compliance expectations on behalf of the public, which should comprise individuals who are regulated participants in that profession.

improve patient safety and to increase the flexibility of the healthcare workforce. However, there are differences between the two regulatory models that have different implications for the paramedic profession in each of those jurisdictions.

The UK experience

As Chapter 1 has documented, in the UK, paramedics have been regulated for over a decade. The drive towards regulation shared a similar genesis to that in Australia following a number of scandals that resulted in the primary focus of safe, high-quality care for patients, being prioritised in a new regulatory model (Smith 2004). The regulatory process was designed to be removed from the government, the employer, and notably the profession (Chamberlain 2014). A secondary focus was on the development of a responsive, flexible healthcare workforce. The UK model is more bureaucratic in its structure than the Australian model and does not accommodate self-regulation by the profession. The nature of a bureaucratic model of regulation is that it attempts to generalise and flatten out skill sets and roles amongst professionals, in order to reduce silos of specialisation and increase flexibility within the healthcare workforce (Secretary of State for Health 2007; Townsend 2018). This model has some advantages and it has certainly facilitated the extension of the scope of practice of paramedics beyond just the traditional emergency prehospital ambulance response (College of Paramedics 2015). However, it also has some weaknesses. For example, it blunts several elements typically associated with a profession, including having a unique purpose, specialised knowledge and skill that are not usually practised by others, and a unique professional identity and thus political power (Brown et al. 2000). The bureaucratic model is contrary to the notion of specialisation and the division of labour along specialised lines.

As work has become more complex over time, specialisation has increased in a number of fields, particularly in healthcare. The division of labour in this way recognises that not every practitioner can know everything or indeed do everything well – 'a jack of all trades is a master of none'. This is especially true in complex and highly technologically advanced healthcare fields like paramedicine. Understanding that some healthcare regulatory systems are designed to divide labour in terms of speciality and others, like the UK, are designed to blend and generalise some healthcare roles allows for some examination of the way in which each system supports the exercise of professionalism.

Townsend (2018) undertook a study of the role of the law in paramedic professionalism internationally, and has observed that professionals share a number of traits, including specialised knowledge and the legal authority to use discretion in the application of that knowledge. This is consistent with the notion of self-regulation of the professions, because their knowledge is too specialised for anyone other than those in the profession itself to understand. This principle is recognised in civil law where, in cases determining professional negligence, members of the professional peer group, not members of other health professions, are called to give evidence as to whether another member has breached professional standards of care (NSW Parliamentary Counsel's Office 2002).

Additionally, the exercise of professional discretion allows for practitioners to manage the complexity and variety of unique cases that they encounter and that are common to human healthcare. That is, there is a recognition that health practitioners who have met education, fitness to practise, and other standards sufficient to be registered as a member of the health profession are sufficiently well trained and responsible to be able to exercise professional discretion in the interests of their patient. However, the UK regulatory model limits specialisation and instead promotes generalisation. Townsend observes:

> Discretionary specialisation associated with professionals allows for flexibility in the practice of specialised skills for a unique purpose. This notion of flexibility and the valuing of specialisation has been lost in the UK's restructure of the workforce that was implemented as an attempt to increase the skills mix of the healthcare workforce. The adoption of a bureaucratic regulatory regime that values uniformity in the form of generic standards of conduct and assessment of professional behaviour has hampered the ability of paramedics as professionals to regulate themselves and has not recognised the unique role and responsibilities that paramedics have and that set them apart from other health professionals. (Townsend 2018)

The unintended consequences, Townsend (2018) argues, are significant, particularly in terms of the identity of paramedics and the control, or otherwise, that they have over their work:

> Instead, paramedics in the UK are regulated the same way as art therapists. They are subject to a generic code of conduct. They do not have control over the nature of their work, which is evidenced by their lack of control over their curriculum. Their work performance is judged not by their peers but by outsiders. All of these elements have contributed to a lack of professional development for paramedics in the UK, despite the introduction of regulation to facilitate professionalisation over a decade ago. This demonstrates the paradox of the bureaucratic model of regulation that, prima facie appears to give paramedics professional status but has had the effect of leading them to believe that they have not fully professionalised because they do not have control over their own work.

The bureaucratic model of regulation in the UK has led to the generalisation of paramedic work in some areas. The question then becomes, why be a paramedic at all? What is it that distinguishes paramedics from other similar health professionals like nurses? This blurring of professional roles and identities has the added effect of contributing to those sitting in judgement of paramedic performance not fully understanding who paramedics are or what paramedics do. This may not matter given that many paramedics appear to be happy to have extended opportunities to practise beyond the traditional paramedic role, but it has been noted by others that there is a risk that having 'knowledge or doctrine which is too general and vague or too narrow and specific provides a weak base for an exclusive jurisdiction' (Wilensky 1964, p. 150). This suggests that it is necessary for each profession to find what Townsend refers to as its 'Goldilocks zone' (Townsend 2018) – the position where the profession maintains its authority over its unique role and specialised knowledge whilst also providing a useful service to a broad marketplace. There is some evidence that this generalised rather than specialised division of labour and blurring of professional roles and identities have implications for paramedics, including contributing to those sitting in judgement of paramedic performance not fully understanding who paramedics are or what paramedics do.

Brady argues that UK paramedics are being sanctioned by the regulator, the HCPC, for perceived deviations from guidelines – working outside their scope of practice – because the disciplinary panel does not know what paramedics actually do. This is consistent with Freidson's suggestion that professional practitioners are likely to view administrators who do not do or have not undertaken the daily work of the profession as being unable to understand their work. Also the practitioner's work is made more difficult by 'abstract technical norms and bureaucratic requirements designed to guide and record their activities', but that do not necessarily cohere with or prioritise the moral intention of the work they do (Freidson 1983). This misunderstanding by bureaucrats can occur when paramedics apply their specialised discretionary decision-making in the best interests of the patient, as do other health professionals (Brady 2013). Peer review, however, is a fundamental element of professional practice and is consistent with a self-regulatory framework rather than a bureaucratic framework. Thus peer review (self-regulation) allows for assessment of the specialisation and expertise of the professional group by members of the professional group who hold the same knowledge and skill and have knowledge of the profession's role, purpose, and values. The confusion over role, identity, purpose, and values is consistent with the lack of clarity about who paramedics are in terms of their educational programmes, their gradually expanding range into nontraditional areas of practice, and their lack of a profession-specific code of conduct. Indeed, in a report commissioned by the regulator and conducted by the University of Surrey into the high number of complaints received by the regulator concerning paramedics, the authors suggested that the HCPC should clarify the criteria by which paramedics are held to account (van der Gaag et al. 2017).

The report did not recommend a change to the regulatory structure, but interestingly paramedics interviewed for it suggested a shift to a regulatory model such as that operated by the General Medical Council. This is a self-regulatory model similar to the Australian model, in that at least half the members of the professional standards review panel must be registered paramedics. Some commentators suggested this would provide better outcomes for paramedics, in part because there is a belief amongst paramedics that the current regulator does not know what paramedics do and does not understand the particularities of their practice (van der Gaag et al. 2017). Lovegrove and Davis, in a review of paramedic education in the UK, identified that a major driver of the paramedic push to professionalisation was a desire to raise awareness of the capabilities of paramedics amongst others (Lovegrove and Davis 2013). Townsend (2018) argues that although UK paramedics are referred to as professionals under the current bureaucratic regulatory model, they are not regulated like professionals; that is, they do not self-regulate, as with a professionalism model. Townsend argues that this form of regulatory approach is paternalistic in the sense that it does not allow the paramedic profession to grow and develop to maturity as a full profession by not permitting independent regulation. This is consistent with the finding in the 'People like us?' report, which suggested that the profession was still evolving (Lovegrove and Davis 2013).

Admittedly, the regulatory model currently in place in the UK was developed almost two decades ago, when paramedics worked differently and the expectations and understanding of what paramedics did amongst the public, law and policymakers, and the regulator were different. It is time for a review of the regulatory mechanism to allow paramedics to regulate their education and accreditation standards and to set a minimum paramedic curriculum. The curriculum should encompass paramedicine's unique and specialised skills and knowledge and reflect its current minimum scope of practice, so that all registered paramedics share this same minimum standard. Setting such a standard would address issues of confusion, particularly amongst the regulators, who are also responsible for disciplining paramedics. Although the paramedic scope of practice has become quite broad, and this has allowed them to work in areas they have traditionally not occupied, the broadening and flattening of their specialised role as out-of-hospital emergency responders have not correlated with other aspects of their professional development. Indeed, there is even evidence that paramedics in the UK have called for 'guidance and limitations' to their practice via practice guidelines to ensure the protection of the public, as they consider themselves not 'professionals' but rather an 'aspirant and emergent group of people trying to understand what it is to be professional' (Donaghy 2013). An examination of some of the complaints made against paramedics regarding their practice and conduct can provide practitioners and educators with some information that may assist with the development of a culture and ethos of paramedic professionalisation in both the UK and Australia.

Paramedics behaving badly

Paramedics in the UK have been regulated for over a decade. There is a wealth of data available on the types and frequency of misconduct in which they have engaged. An examination of that data in 2015–2016 shows that 239 allegations of a breach of a paramedic's 'fitness to practise' were made against UK paramedics by the HCPC. The total number of registrants in that year was 22 380. Paramedics constitute only 6.55% of the total number of registrants, yet they made up the second-highest number of complaints (1.07%) of all the professions registered (Health and Care Professions Council 2016). The group with the largest number of concerns against paramedics was the public (42.8%), followed by the employer (25.2%), and then self-referral (20.2%) (Health and Care Professions Council 2016). Townsend (2018) argues that the UK results cannot be explained simply because of the number of paramedics and the intimate type of work that they do: 'Physiotherapists are the second-largest profession, yet have a much lower rate of concerns raised than paramedics or social workers in England' (Health and Care Professions Council 2016, p. 16). Although the numbers for social workers and paramedics are higher than for other health professions, the proportion of paramedics who were formally sanctioned by the regulator represented less than 0.3% of the total registered paramedic population, and this proportion is consistent with numbers across all registered health practitioners (Health and Care Professions Council 2016). One conclusion that can be drawn from this is 'that there continue to be so few allegations largely because the vast majority of registrants are committed to their job and vocation to help others … they therefore maintain their competence, continue to develop professionally and do not misbehave' (Health Professions Council 2012, p. 49). This suggests that paramedic professionalism is quite high.

However, there were some misconduct matters. The most common included issues regarding 'attending work under the influence of alcohol; bullying and harassment of colleagues; breach of professional boundaries with service users or service user family members; breach of confidentiality; misrepresentation of qualifications and / or previous employment; failure to communicate properly and effectively with service users and / or colleagues; posting inappropriate comments on social media; acting outside scope of practice; falsifying service user records; and failure to provide adequate service user care' (Health and Care Professions Council 2016, p. 46).

Lack of competence examples included 'failure to provide adequate service user care; inadequate professional knowledge; and poor record-keeping' (Health and Care Professions Council 2016, p. 48). The third most common matters related to criminal convictions or cautions and included 'theft; fraud; shoplifting; possession of drugs and / or possession of drugs with the intent to supply; receiving a restraining order and breach of a restraining order; driving under the influence of alcohol; failure to provide a specimen; assault (common or by beating); possession of pornographic images; and sexual offences' (Health and Care Professions Council 2016, p. 50). The type of behaviour complained about included assault, criminal damage, drink driving, drugs possession, fraud, possession of child pornography, attending work under the influence of alcohol, bullying and harassment of colleagues, engaging in a sexual relationship with a service user, failing to provide adequate care, false claim to qualifications, and self-administration of medication.

The reason the regulator has sanctioned practitioners for these behaviours is because their actions represent an abuse of trust or power, amounting to an exploitation or deception of a vulnerable person for personal gain, as in the case study at the beginning of this chapter. Some of the actions also represent a failure to respect the rights of patients to make choices for themselves about their own care, and/or pose a risk to the safety of the patient that is contrary to the purpose of the profession. Some of the actions demonstrate a failure to act legally, but in all cases there has been a failure to act ethically and professionally. This not only compromises patient safety, it reflects low-quality care and has the potential to undermine the public's confidence in the profession.

The Australian experience

The formal professional regulation of paramedicine and paramedics in Australia is in its infancy. In 2018, Australia joined the small, yet ever-increasing pool of countries with national regulation of paramedicine (Townsend 2018). In May 2018 the newly constituted Paramedicine Board of Australia and the Australian Health Practitioner Registration Agency (AHPRA) established registration and other standards for paramedics as registered health professionals (Paramedicine Board of Australia 2018). The Paramedicine Board of Australia Grandparenting Registration Standard is time-limited and provides a temporary registration for current practising paramedics who are without an approved or accepted qualification, but can demonstrate their competence via other training, qualification, and/or experience. The Paramedicine Board of Australia has also signalled the development or use of multiprofessional codes, guidelines, and policies on matters including mandatory notifications, codes of conduct, guidelines for advertising regulated health services, and social media policy, to guide the profession of paramedicine (Paramedicine Board of Australia 2018).

The historical lack of uniform national regulation of paramedicine as a health profession in Australia means that there are no, or relatively few, publicly available records of paramedics' misconduct. Part of the benefit of being regulated under the national law is that this information will now be publicly available. This also ensures that the regulator will hear matters in accordance with principles of natural justice and procedural fairness. The AHPRA, the administrative body of the regulator, provides support to the national boards by administering the registration process; accepting and investigating complaints about professional conduct, performance, or the health of registered health practitioners; and working with the Health Care Complaints Commission in each state and territory to ensure community concerns are dealt with appropriately. (The exceptions are New South Wales, where complaints are investigated by the Health Professional Councils Authority and the Health Care Complaints Commission; and Queensland, where this is undertaken by the Queensland Health Ombudsman.) AHPRA provides material to the respective boards for consideration by a professional standards panel or a tribunal, depending on the type and seriousness of the allegation made against a practitioner. The complaint will be investigated and, if deemed to have substance, will be sent either to a performance and professional standards panel to hear allegations of 'unsatisfactory professional performance' or 'unprofessional conduct'; or to a tribunal for allegations of professional misconduct, the most serious allegation, a finding of which could lead to a practitioner being struck off the register (Office of Queensland Parliamentary Counsel 2009, s. 6). In essence, the Act requires that a practitioner performs to a satisfactory standard. This means that the knowledge, skill, or judgement possessed, or care exercised by, the practitioner in the practice of the health profession is to the standard reasonably expected of a health practitioner of an equivalent level of training or experience (Office of Queensland Parliamentary Counsel 2009).

Other regulatory requirements codify required standards of professional practice or professionalism, for example mandatory reporting of notifiable conduct. Mandatory notifications must be made to the regulator if a health practitioner forms a reasonable belief that another health practitioner has behaved in a way that constitutes notifiable conduct, or if a student has an impairment that, in the course of the student undertaking clinical training, may place the public at substantial risk of harm. **Notifiable conduct**, in relation to a registered health practitioner, means the practitioner has:

- **a.** practised the practitioner's profession while intoxicated by alcohol or drugs; or
- **b.** engaged in sexual misconduct in connection with the practice of the practitioner's profession; or
- **c.** placed the public at risk of substantial harm in the practitioner's practice of the profession because the practitioner has an impairment; or
- **d.** placed the public at risk of harm because the practitioner has practised the profession in a way that constitutes a significant departure from accepted professional standards. (Office of Queensland Parliamentary Counsel 2009, s. 140)

An examination of the types of behaviours that were sanctioned by the Performance and Professional Standards panel against registered medical practitioners and nurses in Australia may give some idea of the likely issues that may arise in paramedic practice, because the work of those professions is the most similar to that of paramedics. The most common behaviours that have been noted include the following:

- Failures in clinical care, for example inadequate or inappropriate testing, investigations, or treatment; inaccurate or misleading health records; inadequate follow-up; missed, incorrect, or delayed diagnosis; or communication in a disrespectful manner.
- Medication-related issues, including inappropriate prescribing; or inadequate, inaccurate, or misleading documentation.
- Breaches of conditions of registration, like failing to cooperate with an investigation.
- Boundary violations, including inappropriate sexual comments and inappropriate sexual conduct; breaches of confidentiality; or inappropriate collection or use of patient information.
- Failures regarding consent, including failure to provide adequate or accurate information; or failure to assess a patient's capacity to consent.
- Inappropriate behaviour, like aggression towards a service user and even assault.
- Conflicts of interest.
- Health impairments, including the misuse or abuse of drugs (Australian Health Practitioner Regulation Agency n.d.).

The common thread across all these behaviours is the failure to adhere to the bedrock of professionalism, putting the patient's interest first.

Professionalism is increasingly regarded and valued as a meta-skill, comprising situational awareness and contextual judgement. Individuals can draw on the communication, technical, and practical skills appropriate for each given professional scenario (Health and Care Professions Council 2014), rather than it comprising a set of discrete skills. Such professional judgement will be dependent upon the knowledge developed through logic, sensed intuitively, gained through experience, particularly prior experience of similar events, and influenced by education and socialisation (Johns 1992). Regulation by professionalism involves consistently demonstrating a set of identifiable, positive professional attributes, values, and behaviours, and being held to these standards by your professional peer group and others. Paramedicine is still evolving as a profession. Although there have recently been changes that have facilitated the process of professionalisation for paramedicine, including legal recognition and regulation of the profession, there remains the challenge of embedding a culture and ethos of professionalism within paramedicine (Townsend 2018).

Conclusion

Paramedics have a significant role to play in the provision of emergency prehospital care. They have evolved over time to become highly skilled clinicians, working in high-risk environments with little immediate oversight, but with enormous responsibilities to act in the interests of their patients. Yet there is an absence of professional self-regulation of paramedics globally (Considine et al. 2019; Shaban 2011). Unlike physicians, nurses, psychologists, and other recognised health professionals who are regulated by profession-based statutory authorities, paramedics and their practice in many jurisdictions are regulated by their employing organisations.

It is up to paramedicine as a discipline and a profession to develop a culture and ethos of professionalism through the development of an identity that embodies the group's values and ideals. Individual paramedics must develop and demonstrate professionalism in all aspects of their practice. Regulation by professionalism works to protect patients where a conflict of laws may operate and have the effect of subjugating a patient's interests to those of another, for example an employer or even the state (World Medical Association 1948). This power is one that must be used judiciously, because as autonomously registered health practitioners – legal entities separate from an employer – paramedics will be held responsible by their professional body for their decisions and actions. Guidelines exist that can help paramedics to achieve this, and this chapter provides an overview of the key issues and principles to help paramedics understand and demonstrate professionalism in all aspects of their lives, but most importantly in their role in providing high-quality professional emergency patient care.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. Describe in classic terms the standard that paramedicine should attain to be deemed a regulated health profession.
2. Describe three key drivers of health professional regulation in paramedicine.
3. Define practice as it applies to health professional regulation for paramedics.
4. What are the benefits of regulation by professionalism (Australia) versus bureaucracy (UK)?
5. What behaviour or conduct by paramedics is deemed notifiable as determined by the AHPRA?

Activity 2.1

Consider the case study at the beginning of this chapter. What are the issues you can identify regarding Donald's professionalism?

Should paramedics in remote communities, who no longer have a relationship with a patient, be able to commence a relationship with that patient?

Activity 2.2

For each of the following questions, state whether it is true or false:

1. Despite doing very different jobs, paramedics in the UK are regulated the same way as art therapists – true or false?
2. Paramedics in Australia will self-regulate – true or false?
3. Paramedic professionalism involves acting 'within a set of norms, principles and standards of conduct and competency' that places the interests of others before oneself – true or false?
4. The most common area of paramedic misconduct is clinical competence – true or false?
5. Paramedic misconduct does not include a breach of professional boundaries with service users or service user family members – true or false?

Glossary

Notifiable conduct: Conduct which breaches the professional code and expectations of a health profession and which poses public risk, such as practising while under the influence of intoxicants.

Professional: An individual who adheres to relevant ethical standards and holds themselves out as, and is accepted by, the public as possessing special knowledge and skills in a widely recognised body of learning derived from research, education, and training at a high level, and who is prepared to apply this knowledge and exercise these skills in the interest of others (Professions Australia 2018; Professional Standards Councils 2018).

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3

Human factors in paramedicine

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Contents

Fundamentals of Paramedic Practice: A Systems Approach, Second Edition. Edited by Sam Willis and Roger Dalrymple.

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Learning outcomes

On completion of this chapter the reader will be able to:

- Define human factors.
- Recognise a model of error minimisation.
- Identify several environmental factors specific to prehospital care that may allow error to occur.
- Identify a number of behaviours that mitigate error.
- Use the egg-timer model to identify and manage disagreement.

Case study

Tom is a newly qualified paramedic. He is keen to impress his patients and colleagues with his knowledge and skills and wants to fit in with his new crewmates. At the first job of the morning Tom is required to administer aspirin to a patient suffering chest pain. He has heard in the crew room that 'every good paramedic knows their medicines protocols by heart' and so doesn't want to display any sign of weakness by checking his medicines protocol app. Fortunately for Tom, his technician crewmate spots that the patient is contraindicated for aspirin on account of his haemophilia. He advises Tom to check his protocols every time and not to listen to crew-room bravado. A medicine error is avoided this time and Tom learns a valuable lesson.

Introduction

As a paramedic you work within a complex system. Your performance is reflected through your knowledge, skills, and intentions, and is partly about 'the system'. Consequently, **human factors** research is the study of the interaction between humans and the system. A key driver of the system is safety; it is not enough simply to 'get things done'. These things must be done in a safe way to ensure each element of the system is concerned with preventing error. For instance, it is not enough simply to give a paramedic a new medicine to use; there are a number of errors that could occur as a consequence of this change. The paramedic must be educated about the medicine and when and how to use it in order to develop the knowledge and skill. They should also be provided with adequate tools to deliver the medicine, e.g. cannulation equipment. The environment is not always ideal for medicine administration: there should be adequate warmth and lighting in the ambulance, for instance. The organisation's culture and objectives should positively influence the paramedic's use of the medicine.

This chapter discusses how the paramedic's environment, or the system in which they work, can contribute to unsafe practice, and provides an insight into how this can occur.

What are human factors?

Paramedic care is influenced by environmental, organisational, and personal influences. These influences are not controlled by the clinician and are termed human factors. Working definitions of human factors relevant to paramedic practice are scarce, but an effective definition is as follows: human factors are any matters in the paramedic's environment that may negatively affect safe clinical care. Such examples include poor communication, ambulance design, fatigue, role conflict between crews, and disparities in decision-making.

Human error in paramedicine

Errors are rarely exclusively the fault of the individual. Even a person with murderous intent *should* be unable to follow through with these intentions if they are working within a safe system. Blaming an individual for an error may seem to exonerate the organisation of responsibility, but it will do nothing to improve safety in the future. There would be no **onus** on the organisation to investigate its systems and processes to seek a safer solution. On the other hand, blaming 'the system' would take all responsibility away from the individual and negate the need for them to exhibit safe behaviour. The reality is more balanced, in which 'blame' rarely features and instead learning opportunities are presented.

Humans are **fallible**: everyone makes errors at some point. But in most cases, humans are the defence mechanism against **human error**. Ideally, we should be working within a multilayered system that allows other defence mechanisms to prevent an error of judgement becoming a clinical error. Reason's (1997) 'Swiss cheese' model illustrates this. Each piece of cheese represents a process designed to protect from error. According to this model, if all the holes line up there is no 'cheese' preventing the error (Figure 3.1). However, in the case study at the beginning of this chapter, Tom's 'cheese layers' should involve checking his medicines protocol, in addition to checking with his crewmate that he has read the protocol correctly.

For an error to occur there will inevitably be an environment or set of conditions that allows errors to occur. Table 3.1 identifies such conditions and associated errors in prehospital care.

To manage these environmental conditions, a model known as the Systems Engineering Initiative for Patient Safety (**SEIPS**) was designed to minimise error by examining the entire system. It goes beyond those individual processes put in place as barriers to error, instead adopting a whole-systems approach (Carayon et al. 2006). In this model, an error is the product of the entire system. If a task is poorly defined, or the paramedic lacks the knowledge to operate the tools provided, the complexity of that task is increased and making an error becomes more likely. By considering the design of the various factors within a system and their impact on the other factors, the likelihood of error can be reduced. Figure 3.2 provides a diagrammatic representation of the SEIPS model. Consider yourself being the paramedic at the centre of the model and how your daily practice is influenced by each of the components, as well as how each component influences the others.

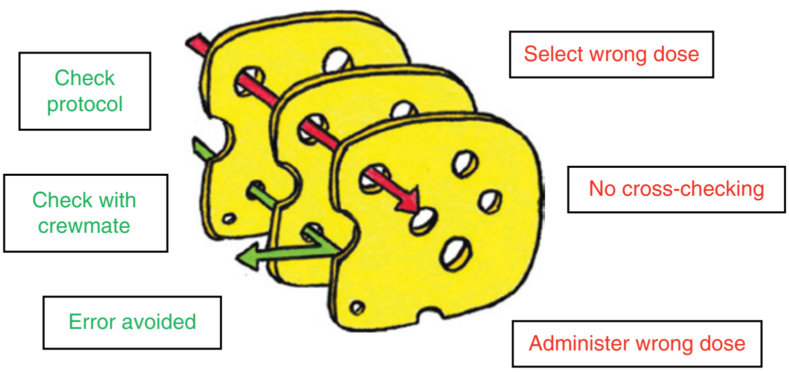

Figure 3.1 Error minimisation in prehospital care based on Reason's Swiss cheese model of errors. Source: Image courtesy of Abigail Milner.

Table 3.1 Summary of error-producing conditions in prehospital care.

Condition	Example
Unfamiliarity with the task	Paramedics are routinely faced with new situations, or medical conditions they have never experienced before, and are expected to safely triage and manage these cases in a timely manner.
Time shortage	During a time-critical situation every second counts. Examples include having to apply clinical skills much more quickly than in non-time-critical situations, or being required to travel to an incident under emergency conditions.
Excessive noise	Typical background noises include relatives and family members, TV, police radios, or traffic (see discussion on background noise).
Poor human–system interface	A badly laid-out ambulance will prevent paramedics from treating their patients safely, and many paramedics may also place themselves at risk to help a patient.
Information overload	Receiving large volumes of personal information, such as a medical history from a patient, or being required to complete several complex tasks all at the same time.
Misperception of risk	Demonstrating a complacent attitude towards risky tasks.

Source: Adapted from Willis and Mellor (2018).

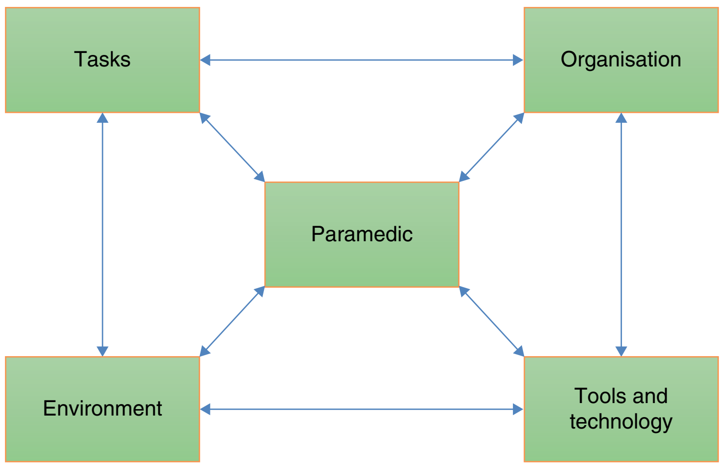

Figure 3.2 Diagrammatic representation of Carayon's (2006) Systems Engineering Initiative for Patient Safety (SEIPS) model.

Tasks

Let us consider one of the riskiest paramedic tasks: handing over a patient at hospital. On first glance, this seems like a relatively straightforward process: we move the patient onto the hospital bed and tell the doctor/nurse why we have brought the patient to them. However, on closer inspection there are a number of processes involved, any of which presents risk if not performed effectively (see Figure 3.3).

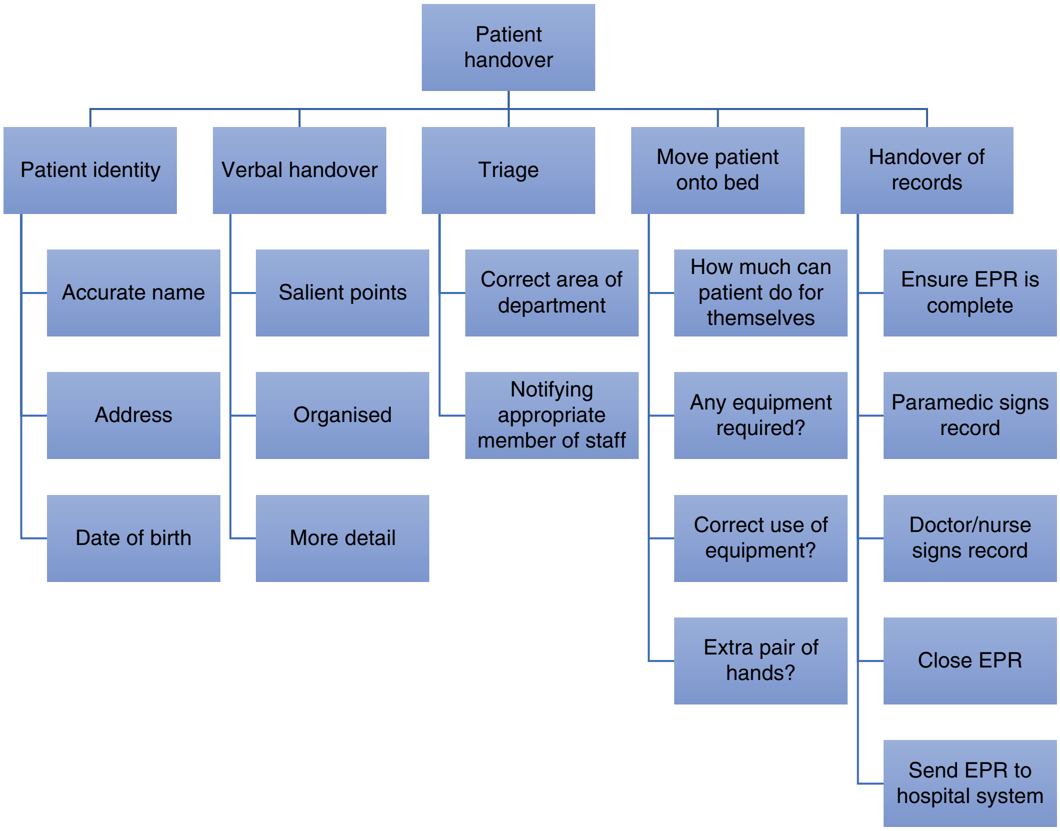

Figure 3.3 Flow diagram showing the true complexity of the patient handover process.

What seems like one task is ultimately made up of a number of subtasks. Each of these subtasks could be further broken down into its **constituent** parts, each of which poses a risk. For instance, something as simple as handing over an accurate patient name may be more complicated if the patient has an alternative name by which they prefer to be known.

The handover of information should be a standardised process. However, an Australian study of patient handover from residential care to ambulance to emergency triage revealed disparities. The information included in each handover varied depending on the type of information imposed by the related document and the clinical role of the caregiver (Campbell et al. 2017). A UK comparison of ambulance service patient report forms and emergency department documentation revealed that 26% of information is changed or lost at handover from ambulance to emergency department (Murray et al. 2012). The accuracy of information is bound to have an impact on patient care.

Consider also the effects of time pressure on the handover tasks shown in Figure 3.3. Might it make cutting corners more likely, if there is limited time in which to conduct the handover?

Organisation

The culture of an organisation is bound to have an influence over the behaviour of individuals working within it. This is likely to happen on (at least) two different levels. At a management level, safety may be taken very seriously, and systems may be put in place (for example, an internal near-miss reporting system) to support this.

This may be available to all staff and its use encouraged, but if the local team do not see the point in undertaking this time-consuming activity, it may not be acted upon.

In the case study at the beginning of the chapter, Tom did not consult the medicine protocol on his mobile app and so failed to notice that the patient fulfilled one of the **contraindications** for aspirin. His employer may well have provided the app for staff use, but because the local team culture dictated that checking protocols was a sign of a weak paramedic, Tom did not check.

In a safe organisation, individuals are made aware of the organisation's goals, standards, and procedures. Ideally there is a two-way conversation between management and staff about processes, procedures, and expectations. In this way, unsafe attitudes can come to light and be challenged for the benefit not only of the patients, but also of the staff.

Clinical scenario: learning from error

Sarah was faced with a situation she had not encountered before. She was about to draw up a dose of adrenaline for a paediatric patient. In the heat of the moment, she remembered the interactive case study that her manager had sent to crews only a few weeks before. She recalled the importance of double-checking medicines with her crewmate and held up the ampoule for her crewmate to confirm the medicine name and expiry date before she proceeded.

This scenario highlights an example of good organisational practice, where learning from errors/near misses is shared widely to help others avoid making such errors. This activity benefits not only staff and patients but also the organisation as a whole, since a learning culture will foster openness and progressive attitudes.

Tools and technology

How many devices do you use on a daily basis as a paramedic? There are the obvious electronic devices such as the electronic patient record, the defibrillator, and the oxygen saturation monitor, as well as the less obvious but equally important nebulisation mask, safety cannula, and giving set. These are all designed to improve the care and safety of patients. As technologies develop, each of these devices is subject to improvements and adaptations.

Whilst the intention is to improve care through developing the technologies and tools, the unintended consequences of such changes can increase the complexity of a task, as the use of a new piece of equipment must be learnt. At best, this can slow a task; at worst, make it unsafe. This highlights the importance of daily vehicle checks. You may have a **Make Ready Centre** to prepare your vehicle and its staff will ensure that all necessary kits are in place, but they may not be there at the start of your shift to point out the new piece of equipment that has been added to your ambulance. Always ensure that you are familiar with all equipment, and ask for guidance if you are not.

Consider some of the paper tools that you use (or their electronic equivalents). These may be essential to ensure the safe referral of your patient to another service, e.g. the falls referral form. If you are not familiar with how to complete and submit it, this tool is of no use to you or, more importantly, your patient.

Environment

The environment in which a paramedic works can be highly variable, which is part of the challenge of the role. Variety is also one of the factors that attracts people to paramedicine. You have to accept that there are some aspects of your environment you can control and others you cannot. For instance, you cannot control the weather, but you can keep your vehicle saloon warm for your patient.

Your ambulance will be designed for optimal ergonomic benefit (Hignett et al. 2009). For instance, your defibrillator/electrocardiogram (ECG) monitor will be housed at around eye level and within easy reach so that you can respond to patient changes easily and quickly. Storage cupboards will have been carefully designed so that the most important equipment is within reach for quick access, and those that have to house the heaviest equipment are at floor level. Outside the ambulance, however, which is where a great deal of your work takes place, the environment is far less predictable and controllable. This can make even the simplest task feel less organised and therefore harder. If you are cannulating a patient at the roadside, the task will feel more complex than if it were being performed in the ambulance. You will need to make additional decisions such as where to place a sharps box, and how best to position your patient and equipment. If you remove daylight from the situation, this further complicates the task. There are ways of organising your equipment and team members that can reduce some of the variability and make your tasks feel simpler and safer. Some of these will be revisited later in the chapter.

Interactions

Each of these factors in isolation will affect how you perform your duties, but they will also have an impact on each other. We have already seen how the relatively straightforward *task* of cannulation can be complicated by the *environment* in which it is performed. Now consider the added complication that you are using a new type of *equipment*: a new safety cannula. Unfortunately, the *organisation* has not provided any training for staff. As each of these new factors is introduced to the scenario, the complexity of the task increases, as does the chance of error.

By changing one or more of these elements, the effect can be to make the task safer and simpler. For instance, if the organisation prioritises safety and provides training, this can **mitigate** the risks posed by the unfamiliarity of the equipment or the challenges of the environment. As a paramedic, you cannot control all of these factors, but having an awareness of how they interact and influence your performance can make you more self-aware and, ultimately, a safer clinician.

Human factors in paramedic practice

It is beyond the scope of this chapter to provide a full discussion of all the known human factors that affect paramedic practice, although it is possible to recognise and discuss common human factors that affect the paramedic on a daily basis, including crew or team working, paramedic fatigue, stress, and situational awareness.

Crew/team working

Being able to work within a team is a fundamental part of ambulance service work. Paramedics work a variety of shifts which cover a 24-hour continuum, and there are occasions when ambulance crews working together have never met each other before.

Practice insight

When working with a new crew member, take some time to get to know them. Provide mutual respect for one another by recognising the skills, knowledge, and personal qualities that each member brings into the ambulance.

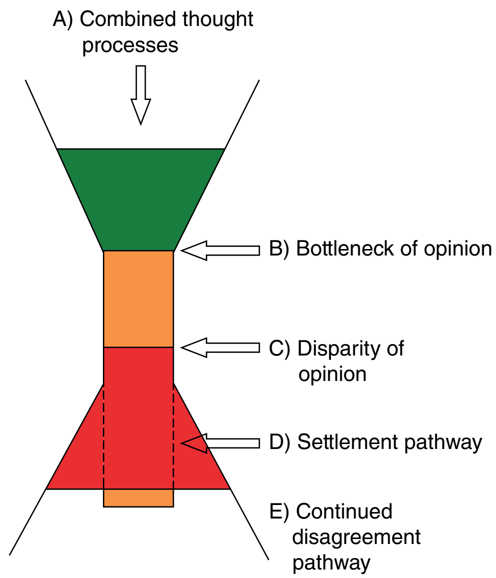

Figure 3.4 Egg-timer model of disparity.

Each person brings into the ambulance their own levels of experience and education, as well as their own personality and preferences for how they want to get things done. This diversity can be a source of strength in a crew, but equally it can be a source of conflict. Such conflict can occur on a daily basis, arising from differences of opinion or clashes of personality, compounded by stress and worker fatigue. Summers and Willis (2010) recognise a pattern of decision conflict that might occur during a typical emergency call, termed the 'egg-timer model of disparity' (Figure 3.4). At the start of the call it is likely that the crew's thinking and consideration for the call whilst en route differ (point A), but then come to be more closely related during the journey and as a result of discussion. Upon arrival at the scene there is likely to be some element of consideration between the crew that matches up (point B), followed by a possibility of difference in opinions (point C), possibly over what the presenting complaint is or how the patient should be managed. If the ambulance crew communicate effectively there is likely to be a positive outcome (point D), but if not, the result will be a stark difference in opinion with the potential for adverse outcomes (point E). The key here is to make sure that with every disagreement the crew members communicate and work together as team players in order to ensure that there is a positive outcome and to reduce differences of opinion.

So what exactly are positive team-working characteristics? Table 3.2 identifies five qualities of team working, but the ability to exercise these qualities will be influenced by external matters such as paramedic fatigue and stress.

Situational awareness

The paramedic must maintain situational awareness for their own safety, the safety of their crew member, and the safety of the patient. Of the many definitions of situational awareness available, that provided by Endsley (1995, p. 36) is perhaps the clearest:

> The perception of the elements in the environment within a volume of space and time, the comprehension of their meaning and the projection of their status in the near future.

Table 3.2 Positive team-working qualities.

Positive team player qualities	Putting these into perspective
1. Creates enthusiasm and initiative to make things happen	Motivation is everything. A motivated team can accomplish anything and can deal with any challenge they face. It is the responsibility of every team member to promote motivation and inspiration within their ambulance station and team.
2. Makes sure everyone clearly understands their roles	There are many roles within the ambulance service, such as emergency care assistant, emergency medical technician, emergency care practitioner, paramedic, advanced paramedic, paramedic level 1, and intensive care paramedic. Each of these roles differs slightly with regard to its scope of practice. It is important to remember the limitations of practice and not undertake anything that extends beyond the scope of practice.
3. Listens to others and considers their suggestions and ways of working rather than dismissing them	It is important to acknowledge the experience of other crew members and actively encourage team decision-making. Joint decisions made by team members can produce safer outcomes and can promote a positive working environment, as well as increase worker motivation.
4. Becomes comfortable with disagreement	We don't always get on with each other 100% of the time. Disagreement is inevitably going to occur at some stage. It is important to take a step back from any situation where a disagreement is taking place and not take the difference of opinion personally. Make every effort to resolve the conflict as soon as possible.
5. Has a positive attitude to and learns from setbacks	The prehospital environment is fraught with complexities. There are going to be occasions where the practitioner is challenged beyond their normal coping mechanisms. It is important to embrace these moments and actively reflect upon them afterwards, in order to learn how performance can be improved. This might involve liaising with others and giving/receiving feedback.

A definition adapted for paramedic practice might be: '[situational awareness] is having an awareness of an entire situation, taking note of all sources of information available to the paramedic, within the environment, which is inclusive of the sights, sounds and smells of the given moment'.

The paramedic must be aware of what is occurring around them at all times and must actively gather information from a range of sources, including direct observation (seeing what is through the window of the ambulance) and sound (listening to information provided by your crewmate and despatch, as well as from the patient). This also extends to listening for external noises that might be pertinent to safety or situational analysis, such as loud music. The situationally aware paramedic will use this information to plan ahead, as well as preparing a course of action should something go wrong.

Having good situational awareness means taking note of and acting upon all available information (Endsley 1995). All this information needs to be processed in order for the paramedic to decide on the next step. Paramedics do not like surprises and good situational awareness will help to prevent a nasty surprise from materialising. Additionally, if something unexpected does occur, then a situationally aware paramedic will be able to plan alternative actions.

A hypothetical example could include the paramedic who is monitoring a patient in the back of the ambulance. Routinely, the alarms sound on the ECG/blood pressure monitor, which is sometimes caused by the parameters being set too sensitively. It is therefore easy to ignore the alarm when it sounds and an immediate response is to silence it. The situationally aware paramedic, upon hearing the alarms, would recheck the patient and take note of the readings on the monitor. If en route to hospital, they would also check their location in case a pre-alert is required or to consider diverting to a closer hospital.

The Resuscitation Council UK (2015) recognises that good situational awareness includes the following:

- Consideration of the location of the patient, which can give clues to the mechanism of injury.
- Obtaining information from any staff and/or family that might be present.
- Confirming the diagnosis with other staff members.
- Establishing and using those present, for example identifying names, roles, and recognising who is leading.
- Taking note of any actions already established, such as chest compressions during a cardiac arrest.
- Effectively communicating with the team and gathering information.
- Determining immediate needs.
- Implementing the necessary patient care.
- Considering the likely impact of any patient care.

Conclusion

Paramedics operate within unpredictable and complex environments where they are routinely faced with the unknown. Understanding how the environment in which they operate may influence their safe practice can contribute to error minimisation. Identifying human factors specific to paramedic care is an area requiring further research; meanwhile, this chapter identifies common human factor themes relevant to paramedic practice.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. What are human factors?
2. Identify five human factors which affect paramedic practice.
3. List six signs of stress.
4. Identify five causes of stress in the prehospital setting.
5. What causes paramedic fatigue?
6. What would you consider to be hazardous attitudes?

Activity 3.1

Consider the following scenario. Identify:

1. The task
2. Organisational factors
3. Environmental factors
4. Tools and technology

Jim is working as a solo responder on a rapid response car. At the start of his shift, a colleague points out that the new cardiac monitors have arrived on station and gives Jim a brief overview of how they work. Jim asks if he will be trained in operating the monitor, but is told that it is quite easy to use and advised to 'have a play with it' when he gets a chance.

At that point Jim's radio sends an alarm and he is sent out on his first call, to an elderly patient who has collapsed in the street. The patient says that he is fine and that he has only fainted. Jim knows he should undertake a 12-lead ECG to rule out cardiac causes, but there are a number of factors that make this course of action unlikely.

Jim might choose to call for ambulance back-up in order to complete his patient assessment before deciding whether to convey the patient to hospital or discharge him on scene. Other factors may dictate that he opts to take the patient to hospital in the car, where a full assessment can be undertaken. In any case, it is clear that Jim is not in an ideal situation during his shift today.

Activity 3.2

Suggest how the scenario in Activity 3.1 could be made safer in the same four areas:

1. The task
2. Organisational factors
3. Environmental factors
4. Tools and technology

Glossary

Contraindication: A specific reason according to which a procedure, drug, or surgery is inappropriate due to the risk of harm it could pose to the patient.

Fallible: Able/likely to make an error.

Human error: An unintended action.

Human factors: The study of the interaction between people and other elements of a system.

Make Ready Centre: A centre dedicated to cleaning, restocking, fuelling, and maintaining ambulances.

Mitigate: Lessening the severity of something (i.e. situation, pain, mistake).

Onus: Someone's duty, obligation, or responsibility.

SEIPS: Systems Engineering Initiative for Patient Safety.

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4

Mental capacity and prehospital care

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Contents

Fundamentals of Paramedic Practice: A Systems Approach, Second Edition. Edited by Sam Willis and Roger Dalrymple.

Companion website: www.wileyfundamentalseries.com/paramedic

Learning outcomes

On completion of this chapter the reader will be able to:

- Define mental capacity.
- Explain the diagnostic and functional tests.
- List the five principles and explain how these relate to paramedic practice.
- List key factors to be taken into consideration when caring for people who have self-harmed and who refuse treatment.
- State the criteria required for lawful restraint.

Case study

An ambulance has been called to a pub in a market town centre where there are reports of a 'middle-aged' female who is 'acting strangely'. Upon arrival at the scene the paramedics establish that the woman has not been drinking alcohol and is not hypoglycaemic. She refuses to allow the paramedic to complete baseline observations.

The patient does not appear to have capacity to consent to treatment and is taken to hospital for further assessment and/or treatment.

Introduction

The Mental Capacity Act 2005 (MCA) was implemented in England and Wales in 2005 to provide protection and powers to individuals aged 16 years and over who may lack capacity to make certain decisions, and also for people working with or caring for them. Other countries have separate guidance and legislation regarding mental capacity. In Australia each state/territory has its own guidance (Table 4.1). Although the wording and terminology used are different to the English and Welsh Act, the underlying principles are the same. This chapter discusses the English and Welsh MCA and relates it to paramedic practice.

What is mental capacity?

'Capacity' is 'the ability of an individual to make decisions regarding specific elements of their life' (MCA 2005) and it is crucial within the prehospital emergency care environment, since everything a paramedic does to a conscious patient requires the patient's consent. Patients must have mental capacity in order to give (or withhold) consent and, apart from situations where the Mental Health Act 1983 (MHA) applies, mental capacity is central to determining whether treatment and care can be given to someone who refuses.

For the person's wishes to be overridden, there must be evidence that some impairment or disturbance of mental functioning exists, rendering the person unable to make an informed decision at the time that decision needs to be made.

Table 4.1 Mental capacity legislation/guidance in Australia.

State/Territory	Office	Web link(s)
New South Wales (NSW)	Office of the Public Guardian	Office of the Public Guardian www.publicguardian.justice.nsw.gov.au Capacity assessment principles www.justice.nsw.gov.au/diversityservices/Pages/divserv/ds_capacity_tool/divserv_assess_principles.aspx
Northern Territory	Office of the Public Guardian	**Office of the Public Guardian** https://health.nt.gov.au/professionals/office-of-the-public-guardian **Adult guardianship and orders** https://nt.gov.au/wellbeing/mental-health/adult-guardianship-and-orders
Queensland	Office of the Public Advocate	www.justice.qld.gov.au/public-advocate/about-us/role
South Australia	Office of the Public Advocate	www.opa.sa.gov.au/page/view_by_id/21
Tasmania	Office of the Public Guardian	www.publicguardian.tas.gov.au
Victoria	Office of the Public Advocate	**Office of the Public Advocate** www.publicadvocate.vic.gov.au/assessing-whether-a-person-has-decision-making-capacity Presumption of capacity www2.health.vic.gov.au/mental-health/practice-and-service-quality/mental-health-act-2014-handbook/recovery-and-supported-decision-making/presumption-of-capacity
Western Australia	Office of the Public Advocate	www.publicadvocate.wa.gov.au
Further information available from the Australian Government, Law Reform Commission: www.alrc.gov.au/publications/equality-capacity-and-disability-commonwealth-laws/capacity-and-decision-making		

How do we make decisions?

For an individual with full **cognitive functioning**, the process of making a decision is usually very easy and is completed spontaneously. There are some decisions which may require conscious thought – and then there is an awareness of the process – but otherwise, we make many decisions every day without always being aware of doing so.

So how do we make a decision? What is involved, and how do we assess this in others?

Paramedics do not need to be experts in assessing capacity. To have protection from liability when providing care or treatment, they must have a **reasonable belief** that the person they are treating lacks capacity to make the relevant decisions; and must have taken reasonable steps to establish (on the **balance of probabilities**) that the person lacks capacity to make that decision at the time it is needed.

Assessing mental capacity

Tests exist to assist the paramedic in using the MCA when assessing a patient's mental capacity. The first is the **diagnostic test**.

Diagnostic test

- Does the person have an impairment of, or disturbance in the functioning of, the mind or brain at this moment in time? (This may be permanent or temporary.)
- *If so*, is that impairment or disturbance sufficient that the person lacks capacity to make the decision needed now?

This does not help us to understand the *process* of decision-making, but is important when using the provisions of the MCA.

Functional test

The second test is more practical and is known as the **functional test**, because it assesses the four functions associated with decision-making (Box 4.1). Although we may not consciously be aware of it, we do complete these processes whenever we make a decision.

Providing information

The paramedic must provide information in a format the patient can understand. Assessment should lead to a reasonable belief that the person has, or lacks, the capacity to make the decision necessary at the time it needs to be made. Remember that capacity can fluctuate, so more than one assessment may be necessary. Always record an MCA assessment in the patient's clinical record. This is evidence of what you have done and will also assist other practitioners to care for this patient in future.

If an adult with capacity makes a voluntary and appropriately informed decision to refuse treatment, this must be respected – even where it appears an unreasonable decision to the paramedic, for example if it may result in the death of the person (and/or an unborn child, whatever the stage of the pregnancy; Department of Health 2009).

When consent is refused by a competent adult, you must:

- Respect the patient's refusal as much as you would their consent.
- Make sure that the patient is *fully* informed of the implications of refusal.

Box 4.1 Functional test

1. Understand the information relevant to the decision.
2. Retain the information and process it.
3. Use or weigh that information as part of the decision-making process (weigh up the 'pros and cons').
4. Communicate their decision, in whatever way the person normally communicates (by talking, using sign language or any other means). Help can be given if necessary.

In order to make a decision, an individual must be able to complete all of these.

Source: Mental Capacity Act 2005 Code of Practice (2007).

- Involve other members of the healthcare team (as appropriate).
- Ensure this is clearly and fully documented in the patient's records.

When an individual is reasonably believed to lack capacity to make the decision required, the paramedic has a legal duty to act in that person's best interests – unless a valid and applicable **advance decision** is in place.

Practice insight

Don't rush in to making a difficult decision in isolation. Contact a senior clinician or the Clinical Hub for advice and guidance if you are unsure. Be sure to make extensive notes on any situation that has left you feeling uncomfortable, in order to be able to reflect on/recall the situation at a later date.

The five principles

The MCA is based on five important principles:

1. Always assume a person has capacity.
2. Appropriate help must be provided to support individuals to make their own decisions.
3. Individuals must retain the right to make what might be seen as unwise decisions.
4. Apply 'best interest' principles (everything done for, or on behalf of, someone without capacity must be in their best interest).
5. Before doing something to someone or making a decision on their behalf, consider whether the outcome could be best achieved in a less restrictive way.

These principles underpin everything done using the MCA. It is not necessary to complete an MCA assessment for every patient seen; assessments should only be completed when doubts about a patient's capacity are identified.

Capacity is *always* decision and time specific; i.e. what is the decision you need the patient to make *now*, and do they have capacity to make it *now*?

Examples:

- A person with profound autism may not be able to make a decision about opening a bank account, but be very able to make a decision about what colour socks to wear.
- A person with dementia may not be able to make a decision about what to buy for their dinner, but is able to make a decision about whether to have a cup of tea or coffee to drink.

Relevance of the five principles to prehospital care

1. *Always assume a person has capacity unless doubts are identified*.
   First impressions are important, but do not be 'blinkered' by focusing on one piece of information you are given prior to arrival on the scene. **Diagnostic overshadowing** might occur when treating a person who has dementia or a learning disability – there is a risk that the paramedic's judgement might be clouded by knowing that the patient has a long-term neurological condition, and inappropriate assumptions might be made that all the symptoms the person is complaining of are directly related to the neurological condition. You must assume the patient has capacity, even though they have a neurological condition.

Doubts about mental capacity may arise for many reasons, including the person's behaviour, circumstances, or concerns raised by someone else. Many people may lack capacity to make decisions for themselves because of:

- Dementia
- Learning disabilities
- Mental health problems
- Stroke and brain injuries
- Temporary impairment due to medication, intoxication, injury, or illness

If the impairment is temporary, can the paramedic wait until the patient regains capacity?
Figure 4.1 shows the Mental Capacity Flowchart, which outlines the process of assessment (from initial concerns being identified to outcome) using the diagnostic and functional tests.
In some circumstances (e.g. a patient who is hypoglycaemic) emergency decisions might need to be made, but long-term ones can be put off until capacity is regained.

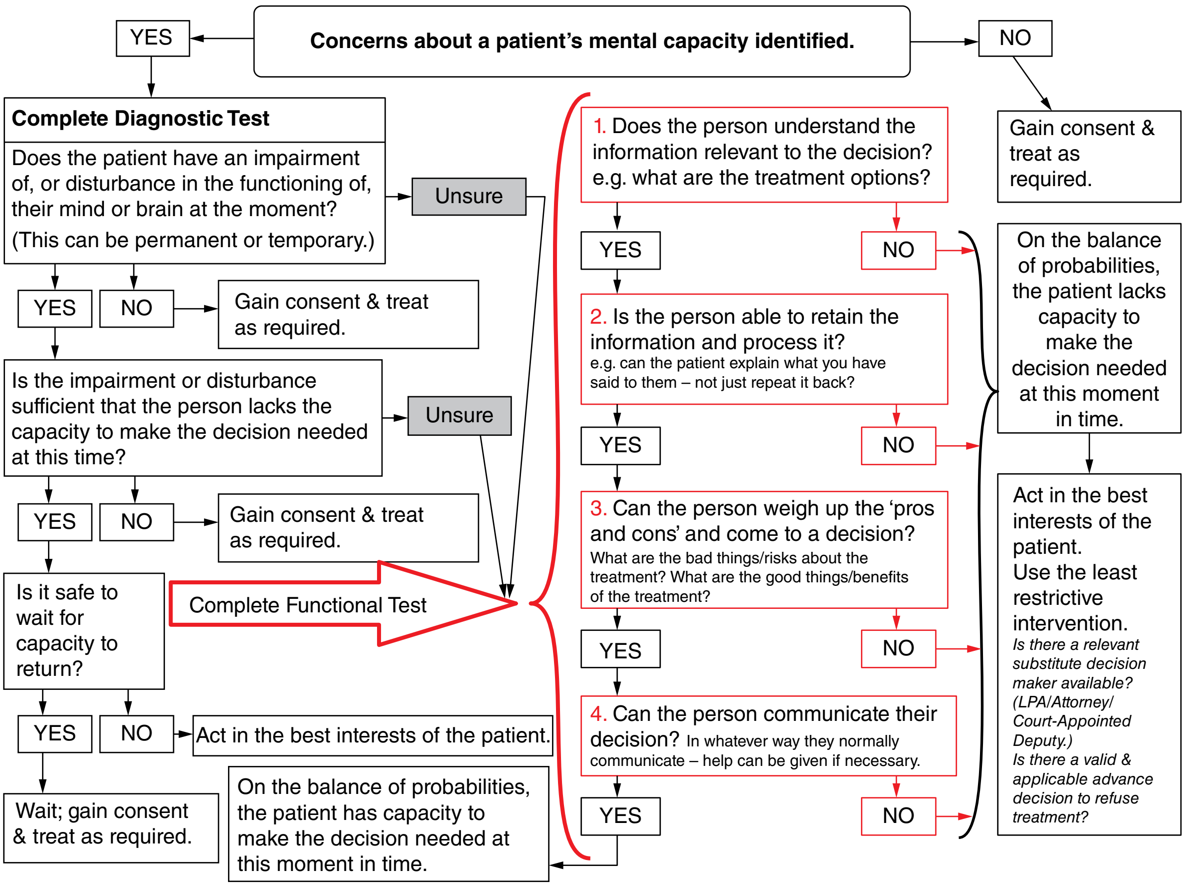

Figure 4.1 Mental Capacity Act (MCA) flowchart. Source: Adapted from MCA (Mental Capacity Act) 2005 Code of Practice (2007).

When a patient has self-harmed and refuses further care or treatment, this can pose difficulties for paramedics. The National Institute for Health and Clinical Excellence (NICE) (2004) has provided guidelines which should be considered carefully.

2. *Appropriate help must be provided to support individuals to make their own decisions*.
   Paramedics must obtain informed consent from patients and must always provide assistance in helping the patient make their own decision. The support the paramedic might provide will range from simple things like rephrasing questions, to more complicated matters like arranging for an interpreter or an independent advocate to assist.
   Always involve people who know the patient, as they will be aware of how the patient's current condition compares to how they are normally, and will be able to advise on techniques that might help, such as:

- Repositioning the patient.
- Ensuring hearing aids are positioned correctly and are functioning.
- Use of pictures/photos or other pictorial (or specialist) communication aids.

3. *Individuals must retain the right to make what might be seen as unwise decisions*.
   Capacity should not be confused with a paramedic's assessment of the reasonableness of the person's decision. A person is entitled to make a decision that others might perceive to be unwise or irrational, *as long as they have the capacity to do so*.
   It is important to note that when an apparently irrational decision is based on a misperception of reality (e.g. someone experiencing delusions), rather than a different value system to that held by the paramedic, then the patient may not truly be able to understand. This would lead to doubts about their ability to make a decision and an assessment should be completed (Department of Health 2009).
4. *Apply 'best interest' principles (everything done for, or on behalf of, someone without capacity must be in their best interest)*.
   This should not come as a surprise to any paramedic. Interventions should always be in the best interests of the patient. Consider the following scenario.

> A general practitioner (GP) has requested an ambulance to transport an 89-year-old, confused, frail elderly lady (who has dementia and has been living in a nursing care home for 10 years) to hospital for investigation of mild rectal bleeding. There are concerns that the patient may have cancer and early intervention is recommended. The patient lacks capacity to make this decision for herself.When the ambulance arrives, the patient's daughter is already on scene and refuses to let the crew remove her mother. The daughter is adamant that her mother has always disliked hospitals and has said on many occasions that she does not want to die in hospital. The daughter also points out that her mother is old and frail and has advanced dementia – she would prefer her mother to be left in her home with people around her who know her, and with whom she is comfortable. Going to hospital would be a traumatic experience for her mother and would not be in her best interests.

If you find yourself in a similar situation in your clinical practice, consider the following guidelines:

- Always gain information from carers and other people who know the patient well. Try to find out the views of the person (past and present).
- Speak to the patient's GP; they may agree to alternative interventions.
- Listen carefully to relatives and negotiate with them to achieve an agreeable (and safe) outcome for the patient.
- Consult with a senior colleague.
- Remember that your patient's care and safety must always take priority.

5. *Before doing something to someone, or making a decision on their behalf, consider whether the outcome could be best achieved in a less restrictive way.*
   Make sure that whatever you do for a patient who lacks capacity to consent, you do not limit their freedom of movement any more than is absolutely necessary.

Practice insight

Don't rush in to making a difficult decision in isolation. Contact the Clinical Hub for advice and guidance if unsure. Be sure to make extensive notes on any situation that has left you feeling uncomfortable, in order to be able to reflect on/recall the situation at a later date.

Deprivation of liberty safeguards

Deprivation of Liberty Safeguards (DoLS**)** exist to protect the human rights of people who lack capacity to consent to arrangements for their care or treatment, and who might need to be deprived of their liberty. For instance, a person who has dementia may need to have doors locked to prevent them from walking away from where they live and getting lost, or coming to harm, as a result.

In other countries, these matters will be dealt with by the local area safeguarding or guardianship processes.

Transportation to hospital in an ambulance is not deemed to be a deprivation of liberty, so does not require authorisation (Box 4.2).

Important note: In March 2017 the UK Law Commission published its Draft Mental Capacity (Amendment) Bill, following a lengthy review of the DoLS process, which had been found to be complicated and unnecessarily bureaucratic (Law Commission, 2017). Passing through parliamentary committee stage at the time of writing, the Bill outlines a simpler, more streamlined process, which will allow for the DoLS authorisation to travel with the patient from one place to another (including any ambulance journey required).

Box 4.2 Deprivation of liberty safeguards summary

Deprivation of Liberty Safeguards:

- Have to be authorised by a specialist assessor (usually through the Local Authority process) or the Court of Protection.
- Apply to people aged 18 and over.
- Authorise the restrictions that have been assessed as amounting to deprivation of liberty; they do *not* authorise any treatment.
- *Only* apply in hospitals and registered care homes. The authorisation is site specific and if a person is subject to authorisation in one setting, e.g. a care home, this gives no authority to detain the person in any other setting, e.g. a general hospital.
- Authorisation does not travel with the person.

(Source: Ministry of Justice 2008)

Additional mental capacity safeguards

The MCA includes safeguards to protect vulnerable people who have reduced capacity, and those using the Act to care for them.

These include the provisions of Sections 5 and 6, a mandatory requirement to record assessments, the Public Guardian, lasting power of attorney (LPA), advance decisions (AD), the Court of Protection, court deputies, and independent mental capacity advocates (IMCAs).

Mental capacity act: Sections 5 and 6

Section 5 of the MCA allows carers and health/social care staff to carry out certain tasks without fear of liability. These involve the personal care, healthcare, or treatment of people who lack capacity to consent to them. The aim is to give legal protection for acts that need to be carried out in the best interests of the person who lacks capacity to consent.

The MCA Code of Practice states:

> As long as these acts or decisions are in the best interests of the person who lacks capacity to make the decision for themselves, or to consent to acts concerned with their care or treatment, then the decision-maker or carer will be protected from liability. (MCA 2005 Code of Practice 2007)

The MCA Code of Practice identifies specific actions taken by the paramedic that will be protected from liability, and includes the following:

- Carrying out diagnostic examinations and tests (to identify an illness, condition or other problem).
- Providing professional medical, dental, and similar treatment.
- Giving medication.
- Taking someone to hospital for assessment or treatment.
- Providing nursing care (whether in hospital or the community).
- Carrying out any other necessary medical procedures (e.g. taking a blood sample) or therapies (e.g. physiotherapy or chiropody).
- Providing care in an emergency.

If you reasonably believe a patient lacks capacity, the actions listed are recognised as being in the patient's best interests and can be completed/given without patient consent when appropriate.

Section 6 imposes some important limitations on acts protected from liability under Section 5, including inappropriate use of restraint, or where a person who lacks capacity is deprived of their liberty.

The criminal offence of 'wilful ill-treatment or neglect' is included in the MCA, which means that individuals and/or organisations may face fines, or up to five years' imprisonment, if they wilfully ill-treat or neglect people who have reduced capacity.

Legal aspects of mental capacity

Lawful restraint

If necessary, the MCA allows for lawful restraint – so long as three criteria are met (as described in Figure 4.2). When trying to decide upon a restraint method, the least restrictive method must be used and for the shortest amount of time. In practical terms this means the minimum amount of force required to achieve the desired outcome of protecting an individual.

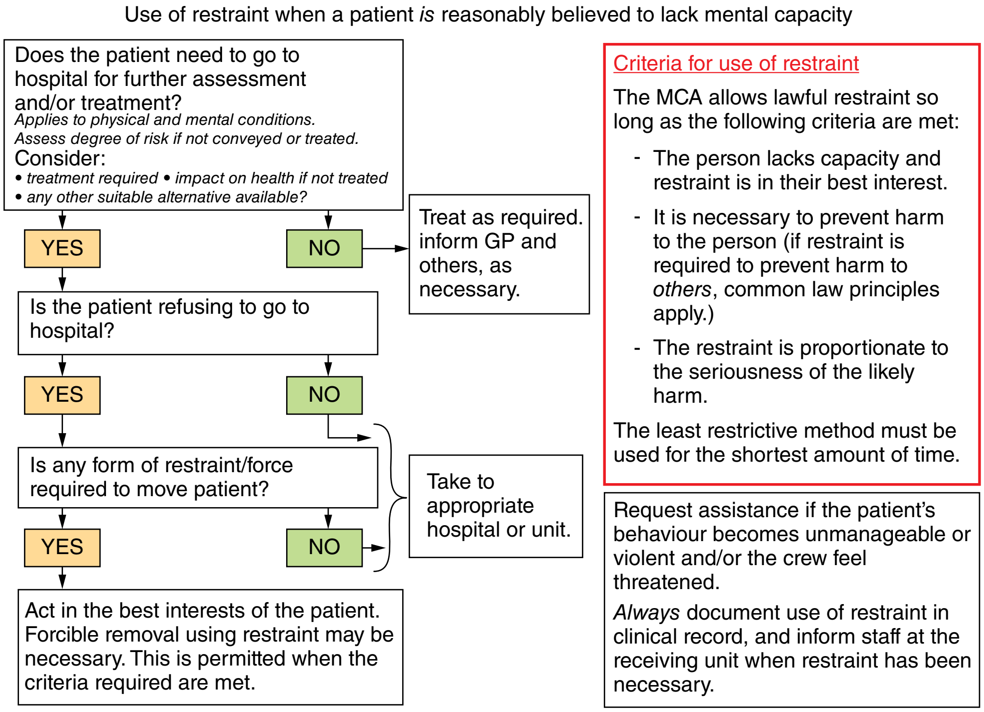

Figure 4.2 Use of restraint.

There is no precise legal definition of 'reasonable force'. What is reasonable will always depend on each individual situation, and this depends on the threat faced. For example, the level of force that can be used to protect life is greater than the force that can be used to protect property (Criminal Justice and Immigration Act 2008).

Practice insight

Remember, paramedics should only physically restrain a patient as a last resort, and once all other methods have been exhausted.

Lasting power of attorney

An individual can give another person the authority to make a decision on their behalf if/when they become unable to do so. This is achieved by establishing an LPA. Once activated, the person holding an LPA can make decisions that are as valid as one made by the person themselves.

In England and Wales, LPAs:

- Can only be organised by someone when they have capacity.
- Have to be registered with the Public Guardian.

- Are of two types: health and welfare; property and affairs.
- Only become valid when the person loses capacity to make their own decisions.
- Must lead to action in the best interests of the person for whom they are held.
- Only those holding an LPA with health and welfare responsibilities can make decisions about health.

See Table 4.1 for details relating to Australia.

It is not practical to expect paramedics to complete the in-depth checks required to establish the validity of an LPA. This is a serious matter. The holder of the LPA should be acting in the best interests of the patient but, where disagreements cannot be resolved, a compromise might be to take the patient to hospital so that they can be kept safe and comfortable whilst the appropriate checks are made (Spencer-Lane and Putman 2011).

Advance decisions

An AD enables someone aged 18 or over (with capacity) to refuse specified medical treatment for a time in the future when they may lack capacity. An AD must be read thoroughly and checked for validity and applicability to the presenting circumstances. Paramedics will be protected from liability if:

- They stop or withhold treatment because the AD is valid and applicable.
- They treat a person because (after checking) they cannot find an AD.
- The AD is not valid and applicable to the situation.

A 'Do not attempt cardio-pulmonary resuscitation order' is a specific type of AD. *Any AD refusing life-saving treatment must be in writing, signed, and witnessed*.

Court deputy and independent mental capacity advocate

Some people who lack capacity may have no one to support them with major, potentially life-changing decisions, so the Act allows a court deputy or IMCA to be appointed if necessary. The former is appointed by a court to work with an individual long term and to represent their affairs; the latter fulfils a representation role for only a short period, defined by a particular task or specific decision that must be made.

Conclusion

The MCA was introduced to protect people who have reduced capacity, and also those people caring for them.

It is an important piece of legislation that has many aspects. However, what it is most important to remember is that capacity is the ability to make decisions and is *always* decision and time specific. Other key considerations include:

- The more complex the decision, the greater the level of capacity that is required.
- More than one assessment might be necessary.
- There is a need to work within the five principles.
- There is also a need to establish reasonable belief on the balance of probabilities.

Any assessment you complete is only as good as the information you obtain. Make sure you are thorough and ask the right questions. Do not always accept things at face value and always fully document your findings and actions.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. What is mental capacity?
2. Why is mental capacity important in paramedic practice?
3. What is the Mental Capacity Act 2005 for?
4. Identify five reasons why capacity may be reduced.
5. What are some of the effects of reduced capacity?

Activity 4.1

Consider what you did in the first 10 minutes after you got out of bed today. Write a list of everything you did and mark all those things where you made a decision. How many of these decisions were you aware of making at the time?

Activity 4.2

Consider the answers you gave for Activity 4.1 and relate the functional test to the decisions that you made.

Activity 4.3

Try to identify some examples of specific conditions/reasons for the list of temporary mental incapacity impairments.

Glossary

Advance decision:	A legal document, written by a person with capacity, outlining their wishes about specific decisions if/when they lose capacity in the future.
Balance of probabilities:	When something is more likely than not.
Cognitive functioning:	The ability to process and use information appropriately.
Deprivation of Liberty Safeguards (DoLS):	A formal process to lawfully deprive an individual (who lacks mental capacity) of their liberty, so that treatment or care can be provided in a care home or hospital.
Diagnostic overshadowing:	When the importance of one condition has a detrimental impact on a clinician's judgement of other coexisting conditions.

Diagnostic test:	A two-stage assessment process used in the initial assessment of mental capacity to determine the presence of a brain impairment, or condition, which might compromise mental capacity.
Functional test:	A four-stage assessment process used to assess mental capacity. If a brain impairment or condition is present, this test will be used to determine the impact of that on the patient's ability to complete the four functions involved in decision-making.
Reasonable belief:	What an average person in similar circumstances might believe.

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5

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Learning outcomes

On completion of this chapter the reader will be able to:

- Define mental health and mental illness.
- Explain how the ABC model of emotion relates to mental illness.
- List the common symptoms of anxiety, depression, bipolar disorder, schizophrenia, and dementia.
- Describe simple strategies to care for someone experiencing a mental health crisis.

Case study

An ambulance is called to a private address where there are reports of a young female with shortness of breath. Upon arrival it soon becomes clear that the female is presenting with symptoms of anxiety disorder. The ambulance crew attempt to coach her respirations with no response, so the patient is taken to hospital for observations and monitoring.

Introduction

Mental health problems are very common. Research shows that in the UK one in four adults, and one in ten children, is likely to have a mental health problem in any year (NHS England 2016). Worldwide, over 300 million people currently suffer from such conditions, placing mental disorders amongst the leading causes of ill-health and disability worldwide (World Health Organization [WHO] 2017).

The predominant mental health problem worldwide is depression, followed by anxiety, schizophrenia, and bipolar disorder (Mental Health Foundation 2016).

Many such problems will be self-limiting and the individual makes a complete recovery, but for others the condition will continue as a permanent aspect of their life. Paramedics are often called to treat people who have mental health problems; these can range from mild anxiety to a major psychotic episode.

This chapter will provide learners with a brief introduction to some of the most common mental illnesses that paramedics will face, and offers strategies to help paramedics manage adult patients presenting with a range of emotional symptoms.

What is 'mental health'?

'Mental health' has been variously defined, but perhaps the best starting point for a definition is the mental well-being component of the WHO's definition of health:

> Mental health is defined as a state of well-being in which every individual realises his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community. (WHO 2014a)

There are medical and social aspects of mental health; adopting a holistic, person-centred approach to individuals will take account of both. 'Mental health' is not a concrete phenomenon: it is constantly changing, even in people who do not have a diagnosed mental illness. Mental health is 'the emotional and spiritual resilience which allows us to enjoy life and survive pain, disappointment and sadness. It is a positive sense of well-being and an underlying belief in our own, and others', dignity and worth' (Health Education England 1997).

Our mental health influences how we think and feel about ourselves and others and how we interpret events. It affects our capacity to learn, to communicate, and to form, sustain, and end relationships. It also influences our ability to cope with change, transition, and life events.

It may help to think of mental health as a continuum with 'mentally well' at one end and 'mentally unwell' at the other (Keyes 2002). In this model there is no fixed divide between mental illness and mental health: individuals are placed somewhere on the continuum and will all, at some point, move along it in one direction or another – often in response to life events.

The overriding factor in determining mental health or well-being is often an individual's emotional state. A person who has been diagnosed with a severe and enduring mental illness (e.g. schizophrenia) may actually be mentally well and have a positive outlook on life, a good social network of family/friends, and the ability to complete their normal activities of daily living – so their emotional state is good, with maximum mental well-being and minimal mental distress).

Another individual may have experienced a recent relationship breakdown, lost their job and home, and subsequently be feeling very low in mood – they have a poor emotional state and maximum mental distress, but have not been diagnosed with a mental illness.

The paramedic will be called to patients who present with both of these situations.

What are 'mental disorder' and 'mental illness'?

Mental disorder is the generic term used to describe a variety of mental/emotional conditions, including learning disabilities and mental illness.

By contrast, the term mental illness is used to describe diagnosed clinical conditions (i.e. those meeting diagnostic criteria from a recognised system such as the ICD-10, the International Classification of Diseases, tenth edition [version 2017], published by the WHO 2014b). Mental conditions are further subdivided into 'organic' and 'functional'.

Organic

Organic symptoms are due to a physical change/damage to or physical abnormality in the brain itself (Table 5.1).

Functional

With functional mental health conditions, there are no physical changes to the brain, but the organ does not function correctly (Table 5.2).

Practice insight

Be aware that you may be faced with a patient who has depression and has symptoms of low self-esteem, affecting their thinking, perception, and behaviour.

Organic and functional mental disorders can be subclassified into neurotic and psychotic conditions (Table 5.3).

Table 5.1 Examples of organic conditions.

Examples	Symptoms include
Dementia	Confusion
Chronic substance misuse	Disorientation
Head injury	Impaired memory
Huntingdon's disease	Impaired ability to reason
	Agitation
	Fear
	Aggression

Table 5.2 Examples of some functional conditions.

Examples	Symptoms affecting
Anxiety	Mood
Depression	Speech
Mania	Thinking
Schizophrenia	Behaviour
Substance misuse	Perception
Personality disorder	Self-esteem

Table 5.3 Neurotic and psychotic mental illness.

Neurotic	Psychotic
Neurosis describes various types of mental health problem that can be regarded as severe forms of normal experience (e.g. anxiety and depression). The person remains in touch with reality and has insight (they know they are unwell).	Psychosis is the term used to describe the presentation of someone who has lost touch with reality. It is more severe than neurosis and is often accompanied by delusions and/or hallucinations.
	Illicit drug use can produce temporary psychosis.
	Examples of psychotic disorders include bipolar disorder and schizophrenia.
	In a psychotic state, the person has no insight into their condition and is unable to recognise they are unwell.

There are many other mental health problems that people experience, but without being formally diagnosed with a clinical condition/illness. Many are temporary and part of 'normal' life, e.g. bereavement, or psychological shock following a significant/distressing event.

Emotions (mood) and behaviour

Emotional states influence behaviour. For example, a pleasant/positive emotional state is more likely to mean that a person will act in a friendly and sociable manner. An unpleasant/negative emotional state means the individual is more likely to be unfriendly, inconsiderate, or rude. Very high arousal is detrimental to concentration and clear thinking, and is more likely to lead to erratic/unpredictable behaviour – even aggression. Most people experience a range of emotions throughout the day.

Mental disorders often cause a heightened emotional response (positive or negative), outside the range experienced by people who do not have a mental illness. Individuals diagnosed with a mental illness may therefore be more prone to extremes of emotion, particularly when unwell.

It is useful for the paramedic to be able to understand emotions, as this can clarify the patient's experience and assist in managing the patient's and the paramedic's responses. One tool to help achieve this is known as the ABC model of emotion (based on Richards and Whyte 2011).

ABC model of emotion

Emotions affect the way we all think and behave – however, our thoughts and behaviour can also affect our emotional state. The ABC model of emotion describes what an emotion is, with the constituents of autonomic, behavioural, and cognitive, which interact and influence each other.

Whatever underlying mental disorder a patient may have, when they are in distress it is likely to manifest as an emotional response, and it is this emotion that the paramedic has to manage in order to establish rapport and provide good-quality care for the patient. Understanding the basic components of an emotion will help the paramedic identify possible reasons for certain behaviours and facilitate appropriate ways of managing them – for example, to reduce anxiety or anger. Being able to understand *why* a person is behaving in a certain way will make it easier to manage the situation safely and professionally.

Brief outline of common mental illnesses

Anxiety

The paramedic is routinely called to a patient who presents with an anxiety disorder. Feeling anxious is normal – we all experience anxiety at times, especially when we face a new, threatening, or difficult situation.

In general anxiety disorder, the symptoms are present nearly all the time for no specific reason. Panic attacks (i.e. extreme anxiety) often come on very suddenly, with intense feelings of anxiety. An attack will reach a peak within 10 minutes, during which time the person feels that they cannot breathe and are dying; many will experience chest tightness and/or pain, which increases their anxiety and reinforces the belief that they are dying. A high number of patients with anxiety-related chest pain present to Emergency Departments every year (McDevitt-Petrovic et al. 2017).

Practice insight

When a patient presents with hyperventilation due to anxiety, assist the patient in coaching and slowing down their breathing by demonstrating a breathing exercise. This is best achieved by speaking slowly and calmly throughout and encouraging the patient to take a deep, slow breath in through the nose, hold it for two seconds (count to two), then exhale slowly through the mouth. Repeat this at least five times.

A phobia is an extreme fear (i.e. anxiety) of something that is not usually dangerous, and that most people do not find frightening. A fear becomes a phobia when the person affected has to change their lifestyle to avoid whatever they are frightened of.

Let us relate the ABC model of emotion to a person experiencing a panic attack.

The autonomic responses lead the person to think they are having a heart attack (because they can feel their heart rate increase in rate and volume, their chest feels tight, they cannot breathe, they sweat profusely, and they feel sick); they are unable to concentrate, believe that something awful is about to happen, and they are not in control. This affects their behaviour, and they become agitated, rubbing their hands together and/or pacing.

The paramedic should encourage the person to sit in a comfortable position and concentrate on deliberately slowing their breathing rate (i.e. altering their behaviour); this will assist the patient to slow down, their breathing becomes more regular, the heart rate slows, and they feel better – they stop thinking they are about to die. The panic attack is resolved. One change can influence all elements of the ABC model of emotion. By influencing one part of this cycle (in this case the behaviour), the paramedic is able to calm the person, and the other elements also reduce.

Depression

Depression is very common, ranging from mild (low mood, but not severe enough to affect normal activities of daily living) to severe and life-threatening (making the person feel suicidal and worthless). Consequently, there are many misconceptions about it. Some people with severe depression will experience psychotic symptoms.

Sometimes there may be an identifiable reason for the person to feel depressed (e.g. following redundancy), but for others no reason will be evident. Some people will only experience one episode of depression during their life, whilst for others it becomes recurring.

Common symptoms of depression include low mood, poor concentration, tearfulness, persistent change in normal sleep pattern, social withdrawal, change in appetite (and weight), loss of interest in previously enjoyed activities/hobbies, loss of libido, lethargy, hopelessness, and low self-esteem and confidence.

One person in every five will experience an episode of depression during the course of their lifetime (Royal College of Psychiatrists [RCPsychs] 2015a).

Specific forms of depression include postnatal depression, **seasonal affective disorder (**SAD**)**, and **bipolar disorder**.

Many women experience 'the baby blues' soon after the birth of their baby, but this usually disappears after a few days. Postnatal depression is a much more serious problem and can appear any time between two weeks and two years after the birth (RCPsychs 2015b).

With SAD, the person experiences depression only during the autumn and winter, which is thought to be due to not getting enough daylight. Individuals affected with SAD may benefit from using a special light box (as prescribed by their healthcare professional).

Not every person affected by depression will become suicidal, but people diagnosed with any mental health condition are shown to be at a higher risk of attempting and completing suicide, with more than 90% of suicides (and suicide attempts) associated with a psychiatric disorder. The highest rates of suicide are associated with depressive disorders.

Previous suicide attempts and self-harming behaviours are also an indication of increased risk (Box 5.1; see also Klonsky et al. 2013). Up to 16% of suicide survivors try again within a year, with 2% of repeat attempts being fatal (Cornaggia et al. 2013).

Bipolar disorder

Bipolar disorder causes episodes of severe mood swings ranging from 'high' (manic) to 'low' (severe depression) lasting for a few weeks at a time, but in between there are long periods of mental stability. The pattern of mood swings varies between people and there are different types of bipolar disorder, but extremes of mood are common to all.

Box 5.1 Prehospital suicide risk assessment

The key to assessing risk is to *ask*. Asking someone if they are feeling suicidal will not plant the idea or encourage them to act on the suggestion. Appropriate questioning provides an opportunity to allow the individual to express their fears and accept support.

Questions need to be clear and simple. *Do not* use euphemisms. Adopt a direct, but sensitive, approach, for instance:

'Have you ever felt so bad that you've thought life is not worth living?'
'Do you think life is not worth living?'
'Have you ever had thoughts about harming yourself, or of suicide?'
'Have you made plans about how you would hurt yourself, or kill yourself?'

Patients often provide clues about their intentions. It is important to use the principles of active listening so that these, often subtle, clues are not missed.

Always take any reference to feeling suicidal very seriously. The IPAP Suicide Risk Assessment Tool – in the UK Ambulance Service Clinical Guidelines (2016) – has been designed specifically for ambulance clinicians to assist with this type of assessment. It is constructed on evidence-based themes and is simple to use for non-mental health professionals.

Table 5.4 Description of manic behaviour.

Noticed by the person	Noticed by others
Very happy and excited	Jumping very quickly from one idea to another (flight of ideas)
Irritated with other people who do not share their optimism	Making plans that are grandiose and unrealistic
Full of energy	Very active and moving very quickly
Unable or unwilling to sleep	Behaving in a bizarre way
Full of new and exciting ideas	Speaking very quickly (pressure of speech), making it difficult for other people to understand what is being said
Feeling more important than usual	Making odd decisions on the spur of the moment Recklessly spending money, getting into debt
Hearing voices that other people cannot hear	
Belief that they have special powers	Irritable

During a manic phase (Table 5.4) the person becomes physically and mentally overactive, may spend more money than they can afford, and can behave recklessly. They will overestimate their abilities, often believing that they are full of fantastic ideas and very important. There may also be an increase in risk-taking behaviour and consumption of drugs and alcohol. Patients frequently become noncompliant with prescribed medication during manic periods, exacerbating the situation.

The person is probably unaware of the changes in their behaviour and will not be able to accept they are unwell. Psychotic symptoms are sometimes present during a manic phase.

Bipolar disorder affects approximately 2% of the UK population, men and women equally, and most people are diagnosed in their late teens or early twenties (McManus et al. 2016).

Schizophrenia

Schizophrenia is the most common cause of psychosis; symptoms include **hallucinations**, **delusions**, and **thought disorder**. Approximately 1% of the UK population are affected, with no gender bias (McManus et al. 2016).

Symptoms are referred to as being either 'positive' (not in the sense of 'beneficial', but in the sense of having clear indicators or behaviours associated with them) or 'negative'.

Positive symptoms

Hallucinations can affect any of the five senses: touch (tactile), taste (gustatory), hearing (auditory), smell (olfactory), and sight (visual). Auditory hallucinations are the most common, and the voice(s) can sound very real. Voices may seem to come out of the air, inside the person's head, or from an object. It is hard for the person to understand why other people cannot hear them. The person may believe the voices are coming from hidden microphones, loudspeakers, or spirits. Sometimes they will respond to the voices (e.g. laughing, talking, or shouting back at them) and may feel that they *have* to do whatever the voices are telling them to – including hurting themselves.

A delusion is a false (usually very strong) belief in something that cannot be substantiated by fact.

'Paranoid' delusions are when the person feels persecuted, even believing that someone is trying to kill them. They may feel that their government is spying on them, that neighbours are harassing them, or that they are God's special messenger.

'Delusions of reference' occur when a person starts to see special meanings in ordinary events such as believing that radio or TV programmes are about them, or receiving messages via the colours of cars passing in the street, or patterns of words/numbers in a printed document.

Thought disorder involves difficulty concentrating and thinking. Thoughts may wander off track and the person can drift from one idea to another one that has no connection with the first.

The person with delusions feels as though thoughts are being taken out of, or put into, their mind and as if someone is trying to take over/control them. In 'high-tech' societies, people blame radio, television, or laser beams, or believe they have a computer chip in their brain. In other communities, people may blame witchcraft, angry spirits, or deities.

Note: in some cultures, a person affected by psychotic phenomena may be revered as having special/magical powers.

Negative symptoms

Negative symptoms are less obvious than positive symptoms. The person's interest in life, energy, and emotions disappear. It is difficult for them to feel excited or enthusiastic about anything. They cannot concentrate, and may not bother to get up or go out of their home. This has a negative effect on their ability to carry out the normal activities of daily living.

Negative symptoms are much less dramatic than positive symptoms, but they can be just as distressing and problematic. Not everyone with schizophrenia will have all of these symptoms.

In an acute psychotic state, the person will present with disturbed behaviour and is likely to be very frightened by what is happening. The brain misinterprets incoming stimuli and a quiet, visual-neutral environment can help (e.g. removing the high-visibility jacket and adopting a quiet approach).

It is important to accept what the patient says about their perception of the world at the time – this is their reality – and the paramedic must try to relate to that in order to be able to communicate effectively with the psychotic patient, however unreal or bizarre it may seem.

Dementia

There are many types of **dementia** and it is a growing public health concern for the UK. Dementia is a progressive disease with no known cure and, in the later stages, a person with dementia will require help with their activities of daily living. There are approximately 850 000 people in the UK with dementia (Prince et al. 2014). Dementia mainly affects people over the age of 65, its prevalence increasing with age. However, it can affect younger people: there are over 17 000 men and women in the UK under the age of 65 who have dementia.

The most common types of dementia are Alzheimer's disease, vascular dementia, and dementia with Lewy bodies. Each of these causes damage to the brain, leading to similar symptoms of increasing forgetfulness, mood changes, and communication difficulties.

Practice insight

Use a reality orientation technique wherever possible and whenever necessary with patients with dementia. This involves telling the patient what day and time it is to help them to remain orientated. This is simple to achieve and can mean a lot to the patient.

People who have dementia can often remember things that happened to them many years ago, but will be unable to remember what happened five minutes previously. This can lead to frustration for them and amongst those caring for them. It is not uncommon for the paramedic to first meet these patients after an ambulance has been called by a member of the public who has found a confused person wandering the streets.

As the majority of people with dementia are over the age of 65, other factors will need to be taken into consideration during patient assessment, including conditions that are a normal part of the ageing process (see more in Chapter 24 on Managing the Older Adult).

It can be very difficult to accurately assess the pain level of people who have dementia, so a thorough assessment is necessary – especially if the patient has fallen. Always include relatives and carers in the assessment, as they know the patient best and will usually provide significant reassurance to them.

Whenever possible (and *only* if safe to do so), do not take the patient to hospital. Consider ways of treating the patient at home where they are in familiar surroundings, are less likely to become distressed, and are more likely to comply with treatment (contact the general practitioner [GP] or other health/social care provider for advice and support, if required).

General strategies to help with all mental health conditions in the prehospital environment

When patients are distressed, their ability to comprehend and communicate effectively is often diminished. Follow these guidelines:

1. Treat the person with respect and dignity.
2. Assess the risk of harm to the person or others; if someone is at immediate risk of being hurt, call for additional support from the police.
3. Maintain the patient's privacy.

4. Be non-judgmental.
5. Remember the person may be embarrassed by their situation.
6. Accept the person's reality; it might seem strange to you, but it is very real for them.
7. Be honest; if you don't know/understand something, say so.
8. Do not be confrontational.
9. Be calm and reassuring.
10. Speak slowly and clearly, and make sure the patient has understood.

Respond in accordance with any local policies or alternative care pathways regarding access to mental health professionals and services. Patients who are already known to local mental health services will have a care plan with additional information which may be of assistance.

Mental health act

The Mental Health Act 1983 (MHA) for England and Wales (Department of Health [DH] 2007) provides a framework for the compulsory care and treatment of people with a mental disorder. In summary:

- It has been modified by various other Acts, including the Mental Health Act 2007 and the Policing and Crime Act 2017.
- It is organised into 10 parts and 149 sections.
- The most widely used manual for its operation runs to over 1100 pages.
- It is supported by a Code of Practice and a Reference Guide.

Use of the MHA in England is reviewed and regulated by the Care Quality Commission.

In order for a person to be detained (i.e. 'sectioned') under the MHA, they must have a mental disorder (defined in the Act as 'any disorder or disability of the mind'), which must be of a nature or degree to make treatment in hospital appropriate and necessary for the patient's health or safety or for the protection of others, and detention is the only way of delivering the treatment. Hospitals should ensure that all detained patients are in an environment suitable for their age, subject to their needs.

When a patient has been assessed and detained in the community, they will need to be taken to the hospital that has agreed to admit them. Paramedics are often asked to do this. Paragraph 17.3 of the MHA Code of Practice (DH 2015) states: 'Patients should always be transported in the manner which is most likely to preserve their dignity and privacy consistent with managing any risk to their health and safety or to other people.' It is important to note that the primary responsibility of the paramedic in such cases is the safe transport of the patient, and monitoring any underlying medical conditions.

Conclusion

What is most common for patients to remember after an incident, or episode of care, is less the practical treatment received, and more the empathy and concern demonstrated by the healthcare provider. This is particularly so in prehospital care for those with mental health issues, and serves as a reminder of the need to develop compassionate, as well as competent, practice. Paramedics who are able to establish good rapport, manage patient distress, and provide reassurance are more likely to elicit the patient's true feelings, sensations, and concerns, facilitating an effective risk assessment and outcome.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. What is mental health?
2. What is mental illness?
3. List two main types of mental illness.
4. List two subcategories of mental illness.
5. Identify the component parts of an emotion.
6. Describe the common symptoms of anxiety, depression, bipolar disorder, schizophrenia, and dementia.
7. Describe simple strategies to care for someone experiencing a mental health crisis.
8. What is the primary function of the Mental Health Act 1983 (amended 2007)?

Glossary

Bipolar disorder:	A mental condition which causes episodes of severe mood swings, ranging from 'high' (manic) to 'low' (severe depression), lasting for a few weeks at a time, but in between there are long periods of mental stability.
Delusion:	A false (usually very strong) belief in something which cannot be substantiated by fact.
Dementia:	A progressive disease of the brain with no known cure. In the later stages, a person with dementia will require help with their activities of daily living.
Depression:	A mental condition characterised by persistent low mood and lethargy, accompanied by feelings of inadequacy and guilt, and disturbance of appetite and sleep.
Hallucination:	Seeing or hearing things that do not exist in reality. Hallucinations can affect any of the five senses: touch (tactile), taste (gustatory), hearing (auditory), smell (olfactory), and sight (visual).
Mental disorder:	A range of disorders of the mind which affect thought processes.
Seasonal affective disorder:	An influence of the seasons on mental health due to a shortening of the days and a reduction of natural light.
Thought disorder:	Difficulty in thinking and concentrating.

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6

Communication skills for the prehospital professional

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Fundamentals of Paramedic Practice: A Systems Approach, Second Edition. Edited by Sam Willis and Roger Dalrymple.

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Learning outcomes

On completion of this chapter the reader will be able to:

- Define the term communication.
- Identify the importance of effective communication.
- Recognise a model of communication and the components of effective communication.
- Recognise elements of both verbal and nonverbal communication.
- Recognise barriers to effective communication in the prehospital environment.

Case study

A call is received to attend a private address where there are reports of a 72-year-old male who has fallen in the back garden.

On arrival at the patient's house, the patient is lying face down on the patio. The paramedic kneels down at the patient's side, holds the patient's hand, and explains who he is and what he is going to do to help him. The paramedic also reassures the relatives that their relative will be given strong pain relief, then taken to hospital for further treatment.

Introduction

Ask any experienced paramedic to define the elements of 'good paramedic practice' and they are likely to include 'communication skills' in their response. Communication involves an interaction between at least two individuals and includes both *verbal* and *nonverbal* elements. The *Oxford Online Dictionary* (2017) defines communication as 'The imparting or exchanging of information by speaking, writing or using some other medium' – a definition that recognises the sharing of information between at least two people, and identifies that there are numerous ways in which this can be achieved.

The paramedic must be able to communicate effectively with all members of the community, including children, adults, the elderly, and those whose first language is not English – often when those individuals are in a position of pain, vulnerability, or distress. This can mean having to *adapt* communication and be persistent with those who are suffering, using a range of verbal and nonverbal methods.

This chapter looks closely at effective and ineffective interpersonal communication in paramedic practice. It explores the use of **verbal** and **nonverbal communication** and recognises the communication challenges unique to the prehospital environment.

Background

Many healthcare organisations, regulators, and professional bodies already recognise the importance of communication skills amongst healthcare professionals. The Department of Health (2010) good practice guidelines identify good communication as a key benchmark for healthcare professionals, whilst the Quality Assurance

Agency for Higher Education's (QAAHE 2016) benchmark statements for paramedic programmes are underpinned with the requirement for students to develop, enhance, and maintain skills such as communication, interpersonal communication, and team working. Furthermore, within its Curriculum Guidance Document the College of Paramedics (2014) makes routine reference to enhancing a student paramedic's communication skills. After qualification, the Health and Care Professions Council (HCPC) expects the registered paramedic to be able to communicate effectively with patients, adapting communication where needed, and further to understand how communication affects patient care (HCPC 2014).

An absence of good communication skills will have a detrimental effect on patient care. Poor communication is not only one of the biggest causes of patient complaints to ambulance services, but is also a large contributing factor to adverse situations and medical errors. Poor communication affects the way paramedics interact with colleagues, managers, and other healthcare professionals. This in its own right brings about many problems when working in this dynamic environment.

The importance of effective communication

For examples of effective communication, it can be helpful to look at team-based and highly interprofessional environments, such as accident and emergency (A&E) departments, where teams include a range of professionals, including senior and junior doctors and allied health professionals, as well as cleaners and support staff. These teams work effectively by communicating with each other.

A good example of when team working comes to life within an A&E department can be seen when the hospital receives a **pre-alert** from an ambulance crew. First the ambulance crew must communicate their situation to the dispatcher in ambulance control, and then their message must be effectively passed to hospital staff by the dispatcher. The hospital staff then request those with the necessary skill levels within the hospital to attend, i.e. an anaesthetist for airway problems or a radiographer if X-rays are to be taken. Those in the medical team all have their separate roles to play, and there will always be a leader who allocates tasks to individual members of staff, especially if the situation involves major trauma.

Similarities exist between the hospital setting and the prehospital environment with regard to communication. When the ambulance arrives at the patient's address, it has taken several people to make this happen, including the call handler and a dispatcher, all of whom must communicate clearly with the patient to obtain the correct information. Once the ambulance arrives with the patient, the paramedic must communicate effectively with the patient, as well as with relatives/bystanders and crewmates, in order to ensure that the patient receives the best care possible.

A breakdown in the communication chain will result in one or more members of the team not achieving what they set out to achieve, which may have a detrimental effect on the rest of the team – and the patient.

A model of communication

During an episode of communication, the sender will communicate a message and the receiver then decodes it. The message itself is of course also of paramount importance. Collectively this is known as the sender, message, and receiver model of communication (Shannon and Weaver 1949; Figure 6.1).

Sender

As the **sender** of a message, it is important to be clear on the reason the message is being sent in the first place. Is the purpose of the message to provide an introduction to a patient? Or to begin the patient assessment? It is important to send the right signal at the right time, which means using the right words and correct **body language** to support the meaning of the words. In addition, when the paramedic communicates with their

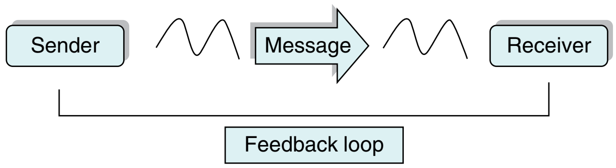

Figure 6.1 The sender, message, receiver model of communication by Shannon and Weaver (1949). The sender of the message can be anyone: a student paramedic, qualified practitioner, patient, or relative. It is up to the receiver to decode the message that is being sent and to give feedback to the sender.

patient, all of the environmental and personal factors that might affect the message need to be taken into consideration, as they can all affect how the message is received and interpreted.

Practice insight

Always be aware of the effect of your own verbal and nonverbal communication on others. Identify from practice a paramedic, or a suitable person, who communicates effectively. Take note of how they communicate with their patients and other staff members and aim to copy the positive aspects of their communication.

Message

The message itself is constructed using verbal messages and cues such as body language and eye contact. An example of a message might be when a paramedic asks a patient a question and uses nonverbal communication to reinforce what they are saying.

Receiver

The receiver is the person accepting the message. They must use all of their interpreting skills to decode the message being delivered. The patient hears the words of the paramedic and takes note of their body language at the same time.

Feedback

Both the sender and the receiver look and listen for feedback from each other, which will then influence the next message that is sent. This element is a crucial aspect of the communication process, and the ability to read the message and the signals or nonverbal cues given by the sender depends upon each individual receiver.

Nonverbal communication

Most communication is nonverbal (Stein-Parbury 2017). Consider, for example, a patient in pain or distress. Pain might be communicated by way of a facial grimace or holding and supporting parts of their body, such as arms or legs (Johnson et al. 2017). It is usually the patient's nonverbal communication that the paramedic will notice first upon initial approach whilst undertaking a **global overview** of the situation. Alternatively, think about your own body language when you are anxious or stressed. You will probably notice a change in what you do, including **hand gestures**.

Thus, in addition to spoken communication, it is important that paramedics are able to use, recognise, and act upon nonverbal cues. When a patient is in need of help, it is important that the paramedic can use their body language and nonverbal cues to help and reassure the patient, as well as to assert authority and control during stressful situations.

According to Hargie (2016), nonverbal communication is conveyed using:

- Body posture
- Eye contact
- Touch (**tactile communication**)
- Proximity
- Facial expressions

Body language

Body language involves using the body to assist verbal communication and includes a wide range of conscious and unconscious physical movements. Body language can be classified as either 'positive' or 'negative'.

Positive body language

Positive body language gestures enhance communication and include confident poses, such as standing in a face-on position to the patient with your hands by your sides and not in your pockets, behind your back, or across your waist. Standing face-on with your hands by your sides is a confident body stance (Figure 6.2), whilst standing with your hands on your hips indicates multiple feelings, such as determination and the ability to take control (Heller and Hindle 2008). It can also, however, be perceived as an agitated or overconfident stance, so be cautious where you use it.

Figure 6.2 Positive body language. Source: N. Raja, Melbourne, Australia, 2014. Reproduced with permission of N. Raja.

The paramedic may choose or need to stand when listening to the history of the incident, and it is important to use body language in a manner that instils confidence in the patient and the patient's friends and relatives.

Negative body language

Negative body language gestures (Figure 6.3) might include standing sideways to the patient, crossing your arms, or placing your hands in your pockets. These gestures communicate a lack of confidence and may also be perceived as lacking interest in the situation or patient. Rubbing your neck or pulling at your ears demonstrates doubt, and looking over the patient's shoulder and towards the exit is a tell-tale sign that you do not want to be there. Sometimes people close their eyes when talking to people if they cannot tolerate being in a particular situation.

Eye contact

Eye contact is important in everyday communication, and more so when communicating with a patient or relative. Box 6.1 identifies how eye contact is used in everyday situations.

Barker (2016) identifies that people speak more with their eyes than with their voice. It is important that the paramedic maintains eye contact with their patient, and when talking to more than one person you must be sure that you establish eye contact with all parties. Look into the patient's eyes, but do not stare right at them

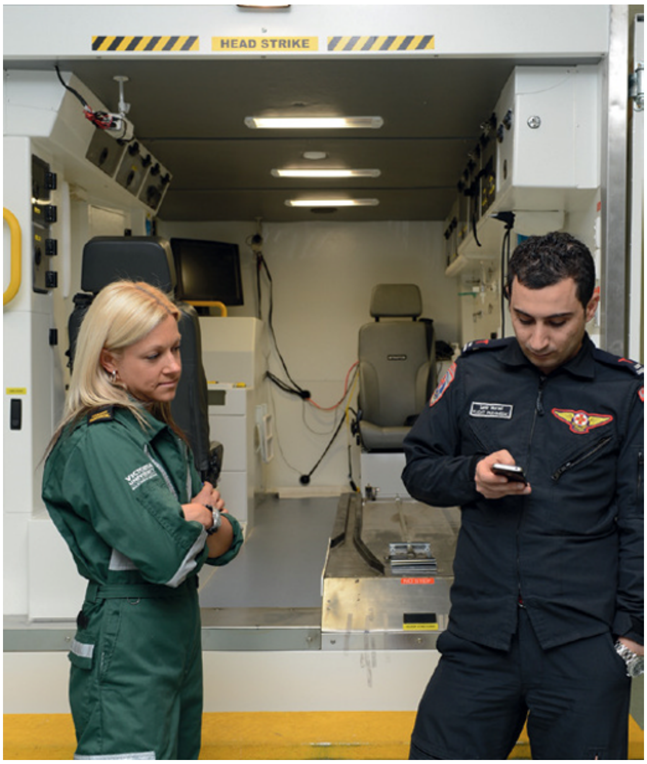

Figure 6.3 Negative body language. Source: N. Raja, Melbourne, Australia, 2014. Reproduced with permission of N. Raja.

Box 6.1 How eye contact is used

- To engage in and maintain conversations
- In regulating levels of intimacy during interactions
- To express emotions
- To gain feedback
- To influence others
- To gain trust
- To express interest or disinterest

as the patient will pick up on this, which will cause a feeling of unease and discomfort. As a tip, when communicating with patients, the two occasions when eye contact should be broken are:

1. When the paramedic is thinking about what to say next.
2. When the paramedic is looking at notes or another object of relevance, such as a blood pressure cuff during physical examination.

Thus, maintaining eye contact demonstrates commitment to the patient and shows an interest in what is happening to them. It is, however, worth noting that there are occasions when eye contact cannot be effectively established – for example in dark rooms and buildings such as night clubs, when the patient is rolling in pain or is acutely unwell. In addition, if a paramedic enters the patient's house wearing sunglasses due to the outside weather, there can be no eye contact. No eye contact with the patient reduces the patient's ability to make close ties with the paramedic and, if the paramedic is wearing sunglasses in the patient's house, this can create mistrust between the patient and paramedic, as well as demonstrating a lack of care and interest on the paramedic's part. Avoid wearing sunglasses when treating a patient.

Touch (tactile communication)

Touch is a powerful form of nonverbal communication and can occur in many ways between the paramedic and the patient, including during a handshake, placing an arm around a shoulder, supporting a patient when standing, or simply holding their hand whilst listening to them. Touch can convey a message of warmth and caring to the patient and can have noticeable physical effects on them, allowing them to relax and be at ease, leading to physical changes in their demeanour such as a lowered tone of voice, lowering and slowing of breathing, and other spontaneous responses (Purtilo and Hadad 2014). Wherever possible, sit and hold the patient's hand if they need it, for example whenever they are scared or in pain.

Practice insight

An easy way of engaging in tactile communication with your patient is to shake their hand (where possible with no gloves on, as this acts as a barrier) and introduce yourself.

Proximity

The physical distance that lies between the paramedic and the patient is termed *proximity*. Hall (1966) identifies four **zones of proximity**: 'intimate', 'personal', 'social' and 'public' zones. A distance of up to 45 cm between the patient and the paramedic would be classed as the 'intimate zone' (Figure 6.4). It is not unusual for a paramedic

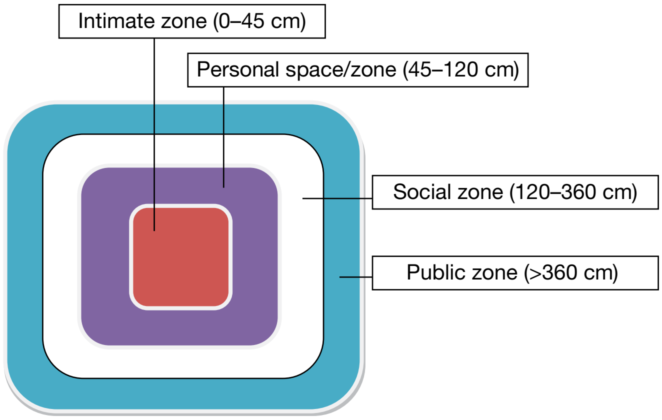

Figure 6.4 Zones of proximity.

to enter the patient's intimate zone during their care, although it is usually reserved for those who are intimate with the patient. However, there are occasions when a paramedic might get this close to a patient. Consider a patient who requires spinal immobilisation: the paramedic might enter the intimate zone whilst supporting the head in neutral alignment and whilst talking to the patient to provide reassurance.

A distance of between 45 and 120 cm is the 'personal space' or zone (Figure 6.4); the 'social zone' or consultative distance is between 120 and 360 cm, which is where most paramedic–patient interactions occur; and the public zone is described as a distance greater than 360 cm.

It is important always to respect personal space and be aware of the proximity between yourself as the paramedic and the patient. Some situations clearly require working more closely with the patient, but always remain alert to the fact that the patient might not feel comfortable with a paramedic being too close to them. Read the patient's body language and if they appear uncomfortable, then always respect their wishes and take a step back. If there is any uncertainty about whether the patient is comfortable, then seek their permission beforehand.

Facial expressions

Facial expressions can reveal a lot about how a person is feeling. It is important that the paramedic picks up on the patient's facial expressions as part of the global overview, and is also aware of their own facial expressions, which the patient will pick up on. Even without direct eye contact, facial expressions can reveal a great deal about feelings. Consciously or unconsciously, facial expressions include:

- Frowning
- Smiling
- Raising eyebrows

Barker (2016) recommends making a concerted effort not to **frown** when in front of the patient. Even though this can be difficult to achieve sometimes, for example after you have undertaken several long day or night shifts or managed several difficult cases, it is important to remember that the patient in front of you requires your attention now.

The presence or absence of a smile is a useful tool in helping the paramedic to determine how comfortable the patient is. A smile is generally a positive facial expression, with the generic meaning that the person is happy and comfortable. Genuine smiles involve the eyes and are known as **full-face smiles**. This is because the nerves around the eyes are also engaged when true happiness is felt and a smile is expressed. When a full-face smile is not possible then a *false smile* is noticed, which is characterised by a lack of involvement of the eyes. A false smile brings with it a sense of uncertainty about the person and demonstrates incongruence between what they say and what their face is saying. In contrast, a **polite smile** can make a patient feel reassured and confident in the care they are receiving.

When a paramedic is displaying positive facial expressions and good eye contact, it is interpreted as warmth and interest (Stein-Parbury 2017); it is used to convey reassurance and care rather than happiness.

Raising eyebrows indicates interest. Doing so whilst making eye contact and leaning forward slightly lets the patient know that the paramedic is paying attention to what they are saying. On many occasions patients will feel comfortable telling the paramedic their lifetime of medical and social histories, and it is the paramedic's role to filter this information into useful and not-so-useful information. **Active listening** and showing an interest in what the patient is saying will allow the paramedic to build rapport with the patient and lead to better patient outcomes.

Verbal communication

Tone, pitch, language, rate, and volume are all important elements of verbal communication. It is important not only to be mindful of how the paramedic uses these when communicating with their patients, but also to be able to recognise how patients use all these elements of verbal communication when they are communicating with the paramedic. Take, for example, a patient in pain: their language might include swear words, the pitch will be high, and the speed will usually be fast. It is important that the paramedic recognises how stress, pain, and suffering affect verbal communication and react accordingly with their own use of verbal communication. If a patient and their relative are panicking, are speaking fast and at a high pitch, the paramedic can calm the situation in the following ways:

- Talking calmly, using reassuring words.
- Talking slowly, but assertively, to gain control.
- Not raising the pitch or volume of their voice.
- Using other forms of nonverbal communication to support verbal communication.

Practice insight

One technique for managing stressful situations is for the paramedic to take a slow, deep breath before entering the scene, which will slow respiration and allow the paramedic to remain calm. This can be done discreetly at any time.

Language

It is easy to forget that patients are not medically trained, and it is unlikely that they will always understand the medical terms that paramedics may use. As Johnson et al. (2017) identifies, it is important to talk to the patient in a way that is suitable to their age, education, and cultural background, and to use unambiguous language that the patient understands. In order to do this, the paramedic must ascertain the person's 'frame of reference'. Using the wrong language, terminology, being too informal, or using the wrong accent can inhibit the communication process. When the paramedic talks to the patient, asking them about their medical complaint and discussing the situation with them, they should take the time to notice any pauses in the patient's response, which may be due to a lack of understanding of medical terms or processes. It is the paramedic's responsibility to make sure that the patient understands the words being used within the conversation, which will place the patient at ease.

Language registers

How words are used in everyday conversation is referred to in sociolinguistics as 'language registers'. Language registers are affected by factors such as occupation, culture, social setting, social class, and group norms, and it is appropriate for the paramedic to adapt their language registers accordingly. For example, when talking to a patient the paramedic might choose to use the term 'heart attack' or 'myocardial infarction', according to whether they are treating a member of the general public or a patient from a medical background.

Mood

A person's mood also affects verbal communication. People who are sad, for example, tend to speak more quietly and, due to a more relaxed larynx, the sound is subdued, less defined, and more muffled. Happier people are described as being 'chirpy' and having a sing-song quality to their tone. Picking up on this will help the paramedic to decide how they will best treat or refer the patient.

Effective listening

When a member of the public calls for an ambulance, they expect the paramedic to listen to what has happened and respond accordingly.

The term active listening is used to describe the paramedic who is engaged physically and mentally in the listening process (Beebe et al. 2015). A good listener is someone who listens actively, by feeding back to the other person what they are hearing, which supports and encourages the speaker. An active listener will allow the person to respond to the questions being asked by not dominating the conversation and by taking it in turns to respond. Being an active listener involves thinking about what is being said and actively focusing on the conversation, making sure that as the listener you are not distracted by anything else in the environment. Maintain a good amount of eye contact with the speaker and show the patient that they are listening actively by using the appropriate facial expressions and by leaning forward slightly. Box 6.2 provides an example of how a paramedic might use active listening.

Active listening demonstrates to the patient and relatives at the scene that the paramedic is interested in what has happened and that they care about the patient. Active listening helps the paramedic to decide on the most appropriate plan of action.

Practice insight

In order to become proficient, use active listening with friends and family before attempting it with your patient.

Box 6.2 Example of active listening between a paramedic and a patient

Paramedic: So tell me what has been happening?
Patient: Well, I have been finding myself increasingly short of breath over the past few weeks…
Paramedic: OK, short of breath…
Patient: …yes and it seems to get worse when I lay flat and at night. Sometimes it even wakes me up.
Paramedic: I hear that you have been increasingly short of breath, and it is worse at night and it wakes you up at night sometimes.

The paramedic is expected to question the patient regarding what has happened, their past medical history, and their family and social history. It is important that the patient is given enough time to answer the questions being asked. It is very frustrating for the patient to be asked many questions and not be given the time to answer. This becomes even more important when working with time constraints, for example as a paramedic on a **rapid response vehicle** (RRV). The paramedic working on the RRV must assess the patient rapidly and begin observations such as blood pressure measurement, and sometimes even commence treatment, before the ambulance crew arrives. During such circumstances it is easy to rush the patient, but be sure to exercise patience.

Empathy

Empathy has been described as the emotional connection between people (Stein-Parbury 2017) that allows the paramedic to be able to feel the emotions of the patient, as well as their relatives and loved ones. Taking the time to consider how the individual patient has been affected by the incident is being empathetic. Empathy is the ability to understand how the patient is truly feeling by placing yourself in the patient's shoes. Where there is no empathy between the patient and the paramedic, it is unlikely that there will be a true connection, and a lack of warmth whilst providing medical care will be evident.

Showing empathy is not difficult to achieve and can be demonstrated by something as simple as nodding your head and maintaining eye contact during a conversation. Actively listening to the patient and the family is also an important element of achieving empathy, as well as not rushing them and providing reassurance that everything that can be done to help will be done. Where possible, it is good practice to involve the patient and the family in any decisions and to provide as many options as possible.

Barriers to effective communication in the prehospital setting

Poor communication occurs for many reasons, including a lack of respect for the importance of communication, a knowledge deficit regarding effective and ineffective communication, environmental factors, and not acting upon **barriers to communication**. It is important to recognise how the specialist environment of prehospital care might have a profound effect on the communication process. Being aware of some of these barriers to communication can help the paramedic to prepare for and overcome them.

Environmental Noise

Environmental noise is by far the most common cause of communication interference within the prehospital setting. Consider a patient involved in a road traffic collision. There can be other road vehicles passing by, police and fire personnel, and multiple ambulance crews at the scene, and all with slightly different roles to play – not to mention the possibility of a screaming patient and passengers. The weather is also a factor that compounds this scenario.

Practice insight

Whether you are a student paramedic or a qualified paramedic, and regardless of whether you are treating the patient or not, do everything possible to reduce the noise on scene, as it generates arousal and therefore stress, and is very distracting. Simple measures, such as closing the ambulance doors or asking the police officer to step out to eradicate their radio noise (where it is safe to do so), can be effective.

Medical conditions

Symptoms of medical conditions, such as shortness of breath and pain, create barriers to communication. When a person cannot breathe they are unlikely to be able to convey a message or respond to a question effectively. A patient in pain will be concerned solely with controlling their pain and receiving pain relief. This is the focus of their conversation. When a patient has experienced a stroke, their ability to communicate is diminished and sometimes even removed completely. It is the paramedic's responsibility to continue to maintain high levels of communication with all of these patients. They will require reassurance from the paramedic, who can use a range of verbal and nonverbal methods, such as spatial proximity and touch, to convey reassurance and safety, and speaking in a calm and reassuring manner.

When a paramedic is faced with multiple casualties, they are expected to be able to take the necessary action, including managing all patients, requesting additional resources, staying calm, and managing the situation as it unfolds. When managing more than one patient, good communication needs to be maintained throughout. Communication with each patient, crewmates and despatch, and the additional resources that arrive is essential.

Individual personal beliefs

Individual and personal beliefs may potentially affect communication. It is clear that the paramedic must maintain the highest possible standards of care for every patient they attend. However, consider a person who has been accused of physically abusing their child. Personal bias may potentially affect how the paramedic communicates with the patient. It is important to recognise where this exists and to act on it by not letting it affect patient care. If necessary, ask the second crew member to take over if it is felt that bias might affect the care delivered.

Relatives and bystanders

Relatives and bystanders place additional demands on the ambulance crew. When the paramedic is dealing with a medical emergency such as a cardiac arrest, there are many occasions when the paramedic must remain sensitive to the needs of the friends and family who are also at the scene. Communication must flick between assertive, when leading the ambulance crews, and caring and compassionate, when talking to the patient's friends and family.

Conclusion

This chapter has identified that communication is a fundamental skill for the paramedic and why, making it clear that there is more to communicating than merely the words that are used. The body itself is used to emphasise what is being said and can reinforce and enhance the communication process. The paramedic must recognise and act upon barriers to communication in order to ensure that the patient receives the best care possible. Poor communication can have catastrophic effects on crew working and patient care.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. What is communication?
2. Who do prehospital professionals communicate with?
3. What are the two main types of communication?
4. Why does poor communication occur?
5. List three consequences of poor communication.

Activity 6.1

During your next visit to the A&E department, take a look around and see how medical teams and individuals communicate. Jot down the verbal and nonverbal methods of communication you observe being used.

Activity 6.2

Search for an online clip of a current high-profile politician and observe how they use their body language to assert confidence and authority. Note down how they use their hands to complement their spoken words. Also take notice of how they dress to instil confidence (known as power dressing).

Mentally note how they use the tone and pitch of their voice to get their message across in an assertive and confident manner.

Activity 6.3

Practise a range of gestures by sitting/standing in front of the mirror to find those that look natural. Try appearing confident, relaxed, and assertive. Practise polite, professional smiles.

Activity 6.4

Think back to when you were last scared of something. How did your communication or ability to communicate change?

Glossary

Active listening: The process of repeating back to the patient what the paramedic has heard.

Barriers to communication: Any distraction, physical or otherwise, that negatively affects the communication process.

Body language: Communication conveyed by body rather than voice by means of posture, gestures, and facial expressions. It can be categorised into *positive* body language, used to convey positive and confident messages, or *negative* body language, such as folding the arms and frowning.

Global overview: An on-scene assessment that commences upon arrival at the location of the patient. It is an assessment of the scene and is intended to help the paramedic look for clues to why the patient is ill or injured (otherwise known as the scene survey).

Frown:	Contraction of the brow as a sign of displeasure.
Full-face smile:	A smile which involves the eyes; also known as a *genuine* smile.
Hand gestures:	The use of the hands to give a verbal message emphasis.
Nonverbal communication:	A form of communication that does not use the voice. It includes facial expressions and body language.
Polite smile:	A smile used by a professional in order to convey a message of caring and support. In contrast to a full-face smile, a polite smile does not involve the eyes.
Pre-alert:	The process used by the ambulance crew to inform the hospital team that a patient is being rapidly transported from the community to the hospital and that, due to the patient's medical condition, the hospital medical team should be on standby.
Rapid response vehicle (RRV):	The term used to describe an ambulance car or all-terrain vehicle that responds in the main to life-threatening calls or 'red' calls. Increasingly they are being used for less serious calls or 'amber' calls.
Sender:	According to Shannon and Weaver's (1949) model of communication, the sender is the person sending a message to another person or group of people.
Tactile communication:	The use of physical contact with the patient, such as hand-holding to demonstrate caring and reassurance.
Verbal communication:	The use of voice to convey a message, including pitch, tone, and language.
Zones of proximity:	The physical distance that lies between two people, which can be divided into intimate zone, personal zone, social zone, and public zone.

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7

Sociological aspects of paramedic practice

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Contents

Fundamentals of Paramedic Practice: A Systems Approach, Second Edition. Edited by Sam Willis and Roger Dalrymple.

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Learning outcomes

On completion of this chapter the reader will be able to:

- Define sociology.
- Describe functionalism, conflict theory, and symbolic interactionism.
- Discuss the social context of health and ill-health.
- Develop a sociological imagination.
- Apply sociological theory to analyse current paramedic practices.

Case study

An ambulance has been despatched to a private address for a female complaining of shortness of breath. Upon arrival at the two-bedroom flat, the paramedic crew notice that the flat is messy and there are four other people living there. All occupants are smoking and the patient in question owns three cats. The patient confirms that she is asthmatic and, upon further questioning, states that she has been a smoker since she was 13 years old and that her parents were also smokers. The patient has lived away from her family since the age of 16 due to falling out with her mother. Since then, she has disowned her family and has been unable to work due to stress-induced asthma.

Introduction

Sociology has an important place in paramedic education. Paramedics treat patients not in isolation, but in the context of their homes, families, networks, and communities. Sociology, the scientific study of society, social structures, and social relationships, helps us to work with patients insightfully, respectfully, and with awareness of their social worlds. An understanding of sociology can help a paramedic to stay client centred and deliver culturally sensitive and personalised care. It can also help to broaden practitioners' awareness of the social causes of health and ill-health; the imbalances in power, equality, and justice in the health and social care system; the way in which social interactions can shape our thoughts, feelings, and behaviours; and our own role within the health and social care sector. Accordingly, this chapter will introduce the reader to some key principles in sociology that can help to illuminate our paramedic practice.

The sociological imagination

Our first key concept, the **sociological imagination**, was developed by American sociologist C. Wright Mills in the 1950s. Mills urged us not to view individuals and societies as distinct, suggesting instead that individuals both shape and are shaped by the society in which they live. He proposed that many personal problems are in fact caused by public influences – societal and political forces that are outside one's personal control (Mills 1959). He argued that learning to develop a sociological imagination, or learning to see one's own and others' experiences in the context of history and social structures, can bring liberation from personal problems (Mills 1959).

Practice insight

When talking to your patient, take some time to get to know them. Break down barriers by asking them about their family and social history (above and beyond what is required for the paperwork). Listen to what they have to say and empathise with them.

Three sociological paradigms

Having met this concept of the sociological imagination, now let us turn to three sociological **paradigms** (philosophical and theoretical frameworks for viewing the world) that can help to illuminate paramedic practice. Sociology contends that our social world is made up of a number of social units or subsystems that collectively create social structure. Social units can range from the interaction of two people, to small groups, to large and complex social structures such as global organisations or political systems. Sociologists focus on three different social units or systems: social relationships (the microsystem), institutions (the mesosystem), and society as a whole (the macrosystem; Figure 7.1). For each of these social units, a different paradigm is applied: **functionalism**, **conflict theory**, and **symbolic interactionism**.

Functionalism

Functionalism was initially developed as a macro-level theory, though many sociologists believe it is better placed as a meso-level theory (Openstax College 2012). Meso-level theories are focused on studying institutions and social structures, as these can both reflect and influence society as a whole.

Functionalism initially developed out of the writings of Herbert Spencer (1820–1903) and Émile Durkheim (1858–1917) and was one of the earliest theories of sociology. Functionalists argue that our lives are influenced by interrelated social structures and that each part of society has consequences for the function of society as a whole. Thus Durkheim asserted that society is more than the sum of its parts, whilst Spencer suggested that, just as the body has organs that need to work together for health, society has subsystems or institutions, such as the economy, the media, political parties, the legal system, schools, and hospitals, and all of these institutions need to work together in order to achieve optimal social functioning and social order (Spencer 1898 cited in Openstax College 2012).

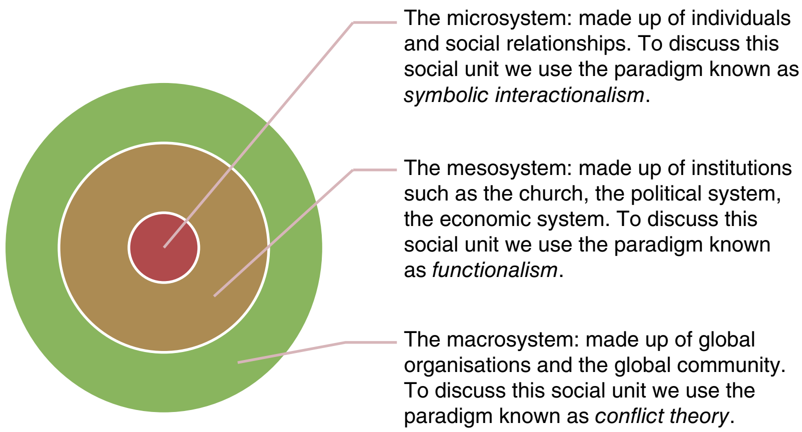

Figure 7.1 The social system.

Durkheim argued that in order for the constituent parts to work together, the system needs to have boundaries, such as laws, customs, and rituals (Durkheim 1984), which reflect the 'collective consciousness' – or shared beliefs, values, and attitudes that persuade individuals to behave in accordance with social norms.

Conflict theory

Conflict theory is a macro-theory, meaning it focuses on the nature and structure of society as a whole. It explores how social structures create and perpetuate power imbalances, which in turn generate conflict (Ballantine and Roberts 2010). Conflict theory highlights that there are finite resources within society; therefore individuals need to compete for power, resources, and opportunities, and those who have greatest access to these will seek to maintain their position (Openstax College 2012). Conflict theorists believe that social conflict is both normal and essential for change, adaptation, and survival.

Marx

Karl Marx (1818–1883), the most famous conflict theorist, argued that all elements of society are influenced by the economic system. Marx observed the industrial revolution and the rise of *capitalism* and drew attention to the significant inequalities between factory owners and factory workers. Marx predicted that capitalism would cause a rise in inequality as the *bourgeoisie*, or people who owned factories and therefore owned the means of production, would be motivated to maintain their social position by preventing the *proletariat*, or those who worked for factory owners, from advancing their social position. He argued that class inequalities occurred throughout history and naturally tended towards an end point of social revolution (Marx and Engels 2005).

Marx asserted that what we do defines who we are. He argued that capitalism caused alienation, since the proletariat worked for money and therefore the connection between worker and product was lost. His view was that this misalignment caused individuals to become isolated and detached from their occupations, society, and their own sense of self, leading to a feeling of disempowerment (Marx and Engels 2005).

Marxist theory suggests this alienation is perpetuated and reinforced by a 'false consciousness', where the beliefs of the dominant class could be imposed on the nondominant class (Marx and Engels 2005). For example, the bourgeoisie's preferences for social competition over social cooperation might create a cultural belief that hard work is rewarding. If this belief is accepted, then the proletariat are less likely to question their social position, and may even assume individual responsibility for their social position.

Marx would have highlighted that class and health inequalities are a key determinant of health – a view supported by the World Health Organization (World Health Organization 2008). In the UK, morbidity and mortality rates are significantly higher for men and women in lower socioeconomic occupations than for their counterparts in higher socioeconomic positions (Office for National Statistics 2009). For example, if you are a man aged 25–64 years in the UK, you are twice as likely to die from cardiovascular, digestive, or respiratory disease, and significantly more likely to die from cancer, if you work in a manual labour position (the proletariat) than if you are in a professional or managerial position (the bourgeoisie; Office for National Statistics 2008).

Symbolic interactionism and microsociology

Our third main sociological view of the world is known as symbolic interactionism (sometimes called microsociology), which focuses on social interactions between individuals and studies how social interactions shape society (Giddens and Sutton 2017). This paradigm assumes that individuals play an active role in shaping reality.

Symbolic interactionism was developed by George Herbert Mead (1863–1931) and his student Herbert Blumer (1900–1987). This approach assumes that people develop meaning by interacting with others and with objects in society, and this meaning influences their behaviour, identity, and beliefs about what is normal, ethical, and fair (Giddens and Sutton 2017). This paradigm thus assumes that society is a product of social interactions, as reality is actively created and interpreted through our social interactions.

Goffman

Erving Goffman (1922–1982) suggested that social interaction follows a set of social rules that maintain social order. Goffman argued that people behave like actors, in that they use tactics to actively manage their social identities in order to protect themselves from negative evaluation by others (Goffman 1969).

Practice insight

Remember that it takes time to get to know a person. Even though you may be expected to work with someone for the first time in an ambulance, you won't really know that person until you have worked with them over a given period of time. Consider this when deciding how much of your own private life you wish to share during the course of the shift (for further reading, look up the 'Johari window' model of self-awareness).

Goffman highlighted the importance of social integration. He suggested that people actively claim a social role, and that this role needs to be recognised and accepted by others (Goffman 1969). For example, in order to be an effective paramedic you need to assume the role behaviours and attitudes of a paramedic, and patients, carers, and other health professionals need to recognise that you are filling this role and play along with it. Goffman argued that when others recognise and play along with our roles, then communication runs smoothly as a shared understanding is established. He also recognised that there can be conflict and misunderstanding when our roles and behaviours are not clearly understood or accepted by others (Béphage 1997). For example, if a paramedic is called to a motor vehicle accident, they may need to resuscitate an individual, assess for spinal-cord injuries, and attend to open wounds. By carrying out these activities the paramedic is able to signify to others that they are doing an important job, and they are doing it well. Other tasks may be less well understood. For example, if a paramedic is called to assess an older person who is having breathing difficulty, they may initially talk to the client and ask them about their day. Through this interaction they may be making clinically skilled observations about the patient's breathing, pallor, cognition, or mental state, but this may not be obvious to the patient, and any onlookers might believe the paramedic is simply chatting, wasting time, or failing to attend to the patient's needs (Béphage 1997).

Nurok and Henckes (2009) found that social integration influenced the value and priority given to emergency cases in an ambulance service. For example, they found that prehospital professionals showed a preference for attending cases with penetrating trauma (e.g. a gunshot or knife wound), where there was a clear cause of injury that could be rapidly assessed and treated, over blunt trauma, where establishing the cause of injury and determining the best course of action could take longer. Blunt trauma was also prioritised over nontraumatic cases that required pathophysiologically based assessment, which could cause delays and could require assistance from other staff. In other words, cases were prioritised that enabled the prehospital professional to take rapid action and show explicit technical skill, thus allowing them to clearly demonstrate their role performance to others.

The sociocultural context of health

Several chapters in this text are focused on helping you to assess a patient's biological function and make judgements about their health. However, it is important to note that our understanding of health and ill-health is *socially* constructed. Today we tend to believe in a bio-psycho-social model of health; in other words, we think that health is determined by our biology, psychological functioning, and social issues, such as our lifestyle, our socioeconomic status, and our social support. Society has not always had this view. If you were to travel back in time you would be able to see how our perception of health and ill-health has shifted as a result of social changes. Before we had microscopes we did not know about bacteria, or viruses. People believed that poor health was related to moral, spiritual, or supernatural causes, and treatments for ill-health reflected these beliefs.

Symbolic interactionists argue that sociocultural beliefs can determine how we view health and ill-health, whether an illness is subject to social **stigma**, and therefore how it is experienced and treated. Conrad and Barker (2010) highlight how some diagnoses are considered controversial by health professionals. For example, illnesses like chronic fatigue syndrome or dissociative identity disorder may not be considered 'real' illnesses by all health professionals. Health professionals' belief about an illness can affect a person's ability to seek help, and it can influence the help that they end up receiving (Sartorius 2007).

Culture not only shapes beliefs about illness, it can equally affect the way illness is experienced. Conrad and Barker (2010) highlight that illness can have impacts on people's occupations and their social network, and can make a person's world feel smaller. Illness can be seen as an opportunity to re-evaluate values, for self-discovery, change, and personal growth. Interestingly, not all cultures around the world have a way of expressing illnesses that are relatively common in the West. For example, some cultures have no experience of eating disorders and others have no language for depression. First et al. (2004) and Kirmayer and Young (1998) highlight that ethno-cultural groups are more likely to *somatise* signs of mental distress. This means that they may feel physical symptoms, such as nausea or chest pain, rather than experiencing the low mood that we might associate with depression.

Goffman argued that the meaning of an illness is derived from social interaction. He suggested that certain illnesses, whether visible or hidden, could become **stigmatised**, and therefore labelling a person with a stigma could discredit and devalue the person, causing social alienation and exclusion (Goffman 1986). Sartorius (2002, 2007) highlights that people with stigmatised illnesses can find it more difficult to seek help and to access care than people with illnesses that are not subject to social stigma.

Sartorius (2002, 2007) further suggests that society, and even healthcare institutions, can discriminate against individuals with stigmatised diagnoses. For example, people who are detained in psychiatric units may not have their physical health needs attended to (Mitchell et al. 2009, 2012), are more likely to be unemployed (Waghorn and Lloyd 2005; Sainsbury Centre for Mental Health 2008, 2009), and are less likely to be offered support to return to work (Secker et al. 2001). They may not be given access to vote in elections (Sartorius 2002), are more likely to become homeless (Gill et al. 1996; Dean and Craig 1999), and are more likely to be imprisoned than people with other health conditions (Singleton et al. 1998; Lader et al. 2000).

Several studies have shown that social values can have a significant impact on clinical decision-making. A seminal study by Sudnow (1967) indicated that health professionals engaged in *social rationing* – the withholding of potentially beneficial interventions based on their perceived social worth. For example, Sudnow found that individuals who were attributed with nondesired or deviant social roles were less likely to receive critical interventions – even resuscitation. Whilst some researchers have debated the transferability of Sudnow's findings to today's healthcare system, there are several studies that support the view that perceived social worth can have a significant impact on the number and quality of interventions provided. Timmermans (1998) replicated many of Sudnow's findings. In his study, patients were more likely to receive lengthy and rigorous resuscitation if they were personally known to the treating health professionals, if they were a well-known person with a valued social role, if they were young, and if they were a patient whom the health professional had previously treated. Individuals were less likely to receive resuscitation, or resuscitation efforts might have been limited, if they were referred from a residential care facility, if they had overdosed or been intoxicated, or if they were perceived as elderly and frail. Timmermans (1998) and Sudnow (1967, 1983) reported that some of the individuals in the low social worth group were pronounced dead whilst still alive or whilst lifesaving interventions were still viable. In Nurok and Henckes' (2009) ambulance service study, it was found that perceived socioeconomic status and social worth could affect the efficiency and quality of treatment. Timmermans (1998) and Sudnow (1967, 1983) also found that if a health condition was considered to be 'self-inflicted', then care could be withheld, or unnecessary invasive interventions could be prescribed.

Medicalisation and demedicalisation

Medicalisation is a process in which phenomena that were once viewed as normal or socially deviant become viewed as conditions that require medical attention. **Demedicalisation** is the opposite process, where an illness is no longer defined as an illness, but comes to be seen as either normal or a condition of social deviance.

Medicalisation can affect how people view personal responsibility for a condition and how other people respond to the person with the condition (Conrad 2008).

Women's health issues, including menstruation, pregnancy and childbirth, and menopause, are frequently cited as examples of medicalisation. The meaning and experience of menopause vary across cultures, and some cultures may not even recognise it as a medical concept. For example, in Japan the prevalence of women reporting issues with menopause is significantly less than for women in North America (Lock 1994). In some cultures menopause is seen as an entirely normal biological transition, whilst in the West menopause can be viewed as a condition either to be endured or to be treated, since it increases the risk for heart disease, osteoporosis, and Alzheimer's disease (Meyer 2001). Healthy women may be given advice to take hormones to delay the onset of menopause, maintain health, and increase their longevity; however, these treatments remain controversial (Meyer 2001).

Ivan Illich argues that medicine has the potential to cause harm through medicalisation and demedicalisation, by leading people away from their natural coping mechanisms to become dependent on the medical system. For example, he saw that labelling someone as ill could lead them to believe that they were a 'victim', and this could disable them from coping with their environment, alienate them from their relationships, and increase their dependence on the health system (Illich 1976; Sheaff 2005).

Conclusion

This chapter has shown the value of applying sociological concepts to paramedic practice. To do so helps us to recognise how health and ill-health are to some extent socially constructed, as are interactions between health professionals and patients. Learning to see yourself, your team, and your patients in the context of the broader social environment can help you to take a client-centred and culturally sensitive approach to care, advocate for clients who may find feel disempowered, and understand the full extent of your role within the broader social system.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. Define 'sociology'.
2. Describe what Mills meant by the 'sociological imagination'.
3. Identify social and cultural factors that can influence your health beliefs and your experience of health and ill-health.
4. Consider the case study at the beginning of the chapter and explain how social interaction can lead to stigmatisation and social rationing.
5. Describe the consequences of medicalisation.

Activity 7.1

Generate a discussion on station or with your crewmate. Ask them about their thoughts on conflict theory and about competition for power in the ambulance service. Specifically ask what action has been taken by paramedics to try to change their working conditions for the better.

Activity 7.2

Adopt a conflict perspective and consider how your social class, gender, age, or ethnicity might have an impact on your health and well-being. Consider what inequalities you may face if you were:

- A homeless single parent living in rural Wales.
- A widow with five children from war-torn Somalia who has just applied for refugee status.
- A 12-year-old young carer who has taken on the responsibility for caring for her mother, who has schizophrenia, and three siblings.
- A 95-year-old Bangladeshi women living on a council estate in West London.

How might your environment and your social situation influence your health and well-being, your access to healthcare, your power to gain access to social welfare and equal opportunity, and your ability to educate yourself and access resources to improve your social situation?

Activity 7.3

Consider how you behave in different social contexts. Do you exhibit the same behaviours when you are communicating and interacting with your family, flatmates, colleagues, practice educator, and lecturers? Consider how the social context affects your interactions with these people, and how the feedback you receive from them shapes your identity and your perception of what it means to be a paramedic student.

Activity 7.4

Consider the example of Winterbourne View, a care home for people with learning disabilities. Eleven staff working at Winterbourne View were convicted of abuse and neglect (Department of Health 2012; Flynn 2012). In a BBC *Panorama* documentary (BBC 2011), staff were observed punishing patients, wrestling patients in an attempt to restrain them, and inciting aggressive games. In fact, one of the staff members was heard saying, 'The only language she [one of the patients] understands is force' (Flynn 2012).

Consider how healthcare institutions might socialise staff to behave in ways that conflict with their perceived sense of self. How might healthcare institutions depersonalise patients? How might staff working in teams have a reduced sense of personal responsibility for their actions? How might a lack of training, reflection, supervision, and review of work practices prevent staff from seeing their actions as potentially abusive? How might team working make it difficult to be a whistleblower?

Activity 7.5

Consider how you might react if you were diagnosed with an illness that is subject to a significant amount of social stigma, such as schizophrenia, chronic fatigue syndrome, or HIV. What would you think about your diagnosis? How would this make you feel? How would other people respond to you? How would other people's reactions affect you?

Activity 7.6

Consider your beliefs and values about health and ill-health. How have you come to hold them and are they congruent with other cultural groups in your community and with mainstream medicine? How might your beliefs and values affect your ability to attend to a client who holds different beliefs? How might they affect your ability to work within a team when other professionals hold opposing beliefs?

Glossary

Conflict theory: A social paradigm that focuses on social competition and social inequalities.

Demedicalisation: A process in which a medical condition is no longer viewed as such and comes to be seen as either normal or a condition of social deviance.

Functionalism: The belief that society is like a system with subsystems that need to work together to create and maintain social order. It focuses on the way social structures and functions socialise us to conform to norms, role expectations, customs, and traditions.

Medicalisation: A process in which what was once viewed as normal or socially deviant comes to be viewed as a medical condition.

Paradigm: A framework containing assumptions about how the world can be interpreted, analysed, and understood.

Sociological imagination: Wright Mill's view that personal problems are often the result of public or social influences, and that by learning to view the social environment and the historical context, one can free oneself from blame and become empowered to act on the system.

Stigma: A devalued social characteristic that identifies a person as being deviant or different.

Stigmatisation: The process by which one's identity can become 'spoiled' or devalued through social interaction with others.

Symbolic interactionism: A paradigm that focus on social interaction and social creation of meaning.

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8

Legal and ethical aspects of paramedic practice

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Learning outcomes

On completion of this chapter the reader will be able to:

- Discuss the importance of law in relation to paramedic practice.
- Discuss the importance of ethics in relation to paramedic practice.
- Identify ethical principles as frameworks that can be supported in practice.
- Identify legal principles as frameworks that can be supported in practice.
- Understand how the legal aspects that underpin ethical principles relate to paramedic practice.

Case study

An ambulance has been despatched to a high street where there are reports of an intoxicated male. This is the fourth call in the shift involving alcohol as a reason for ambulance attendance. The paramedic assesses the patient and it is clear that he cannot be left alone due to his intoxicated state. The patient cannot provide any information pertaining to a friend or family member, and as a final resort he is taken to the local emergency department.

Introduction

The role of the paramedic has changed significantly over the past decade. In addition to a clinical knowledge base, today's paramedic must also demonstrate extensive knowledge of law and ethics, as these subjects provide the foundation upon which paramedic practice pivots. The subject is so important that whole books have been written just focusing on the law and ethics of paramedic practice. As such, there is only space in this chapter to provide an introduction to some key areas of focus on law and ethics in paramedic practice.

Legal aspects of paramedic practice

In the UK and Australia, paramedics are regulated by a particular piece of legislation that provides authority to an overarching regulator to manage the practice of practitioners. This regulatory regime applied *in addition to* other legal frameworks that also regulate paramedic behaviour, including civil laws (e.g. trespass, negligence), criminal laws (e.g. assault, fraud), and employment laws (e.g. contract of employment with the employer). In this way, it could be argued that health professionals like paramedics are subject to an extra layer of law that may not apply to some other workers.

In the UK, that regulatory body is referred to as the Health and Care Professions Council (HCPC). In Australia, the regulatory body is the Paramedicine Board of Australia, which receives administrative assistance from the Australian Health Practitioner Regulation Agency (AHPRA). These two regulatory systems are slightly different in structure and effect, although their objective is largely the same. The objective of both these regulatory agencies is to ensure public protection and safety by requiring paramedics to be suitably educated, competent, and able to work according to a set of conduct standards that place patient interests first.

The HCPC first published its 'Standards of Conduct, Performance and Ethics' for paramedics in 2003. This document establishes the professional standards expected of paramedics in practice, including recognition that paramedics, as a matter of professionalism, must manage not only their patient's health and well-being but also their own. This is because a practitioner may place a patient at risk if the practitioner is impaired whilst practicing their profession. Breaches of these standards can result in paramedics being sanctioned in a number of ways by the HCPC. These sanctions can include restrictions on practice and even the loss of registration.

The Australian regulatory model differs from the UK model to the extent that paramedics in Australia have their own regulatory body – the Paramedicine Board of Australia – that will not only establish education, registration, conduct, and **competence** standards, but also establish disciplinary panels comprising members of the profession and the community to assess the performance of paramedics who may have breached their professional standards. A similar range of sanctions apply to paramedics who breach those standards. The important point for paramedics to remember with regard to this regulatory regime is that it is designed to ensure that patients stay safe and that their interests are placed ahead of other interests, including those of the paramedic or their employer.

Consent to treatment

One of the primary ways in which the patient's interest can be protected is by ensuring that consent is gained from them prior to the commencement of treatment. This principle of patient **autonomy** is both a legal and an ethical principle and should be well known and understood by practitioners. Essentially, the paramedic is required to ensure the patient is sufficiently informed about the proposed treatment in order to weigh up the benefits and risks, and then communicate their willingness to accept those benefits and risks or any concerns they may have to the treating paramedic. The term 'informed' means just that: there must be enough information available for someone who has the decision-making capability to be able to make a judgement.

Gaining consent to treat a patient is an important aspect of paramedic practice. Implied and informed consent are the two most commonly occurring forms of consent that affect the paramedic.

Informed consent

For the most part, prior to the commencement of treatment, a practitioner is legally required, as part of their duty of care, to inform the patient about the broad nature and effect of any proposed treatment. So if the paramedic plans to give the patient an injection, then it is enough simply to tell the patient what drug you plan to give, why you are giving it, what the side effects may be, both good and bad, and then to ask the patient's permission to give it. This is as much about good practice as it is about lawful practice. **Informed consent** is consistent with the overarching legal and ethical principle of individual autonomy, or the right to self-determination.

Often in paramedic practice the patient is not able to give any form of consent because they are unconscious, incompetent, or otherwise incapable of doing so. The paramedic must be able to assess the patient's decision-making capability accurately. If the patient does not have the capacity to consent to treatment, then this should be documented by the paramedic. Consent may be given by an authorised surrogate decision-maker, for example someone who has been authorised to make such decisions in a formal legal instrument like a guardianship order, or a spouse, a carer, or other family member. The laws around surrogate decision-making differ in each jurisdiction. The same overriding principle of 'patient's **best interest**' still applies in cases where there is a surrogate decision-maker.

If there is no other decision-maker around to act for the patient, then the paramedic can make decisions on the basis of necessity, provided the decisions are made in the patient's best interest. Paramedics are able to rely on the legal principle of necessity to support their interventions. Necessity is the principle whereby the provision of treatment without consent can be justified on the basis that it is not practicable to communicate with the person you are assisting, *and* the action is one a reasonable person would take in the best interest of the assisted person. The basis of the provision of treatment is that it is necessary and in the patient's and society's best interests to do so.

Implied consent

Picture the scene. You are the paramedic looking after a patient and you have them settled in the back of the ambulance. You move towards the patient with a blood pressure cuff and the patient extends their arm for you to apply it. This is **implied consent**. This kind of consent is valid in a court of law, as the patient has expected the paramedic to treat them since they observed the paramedic approaching them with the blood pressure cuff. The patient has accepted the treatment by extending their arm. As a general rule, the more serious the potential consequence of a treatment may be, the more important it is to have a higher level of consent. Implied consent is low-level consent and is usually reserved for low-level interventions. If the paramedic was considering performing an intervention with serious consequences, then it would be better practice to receive verbal or written consent for the treatment. There are some exceptions to a reliance on implied consent, and that is where the wishes of the patient are known (e.g. refusal of treatment stipulated in an advanced care directive or other equivalent instrument) or where there is a surrogate decision-maker (i.e. someone other than the patient who knows the patient well and would be able to make decisions as if they were the patient).

Practice insight

When providing information to a patient in order to gain informed consent when administering a drug, don't forget to tell the patient about key side effects, as patients may not be aware of how unwell the paramedic-administered drugs might make them feel.

Some patients are happy to allow the paramedic to make decisions for them and assent to any treatment pathways offered. Paramedics enjoy a large degree of patient trust. Maintaining public trust in the integrity of paramedic practice is essential, because trust brings power and with power comes the responsibility to use it in the patient's best interest.

Best interest

The term 'patient's best interest' is routinely used within prehospital care. This is because the nature of the professional power that paramedics have is particular to the work they do. Paramedics commonly work with very vulnerable people in extreme situations where the stakes are often high, sometimes literally life and death. As such, it is imperative that paramedics wield this professional power responsibly. The law does codify this principle in that the regulation of paramedics in both the UK and Australia is set up to protect the public. For example, standard one of the HCPC standards of conduct, performance, and ethics relates to acting in the best interests of the patient. It is therefore both an ethical and a legal obligation for paramedics to act in the patient's best interest. This may sound contrary to principles of autonomy, because it suggests that a paternalistic, 'paramedic-knows-best' attitude applies. However, acting in the patient's best interest does not allow a paramedic to override the choices of a competent patient. It does provide guidance for paramedics in decision-making where there is an incompetent patient (a patient who is unable to make decisions for themselves) or a conflict of choices. For example, the paramedic may have been directed by their employer to perform a certain task that is contrary to the wishes or interests of the patient. For example, this might mean taking the patient directly to a specialist treatment centre that can more appropriately deal with the patient's condition, rather than to a routine accident and emergency (A&E) department that may not always be equipped to do so. The paramedic as an independently regulated, autonomous professional may have an obligation in an instance like this to breach their employer's guidelines if it is in the best interest of the patient to do so. At all times the overriding principle informing the paramedic's decision-making should be how an action can best benefit a patient and do the least amount of harm. This may be difficult, particularly if the action the patient wants to take is harmful. For example, if a terminally ill patient refuses transport to hospital because they want to die at home, it would be a matter for the paramedics to help facilitate this request because, although it may be harmful, it could potentially be more harmful to override the patient's wishes.

All patients have a right to decide what they do and what happens to them, and unless the patient lacks the capacity to consent to treatment, they must be allowed to make that decision proactively. Take the example of a patient who presents to the paramedic with cardiac-related chest pain. The paramedic's role is to perform a thorough patient assessment and take an in-depth history in order to identify what treatments the patient should receive from the paramedic, and also to decide whether the patient should travel to the local A&E department or whether they should be taken directly to the cath lab for cardiac catheterisation. However, not all patients want to go to hospital or travel to a cath lab for treatment. This is when acting in the patient's best interest can become controversial. The paramedic must inform the patient in clear terms why they think the patient must travel for treatment, highlighting the possible effects of refusal, but must also respect the decisions of the patient if they refuse; otherwise, the paramedic will be susceptible to claims of **battery**.

Battery

If a paramedic touches a patient without first gaining their consent to do so, it may be considered battery. It is good practice to get into the habit of simply asking the patient if it is OK to do something before it is done, which adds no extra burden to the paramedic in the execution of their usual business, from taking a pulse to performing a much more invasive intervention. This simple communication skill is not only facilitating the paramedic meeting their legal obligations, but also allows them to meet their ethical and professionalism standards as well. Asking the patient for permission to perform interventions lets the patient know what the paramedic is planning to do, which can help reduce anxiety and allow the patient to be a participant in their own care.

Negligence

Negligence occurs when the paramedic falls short of providing the standard of conduct and competence established by their peers as being a 'reasonable standard' for a paramedic with equivalent knowledge and training, and that results in harm being done to the patient. The standard is established from educational standards which inform the scope of practice, along with codes of conduct, clinical guidelines, and policy documents. These all help to establish the standard of care expected of a 'reasonable' paramedic. The legal standard of negligence is therefore very high, because in most cases where negligence has been claimed against a practitioner, the peer group has provided evidence that they would have behaved in a similar way given the particular circumstances of a case. In order to be found negligent several elements need to be established, including that the paramedic owed the patient a duty of care, that the paramedic breached their duty by providing treatment that was below the reasonable standard, *and* that as a result of that breach of duty a harm was caused. The nature of civil liability law and the complexities of healthcare mean that it is quite difficult to prove that an act or omission to act by a practitioner was the direct cause of harm to a patient, because usually patients are already harmed by some other process.

Duty of care

Wherever there is a practitioner–patient relationship, there is a duty of care. The paramedic employer might also have a duty of care that is separate from that of the paramedic. For example, an ambulance service owns the duty once telephone contact has been established. The term 'duty of care' was defined in the legal case *Donoghue v Stevenson* (1932) AC 562 at 580. It means that a person with a duty of care has an obligation to take care of, and prevent harm occurring to, another individual that may be 'so closely and directly affected by my acts that I ought reasonably to have them in contemplation as being so affected'. This duty extends to 'the examination, diagnosis and treatment of the patient and the provision of information in an appropriate case' (*Rogers v Whitaker* [1992] 109 ALR 625).

Breaching a duty of care

Whether or not a paramedic has breached their duty of care will be established by examining the standard expected of a 'reasonable paramedic' of equivalent knowledge and training faced with a similar situation. This is sometimes referred to as the **Bolam principle** (from the UK case *Bolam v Friern Hospital Management Committee* [1957] 1 WLR 582, where the principle was first elucidated) and it applies in both the UK and with only minor modifications in Australia (e.g. the standard cannot be irrational). Provided a practitioner can find a peer and other evidence (e.g. codes, guidelines, policies, educational standards) that would support the action of the paramedic, then it is probable that a breach will be unable to be established. The significance of this standard for paramedics is that now they are regulated as autonomous professionals, the peer standard will be established by paramedics, not practitioners from other disciplines like emergency medicine. This is because the Bolam principle is that the practitioner is assessed as meeting the standard of care of their peers, 'the reasonable paramedic', not the reasonable 'emergency doctor', who is trained to a different standard and has different skills.

Capacity to make decisions

As has been discussed earlier in this chapter, in order for a paramedic to uphold the rights of their patient and to act in their patient's best interest, the paramedic should get consent from the patient before commencing treatment. In all persons over 18 years of age, competence or capacity to make decisions is presumed. It is up to the practitioner to prove that the patient was not competent to make decisions for themselves if the practitioner does not get consent from their patient for treatment (unless the practitioner is able to rely on the principle of necessity as a defence). As has already been noted, the nature of paramedic work means that there are commonly occasions when the patient does not have the mental capacity to give valid consent to treatment, because the patient is unable to take in, retain, weigh up, and convey an understanding of the information shared by the paramedic about the proposed treatment. Establishing competence in patients is important, particularly if the consequences of decision-making are high. This is because at law, *competent* patients have a legal right to refuse medical treatment, even if it may result in their death.

In the instance of an acutely suicidal patient, establishing the competence of the patient becomes even more difficult because of the high stakes and often extreme time pressures that are placed on paramedics in those situations. It should be noted that there are no instances of paramedics having been prosecuted for treating an acutely suicidal patient, even when the patient has an objection to treatment. There are provisions within the criminal and mental health law that provide protection for those who offer help and treatment to acutely suicidal patients. It is important to note that this exception does not mean that the court would find *all* suicidal patients to be lacking in competence just by virtue of the fact that they are suicidal. Indeed, the court has commented many times that having suicidal thoughts can be an entirely rationale response to particularly stressful events (Townsend and Luck 2013). However, in the case of an emergency where there are time-critical factors and the stakes are high, there are protections afforded to paramedics against a charge of battery for treating a patient where there is some doubt about the patient's competence to give or refuse consent for treatment.

As already noted, there are particular provisions within mental health law, which is particular to each jurisdiction (i.e. the UK and each state and territory in Australia) but largely similar in nature, allowing for the treatment of those patients who pose a risk of harm to self or others and have a mental illness or disorder.

Mental capacity in children

For people under the age of 18, capacity is not presumed and it is incumbent upon the child or young person to demonstrate that they have capacity to give or refuse consent for treatment. Even though in law adulthood begins at age 18, the Gillick principle, or Gillick *competence* as it is sometimes known, which applies in both the UK and Australia, established that a person under 18 may be able to make decisions for themselves, provided they can demonstrate an ability to weigh up and use information to make a decision in the same way a competent adult would. This applies for consent to treatment. It does not generally apply to refusal of treatment.

However, as previously noted, there is a sliding spectrum of capacity depending on the seriousness of the action being consented to or refused. For example, if a paramedic were to approach a 4-year-old child to put on a plaster for a superficial wound and the child started to scream, then it would be acceptable for the paramedic to consider this a refusal of treatment that would have little benefit in being pursued and perhaps create a greater harm (i.e. to the child's relationship with paramedics in the future). However, a young person under 18 cannot refuse life-saving treatment, and neither can their parents or guardians. Only the court can decide if a person under 18 can refuse life-sustaining treatment.

Often paramedics are called to children of couples who are no longer together or where there are step-parents involved in the child's care. The legal particularities of the care of children in our society is that we *all* have an obligation to care for children, because they are considered vulnerable people unable to care for themselves. It may be that a paramedic is able to get consent from a parent about the treatment of their child, but if they are not, or if there is some disagreement as to which parent has decision-making powers that is unduly delaying treatment to the detriment of the child, then paramedics can act without the consent of a parent, provided their action is in the child's best interest. This is again an example of acting under the principle of necessity for a person who is unable to give or refuse consent to treatment for themselves.

It should be noted that there are limits to the authority that parents have to consent or refuse consent to treatment for their children. For example, a parent does not have the authority to refuse life-sustaining treatment. If a paramedic is placed in the difficult situation of assessing that the parent is not making decisions in the child's best interest, the paramedic can and should step in to treat the child in the child's best interest, because the paramedic's professional, legal, and ethical responsibility involves protecting vulnerable patients of all ages.

Practice insight

It is always a sensible idea and good clinical practice to take contemporaneous notes about difficult cases, so that you are able to refer back to the notes later if necessary.

Ethical aspects of paramedic practice

Before we can discuss what we mean by ethics as a term, we should consider why ethics is important to paramedic practice. Duncun (2010) claims that everyone involved in healthcare should have a fundamental concern with issues of values and ethics. Whatever aspect of healthcare you are in, and regardless of the specific engagements within your role, the nature and practice of healthcare demand that professionals are concerned with ethics. Paramedics are by no means an exception. However, a large proportion of the literature within healthcare ethics places a heavy focus on ethical issues in a clinical hospital setting, and, although we have seen a shift in recent years to incorporate ethical issues within emergency care, the examples that are used to illustrate ethical dilemmas often fall outside everyday paramedic practice. It has to be noted that ethical texts cannot provide the answers for any given eventuality (Clarke et al. 2012) that may occur across the healthcare setting; nevertheless, what ethical texts can provide is key ethical and legal frameworks that are integral to professional practice.

Paramedics often meet people in extremely difficult and distressing situations and at a time of heightened vulnerability for the patient(s) (Clarke et al. 2012). It is thus critical that paramedics have an understanding of the

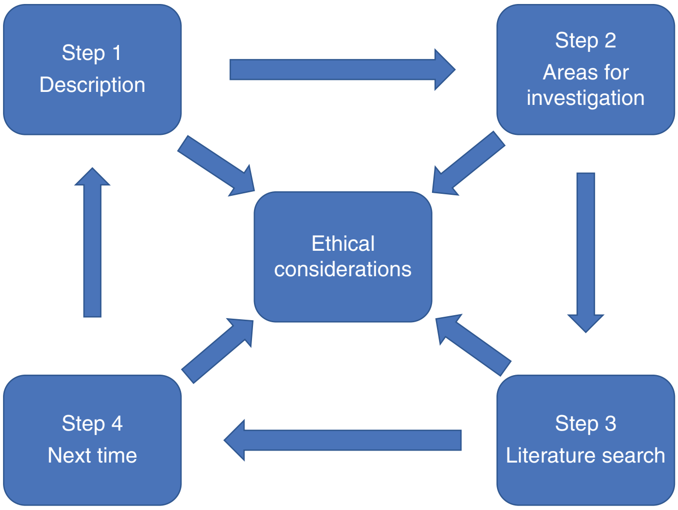

Figure 8.1 Willis's reflective model.

ethical issues that can have an impact on their decision-making in respect of patients and their families. In support of this, paramedics are still required to be registered with the HCPC and to adhere to the professional and ethical standards it prescribes. In addition, the paramedic has to be in a position to make informed decisions and judgements regarding patient care in cases where the standards and codes may not provide specific guidance. Therefore, the teaching and understanding of ethics are integral to paramedic education, and it is crucial that paramedics have a strong understanding of the ethical principles and legal precedents that apply to their practice, in order to be in a position to apply these principles to any changes within practice, procedures, or polices. The use of reflection within practice supports paramedics in developing a foundation of basic knowledge and experience into expert knowledge and skills, to enable them to recognise and acknowledge the effects of their actions (Jasper 2006).

Willis's (2010) reflective model (Figure 8.1) provides the paramedic with clear directions for considering their ethical behaviours within a given situation, and enables them to question whether the treatment they have provided is in line with ethical practice.

Ethics and morality

Ethics is often considered to be a branch of philosophy that addresses questions about morality; therefore, when ethics is used in the context of moral philosophy, it is often concerned with the study of morality, moral problems, and moral judgements. Ethics also attempts to define what is good and evil, right and wrong, justice and virtue (Mehmet 2011). There are three key aspects that support our understanding of what we mean by ethics:

- *Meta-ethics* provides analytical thinking about the source of the meaning of words or concepts; it can be considered as the theoretical side of ethics. Examples would be the term 'morals' and the source of 'morality', or questioning the meaning of terms such as 'right', 'wrong', 'good', or 'evil' within the context of morals.
- *Normative ethics* attempts to give answers to moral questions and problems in relation to what might be the morally right thing to do in a given situation, or whether someone is a morally good person.
- *Applied ethics* attempts to apply the concepts of ethics and to answer difficult moral questions that people face in their lives, such as whether assisted suicide is morally wrong, or whether individuals have the right of self-determination.

The combination of all three aspects of what we understand as ethics is important within a professional context. Meta-ethics allows us to question these terms and to obtain a greater understanding of the concept and ideas of what we mean by 'right' and 'wrong' in particular, within the professional context. Normative ethics allows us to place these concepts into real situations and apply their meanings. For example, if lying is considered to be morally wrong and this is taken to be a moral norm, then the application of this norm would be the question: 'Should patients *always* be told the truth?' Applied ethics provides the platform to apply ethics to specialised areas such as healthcare ethics, public health ethics, or business ethics.

Utilitarianism and deontology

Modern philosophers or ethicists have contributed to two main ethical theories: utilitarianism and deontology. A third theory, virtue ethics, although arguably the oldest in origin, is rarely used within healthcare as it is not action guiding in the same sense as utilitarianism and deontology. However, in recent times, virtue theory is starting to be applied across social work and some aspects of healthcare.

Utilitarianism is a doctrine proposed by Jeremy Bentham (1748–1832) and later by John Stuart Mill (1806–1876), whereby an action is morally good if it produces the greatest amount of good or pleasure for the greatest amount of people. Deontology (*deon* meaning 'duty') proposes that it is the moral intention of the agent that makes an action right or wrong. According to Immanuel Kant (1734–1804), we have a moral duty within society to act in a morally permissible way. Kant articulated a set of universal laws, whereby moral rules were applicable to all, so that if something is right for one, it is right for all. It is from deontology and the idea of set moral norms that 'codes of ethics' originated, since deontology provides fixed rules about what is right and wrong universally. Beauchamp and Childress (2009) consider that deontology provided the foundations for building a simpler and more effective way of supporting people in what is considered to be morally right and wrong within society, and developed four ethical principles – autonomy, **beneficence**, **nonmaleficence**, and justice – that arose from deontological theory (see the next section).

Virtue ethics stems from the work of the ancient philosopher Socrates and was then further developed by Plato and more extensively by Aristotle. This theory focuses on the attention of the character rather than their actions as the focus of moral concern, and someone who shows virtues such as kindness, generosity, respect for persons, honesty, and compassion is the model of moral conduct. Although it does not consider actions – i.e. rather than 'what I ought to do' the focus is 'what type of person ought I be' – someone's intentions and character will be reflected in their actions. Campbell et al. (1997) and Macintyre (2007) have supported the adoption of virtue theory in medical and nursing ethics, and paramedic practice should be no exception. The adoption of virtue ethics in education on ethics may support students in recognising that virtues are an extension of what we consider professionalism to be, and encourages them to consider their own character.

Ethical principles: An ethical framework

The ethical principles proposed by Beauchamp and Childress (2009) are often used as an ethical framework within healthcare, as these four main principles are considered to govern every aspect in healthcare and to support decision-making. This is also referred to as principlism, which is not designed as a moral theory but rather is a framework for determining what to do. The four principles are taken to be *prima facie* rather than absolute duties. This means that it is permissible to break or diminish one or more ethical principles to meet a more pressing requirement from another *prima facie* duty. For example, if you were to respect an individual's autonomy by carrying out their requests, but it may cause the individual a degree of harm (physical or psychological), then it would be permissible to diminish their autonomy, as that would be in their best interest.

The four ethical principles are as follows:

- *Respect for autonomy:* respect the capacity of individuals to choose their own definition of a 'good' life and to act accordingly. An autonomous decision (act) is one that is made (performed) intentionally, with understanding, and without controlling influences. Fundamentally, it is respecting the individual's decision regarding their treatment and this must be respected.

- *Beneficence:* maximise benefits and account for all the actions of a health professional to ensure they are in the individual's best interest.
- *Nonmaleficence:* 'do no harm', or do not cause any 'undue' harm, which must be balanced in particular against the potential benefits of a course of action. Leaving a vulnerable patient at home may address the autonomy of the patent, but they may require hospitalisation, leading the paramedic to need to weigh the potential harm against the potential benefits.
- *Justice:* consideration of what is fair and equitable or what is owed to each person. Each individual's rights are accounted for, such as allocation of resources and time spent on scene with patients that may limit the time spent with other patients.

Although these four principles provide a framework and foundation of support for actions and decisions within healthcare practice, it also has to be recognised that principlism does have its limitations. First, it can lend itself to being presented in the form of a checklist ensuring all principles have been met. It may be not only unsuitable but also detrimental to advocate the adoption of all four principles in a given situation. In addition, the principles can conflict. For example, vaccinations are administered with the aim of providing a potential benefit to an individual, yet simultaneously impart a degree of physical harm and risk. When ethical principles are in conflict, the use of specifying and balancing may provide a foundation for obtaining the right course of action that must be ethically justified. Specification requires the person to spell out where, when, why, how, by what means, to whom, or by whom the action is to be done or avoided. Alternatively, balancing the principles against each other to determine which is the more pressing may determine the right course of action.

Conclusion

Paramedics must provide ethical healthcare to their patients; this is not a nicety, but a necessity. All patient interactions must be both ethical and have respect for the law. Guidelines exist that can help the paramedic to achieve this, and this chapter provides an overview of the key ethical and legal theories and principles to help the paramedic provide legal and ethical healthcare.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. Can a paramedic treat a patient without their verbal consent?
2. What is a duty of care?
3. What does the term 'patient's best interest' mean?
4. What are the four main ethical principles?

Activity 8.1

Answer the following questions relating to consent to treatment:

1. Which two kinds of consent are most likely to affect paramedic practice?
2. How does a patient imply their consent to the paramedic?
3. What information do patients require to be able to make informed consent?

Activity 8.2

Paramedics are routinely called to families of relatives who have been issued with 'do not attempt resuscitation' (DNAR) orders. Using the ethical principles of beneficence, nonmaleficence, and justice, discuss the concept of withholding resuscitative measures from a person.

Glossary

Autonomy:	The right of self-determination or the right to make one's own choices. The autonomous individual must be competent to make decisions affecting their life and welfare.
Battery:	When a patient is touched by a health professional without prior consent being given.
Beneficence:	A moral obligation to act in the benefit of others. The principle of beneficence requires us to enable others by preventing or limiting harm.
Best interest:	Doing what is right for the patient rather than for any other reason.
Bolam principle:	A test used to recognise if a paramedic or medical professional has breached a duty of care.
Competence:	Used to describe a situation of capability and capacity. For example, the patient has the competence to make their own decision to treatment.
Implied consent:	Taking physical gestures and body language as an indication of agreement; for example, a patient's extended arm when a paramedic approaches with a blood pressure cuff.
Informed consent:	Consent that is based on reliable and fully understood information.
Nonmaleficence:	The moral obligation to 'do no harm', often balanced with the principle of beneficence.

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9

Leadership and mentorship in paramedic practice

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Contents

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Learning outcomes

On completion of this chapter the reader will be able to:

- Recognise how all roles in paramedic practice involve aspects of mentorship and leadership in terms of influencing and engaging others.
- Identify leadership behaviours.
- Recognise the value of leadership theory in enhancing practice for the prehospital care professional.
- Discuss leadership styles and approaches.
- Apply theories and principles of leadership theory to develop practice at an individual level, when supervising others and when working with teams.

Case study

You arrive at work one morning to be greeted by the team leader, who asks if he can undertake your personal development review (PDR) with you. You were not expecting this and did not make any preparations for it. You have found on more than one occasion that your team leader tends to act in spontaneous ways and does not always communicate with you or brief you as fully as you would like. You are conscious that you have quite different ways of working and approaching working relationships within your team and the wider setting. You would like to raise this and you would also like to reschedule the PDR so that you can prepare adequately, but are not quite sure how to broach the subject.

Introduction

At first glance, the place of mentorship and leadership in paramedic practice might seem to be a pressing issue for the few, not the many. Traditionally it is the individuals at the top of an organisation who must concern themselves with the classic leadership questions of 'Where are we going? How will we get there?' and who on a daily basis must take on the serious and challenging role of engaging and motivating others. Likewise, it might initially appear that only those paramedics with specialist roles relating to leadership have a responsibility for the development of others. However, a closer look at the workings of prehospital emergency care quickly reveals that leadership and the development of others are important and ever-present parts of working life for all paramedics, affecting every aspect of their practice (Blaber and Harris 2014). From day one as a professional in this field, demands are made on each individual's capacity for positively engaging and influencing others – the key components of the leadership process. Indeed, it might be suggested that the effective paramedic learns first to develop leadership knowledge and skills at the level of *self* (learning how to self-motivate, self-regulate, and self-monitor performance); then learns how to extend those skills in a supervisory or mentoring capacity in relation to *others* (perhaps a junior paramedic or less qualified colleague); then extends those skills to working with *teams* (both within healthcare and across other emergency services); before finally, in some cases, developing their contribution still further at the level of the *organisation*, perhaps by shaping the process or future direction of the service.

Figure 9.1 Leadership skills and aptitudes start at the level of the individual and inform all of our working relationships.

At a practical and personal level, then, there is clearly much to be gained by thinking about mentorship and leadership across the span of a career in prehospital emergency care. Whether or not you currently identify yourself as a 'leader', this chapter aims to show how leadership as a concept provides a valuable way into thinking logically and coherently about some central workplace questions and challenges you will face, such as:

- How do I manage myself and maximise my own performance and professional contribution?
- How effectively do I work with other individuals, especially where I hold a mentoring or supervisory role relative to that person?
- How effectively do I work with teams and, where I encounter challenge and conflict in team work, what models and processes do I draw upon in order to find a way forward?
- Finally, how do I see my own paramedic practice fitting into the wider picture of my organisation and how does my contribution help to shape that wider picture?

This chapter will consider the role of leadership in paramedic practice at these respective levels of working, starting at the level of the individual and moving outwards through the different spheres of influence we exert when working with others. After a brief review of the most influential and current leadership theories, the chapter will consider how we develop leadership skills and knowledge at the level of the individual, how we deploy them in relation to others, particularly those we may be mentoring or supervising, and how we use and develop those skills when working in teams (Figure 9.1).

Theories of leadership: a brief overview

Leadership as a concept has become increasingly prominent in the health and social care professions over the last 25 years. A scholarly literature has grown up around the topic, and the different professional bodies and councils supporting health and social care professionals have dedicated a good deal of resource to leadership development initiatives designed to support and nurture the leadership potential of the workforce (Barr and Dowding 2015; Gopee and Galloway 2017). As with all theories applied to professional practice, leadership theories are most helpful when used pragmatically to provide a framework for looking constructively at a situation, articulating something that was previously only implicit, or identifying a way forward when a challenge, dilemma, or problem has arisen. With this practical orientation in mind, let us briefly review some of the key leadership styles and approaches, as defined in the current scholarship. The discussion is organised in three key sections: definitions, leaders and leadership behaviours, and leadership styles and approaches.

Definitions of leadership

Most discussions of leadership begin with definition – what does this much-used term actually mean? It is helpful to follow Roger Gill (2011) and reflect on the etymology or root of the word. In its Anglo-Saxon origins, the verb to lead (in Old English *lædere*) means literally 'to show the way'. This is a helpful starting point, as it conveys how leadership in all of its forms is intrinsically related to the idea of setting direction, taking oneself and others on a journey, and picking out and identifying the destination to work towards. This destination need not be a grand organisational goal; it may simply be the effective resolution of an individual case of care, or the successful meeting of a challenge facing a paramedic unit or wider team. Direction-setting and showing the way take place in practice on a daily basis.

Many definitions of leadership also take as their starting point the distinction between **leadership** on the one hand and **management** on the other. Although these are clearly closely related and sometimes overlapping processes, leadership tends to be associated with vision, setting the direction of travel, and inciting and motivating others to follow, and management tends to involve more the instrumental and practical aspects of fulfilling that vision and undertaking that journey step by step. So whilst leadership is concerned with purpose, vision, and winning hearts and minds, management is concerned with the more day-to-day considerations of planning, monitoring, and controlling resources. Whether a truly meaningful distinction between the two concepts can indeed be arrived at in only a few words without simplification is a moot point – see, for example, Bennis and Nanus's (1985, p. 21) famously pithy 'Managers are people who do things right; leaders are people who do the right thing' – but drawing some distinction certainly helps to clarify and focus our attention on what leadership (and particularly good or effective leadership) involves.

From leaders to leadership behaviours

Leadership theories, as set out in scholarly texts and 'how to' practitioner guides, are diverse, and a brief summary risks simplification. However, it would be broadly true to say that discussions of leadership over the last four decades have gradually, but consistently, shifted from discussing leadership in terms of individual *leaders* to considering the topic in relation to leadership *behaviours*. Earlier discussions of leadership would sometimes tend (as entry-level discussions of the topic today can still do) towards trying to define leadership in terms of great examples of leaders, such as John F. Kennedy, Nelson Mandela, or, perhaps more controversially, Margaret Thatcher. Starting from these individual examples, these explorations of leadership would then work inductively to try to establish the characteristics of a good leader – the assumption being that if we can work out what these great leaders have in common, we can seek to imitate it. There are obvious limitations to such an approach. First, there is the issue of transferability: is it really the case that an effective leadership quality shown by John F. Kennedy in the unique political climate of the early 1960s would be transferable in another context to another individual at another time? Second, to start with examples of great leaders and then look for underlying principles of great leadership can be more challenging when it comes to less tangible and fluid leadership qualities involving personality and style. For example, the eminent leaders mentioned were all much noted for their 'charisma' or 'charm' – a personal quality that is not generally viewed as something that can be imitated, developed, or adopted if it is not already there. This method of deriving leadership principles from notable examples, then, can lead to the perpetuation of the view that great leaders are 'born not made', arriving in the world with in-built traits that naturally set them apart from their fellow men and women. Whilst there may be something to be said for this view, such a **trait theory of leadership** is obviously limited in terms of the practical lessons it can offer to others in terms of their own leadership development.

Practice insight

Next time you are on station or on standby, discuss the subject of leadership with your crew mate or colleagues. Ask them what they think the differences between leadership and management are. Also ask them what they think are the essential characteristics of a leader.

More recently, it has generally been recognised as more helpful to move away from focusing on individual leaders and instead describe leadership *behaviours*. Crucially, although 'traits' tend to be innate and cannot be adopted at will, behaviours very much can be, thus making behaviourist accounts of effective leadership of much more practical value to those who wish to develop their own leadership effectiveness. It is open to us as current or aspiring leaders to develop particular styles and approaches that are in tune with our personalities and values, but also with a track record of effectiveness. It is now time to consider what some of those styles and approaches might involve.

Leadership styles and approaches

Each leader makes an individual contribution and works in their own particular way, but it is nevertheless true that trends and patterns can be perceived in the way in which different leaders typically go about the task of engaging and motivating others. Some of the most distinctive and familiar of these approaches are set out in Table 9.1. It is important to remember that each is at some level a caricature: very rarely will one leader exhibit only one leadership style or approach; more commonly each leader will span a whole range of styles and approaches.

These are the dominant styles and approaches identified in the literature, although it is worth noting that there are many others that might be mentioned and new models are being advanced all the time as a result of research into management education and organisational development. Bass et al. (1975), for example, have suggested *directive*, *consultative*, *participative*, *negotiative*, and *delegative* as the dominant styles, whilst more recently

Table 9.1 Different styles of leadership.

Autocratic leadership	A leader adopting an autocratic approach would make unilateral decisions without team consultation or input.
Democratic leadership	A leader adopting this approach would be highly consultative and would seek guidance, input, and sometimes formal voting on leadership decisions and actions.
Laissez-faire leadership	A leader adopting this approach is 'hands off' in dealings with colleagues; they are trusted to get on with the task in hand and are left room for individual judgement and for making mistakes.
Distributed leadership	This model develops further the idea of democratic leadership: in this co-leadership model decision-making and responsibility are shared.

the Hay Group's (2008) study into the styles displayed by nurses distinguished between *directive*, *visionary*, *affiliative*, *participative*, *pacesetting*, and *coaching* styles of leadership.

As already suggested, it is unlikely that any one individual will stick to a single style or approach all of the time. Instead, there is good evidence that the most effective leaders are able to adapt their style or approach according to the specific needs of each follower and to the *situation* or *contingency* at hand. **Situational leadership** (Hersey and Blanchard 1969, 1993) and contingency theory (Fiedler 1969) are thus important (and probably more realistic) theories of how effective leadership is flexible and adaptable according to context.

Reflection point: mind that label!

Whilst it may sometimes be helpful to label different leadership behaviours and approaches to discuss practice, it is crucial that we remain critically aware and do not use labels in an unexamined or casual manner. It would be a mistake, for example, to label an individual leader 'a transactional leader' based on only one or two interactions or decisions. Likewise, it would be simplistic to suggest 'I am a transformational leader' based on only a snapshot of practice; the truth is always more complex and fluid than this.

Indeed, it is far better to avoid labelling any individual an 'X' or 'Y' kind of leader (this is inevitably a simplistic approach). Instead, think in terms of a continuum between different leadership behaviours and approaches and consider where *individual leadership decisions or actions* fall on that continuum.

Finally, a theory that merits discussion at greater length (and which currently exerts by far the greatest influence in the health and social care professions) is **transformational leadership**. First developed by James McGregor Burns in the late 1970s and elaborated in the next two decades by Bass (Burns 1978; Bass 2006), transformational leadership is characterised as a way of leading that involves winning hearts as well as minds in order to gain optimal results and bring the best out of oneself and others. Transformational leadership becomes a more tangible concept when it is contrasted with what Burns and followers call transactional leadership – a model of leadership more akin to management, where leaders and followers engage with each other on a more pragmatic or instrumental basis of incentives and rewards for good performance or sanctions for poor performance. In transactional leadership engagement, expectations are clear and results are predictable; it is a mechanistic model of leader–follower engagement whereby we 'get out what we put in'. By contrast, in transformational leadership, the leader–follower engagement is deeper and focuses not just on the task to be done, but on the person involved in achieving it. In a transformational leadership encounter, there is interest in what the follower might get out of doing a task, how they might learn and develop whilst doing it, and how they might want to use their own initiative and skill set in accomplishing the task. In this model, then, we get out more than we put in: there are exponential gains for all involved. This more humanist model of leadership involves a more coaching orientation to working with others and has been shown to bring positive results to an organisation in terms of developing more motivated, engaged, and confident employees. Crucially, though, all the proponents of transformational leadership are careful to point out that this leadership approach is intrinsically linked to transactional leadership; the two are not opposites, but complementary. There needs to be a transactional basis to much of our working lives and professional practice if there is to be a firm and predictable foundation for more transformational, intuitive, and creative ways of working.

Leadership at the individual level

What does all this theory mean for us at a personal level? The process by which we learn to regulate ourselves as professionals, monitor our own performance, and find ways to improve that performance is itself a leadership process. Thinking about our individual development in relation to the concept of leadership can be a helpful way to gain self-knowledge and to learn more about not only how we perceive ourselves, but also how we are perceived by others.

Learning activity: my leadership style and approach

Review the different leadership styles identified in the previous section. Whether you are currently in a leadership role or aspiring to be, which of the different styles and approaches seems most descriptive of your practice?

There are also opportunities to complete leadership questionnaires or inventories on the internet. The NHS Leadership Academy (2013) has developed a self-assessment tool that is free to use and can offer an interesting snapshot of your approach to engaging and working with others: www.leadershipacademy.nhs.uk/discover/leadership-framework-self-assessment-tool.

Learning more about the different leadership categories and approaches provides an opportunity to reflect on your leadership orientation and on the approach you might naturally take. It also helps to identify the styles or approaches that you use less habitually and that you might do well to build on and develop if you are to be effective as a leader when working with others.

Practice insight

In order to keep up to date with service developments, including new roles that emerge over time, be sure to make sure you read all e-mails and in-house communications placed on noticeboards sent from the service. Engage in discussions regarding developments with paramedic colleagues, and be sure to attend as many ambulance service study days and events as possible. This includes events held by the professional body. Go one step further and become a student ambassador with the professional body and be active in raising standards.

Leadership and the mentoring or supervisory role

You do not need to command a big team to be a leader; there is a leadership role awaiting qualified paramedics who undertake a mentoring or supervision role for a junior colleague (Armitage 2010).

Whilst you may initially think of leadership as involving setting direction and encouraging motivation amongst large numbers of people (as a CEO or politician might), there is no less a leadership element in helping to oversee the learning and development of a mentee. This is an important context in paramedic practice, since the typical configuration of a paramedic unit despatched to an emergency situation will usually comprise one qualified paramedic and one less qualified companion – usually an emergency care assistant (ECA) or emergency medical technician (EMT), who will quite probably be an aspiring paramedic themselves. The qualified paramedic in this unit clearly has an important leadership and mentorship function in terms of role modelling appropriate behaviours, establishing the optimum working environment for the team, and helping to identify and support the development needs of the ECA (Figure 9.2).

Figure 9.2 Paramedics also have opportunities to show educational leadership in supporting the learning and development of emergency care assistants and other practitioners in prehospital care.

Effective leadership of someone's learning and development also benefits from acquaintance with a certain amount of educational theory, particularly related to notions of style and preference in learning (Coffield et al. 2004) and the influential idea of multiple intelligences (Gardner 1983). You do not need to know these theories in detail; suffice it to say that there is a strong case (albeit not an absolutely proven one) that individuals may adopt preferred learning styles where they take a visual, auditory, or kinaesthetic (active) emphasis in the way they engage with new ideas and with the world around them. Likewise, **multiple intelligences theory** suggests that individuals may have particular strengths in processing information or creating new ideas by means of 'intelligences' other than the traditional kind of intelligence we are used to measuring with an IQ test. The argument runs that in addition to our IQ or intelligence quotient, we may also exhibit musical–rhythmic, visual–spatial, verbal–linguistic, logical–mathematical, bodily–kinaesthetic, interpersonal, **intrapersonal**, and naturalistic intelligences (Gardner 1983). Again, effective leadership in a mentoring or supervisory role need not involve engaging completely with this theory or trying to map one's mentee onto a particular style. Instead, it is good practice to use awareness of such theories to personalise the learning journey of the mentee as much as possible, and to be aware that sometimes good communication (key to all forms of leadership) is about making **multiple representations** of the same idea: conveying the same message in different ways, providing different examples, and expressing the idea in different registers or forms of words.

Reflection point

Think of a situation where an instructor or senior colleague was teaching you a principle or procedure and it took some time for them to grasp the point you were making. How far might learning styles theory or multiple intelligences theory account for the delay in 'the penny dropping'? Did the point finally hit home when a different representation of the same idea was made?

Leadership and team work

Collaborating with others and combining resources and efforts for a common purpose can be one of the greatest rewards of working in the health and social care field, but it can also provide many of the biggest challenges. Whilst on the one hand effective team work has been shown to provide enhanced outcomes for teams, patients, clients, and organisations, the problems arising from ineffective, or dysfunctional, team work can create disproportionate stresses, tensions, and inefficiencies in the workplace (Mickan 2005; Lencioni 2002). Paramedics need to work effectively as part of a number of teams comprising other ambulance service personnel, including line managers and control room staff, other healthcare professionals (including doctors), and members of other emergency services – typically the police and the fire service. In doing so, it can be helpful to know a little about the differences of personality, working style, and team role preference that can sometimes lead to conflict in a team. An influential thinker in this area is Meredith Belbin (2003), whose work on **team roles** is widely consulted and well respected. Belbin's work suggests that there are a number of pronounced and distinctive roles that an individual might adopt when working in a team, outlined in Table 9.2.

As with the previous discussion of leadership approaches and styles, it is likewise important to avoid using Belbin's team roles as absolute labels for oneself or members of one's team. The different roles are helpful only as a frame of reference, to be used judiciously when analysing a team, and in particular looking at what works well or what might be going wrong within a group. No well-rounded professional could be described as only a 'completer-finisher' or solely a 'plant'; each of us occupies a number of roles according to the team we are working in or the task we are dealing with. Thus for Belbin's team roles to be helpful to us, we need to apply them sparingly and with the knowledge that they will shift and overlap when applied to any given group of people.

Table 9.2 Belbin's team roles.

Plant	The team member most associated with creativity, with 'blue skies' thinking, and with identifying innovative solutions to tasks and challenges.
Monitor-evaluator	The team member most consistently focused on monitoring team performance and measuring this against desired goals and outcomes.
Co-ordinator	The team member most comfortable with taking a directive role and marshalling the other team members once the team goals and direction have been settled upon.
Resource investigator	The team member best placed to help locate and draw upon the resources required for the team to complete the task.
Implementer	The team member best equipped or most motivated to see through the different phases of the team's tasks.
Teamworker	Perhaps the most flexible and adaptable member of the team, who will adapt readily to others and work collaboratively without any overriding preference or particular model of working.
Shaper	The team member most likely to want to shape or influence an existing idea and to attempt to shape how the team achieves its goal.
Completer-finisher	The team member most focused on seeing all constituent steps of a task through to completion.
Specialist	Added as a development of Belbin's original research, the specialist is the member of a team most likely to contribute key or specialised knowledge relevant to a given task.

It is also helpful to remember that the typical experience of the health and social care professional is to work not only with an immediate team whose membership is regular and predictable, but also with a wider, more distributed team of other health and social care professionals, the composition of which will regularly change, increasing the likelihood that new challenges to effective working will arise as new personalities come into a team.

Activity

Think back to an incident where conflict arose in a team in which you have worked. If you were to think about the team members in terms of Belbin's team roles, was there a clear distribution of roles between members? Might any conflicts within the team be explained in terms of a clash between roles? Or by the fact that there were too many individuals vying for the same role? How might airing the problem and using the language of team roles have helped to resolve the situation and move things forward?

Ongoing leadership development

In the course of your career in paramedic practice, you may well wish to progress into a specialist paramedic role with particular responsibility for mentoring, supervision, or leadership; the prevalence of roles of this kind is increasing with the development of the profession (Armitage 2010; College of Paramedics 2016; Paramedics Australasia 2016). Regardless of whether you adopt a specialist role, there is value for all paramedics in undertaking ongoing leadership development and in accessing professional development related to team working, personal resilience and well-being, and personal development. Development opportunities of this kind will be extended to you throughout the course of your career and it is recommended that you embrace these with a reflective, enquiring, and constructive approach.

Conclusion

In this chapter we have explored the value of leadership theory as a framework for thinking about how a paramedic perceives their own professional role, their interactions with those they are supervising or mentoring, and their collaborations with wider teams of professionals. We have seen how leadership influence and initiative can be shown at all organisational levels, not only by those holding the explicit leadership roles in a hierarchical structure. We have also seen how a good working knowledge of leadership theory can help the prehospital professional to map their own learning and development across the span of their career. Paramedic practice involves daily situations where decisions must be made in the face of challenging and changing circumstances. Engaging with leadership concepts and theories helps our readiness and resilience in the face of these challenges.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. Define the difference between leadership and management.
2. What did the word 'leader' originally mean?
3. What does 'situational' or 'contingency' leadership involve?
4. Identify three distinct leadership styles.

Activity 9.1

Consider the many different leader–follower engagements that make up paramedic practice. How often and in what contexts do junior colleagues and senior colleagues meet? Who sets direction and gives instructions, and in what style of engagement do they do this? How much scope is there for adopting a 'transformational' approach to some of these engagements (involving colleagues in decision-making, communicating a vision, helping them to identify a stake in the goals to be achieved, helping them to learn and grow as a result of undertaking the task)? What examples can you think of where a transformational approach would be inappropriate and a transactional approach is absolutely required?

Activity 9.2

Look back at the case study at the start of this chapter. How might discussion of team roles, multiple intelligences, or leadership styles help you to broach and address the difficult situation described?

Glossary

Intrapersonal:	Existing or occurring within the self (as opposed to interpersonal, which involves the self and others).
Leadership:	The process of motivating, engaging, influencing, and persuading others towards the achievement of a common goal.
Management:	The process of planning, budgeting, monitoring, and controlling organisational activities and resources.
Multiple intelligences theory:	The notion that in addition to a traditional 'intelligence' measured by IQ, there are significantly different ways in which we process, experience, and understand the world, encompassing musical–rhythmic, visual–spatial, verbal–linguistic, logical–mathematical, bodily–kinaesthetic, interpersonal, intrapersonal, and naturalistic intelligences.
Multiple representations:	Conveying the same idea in different ways, such as suggesting the circulatory system is like a series of connecting rivers and streams, or like a car engine, or like a road network of A roads and B roads.
Situational leadership:	Adapting one's leadership style or approach according to the needs of each follower and the specific situation at hand.
Team roles:	The behaviours we typically adopt and the roles we typically fulfil when working in a team.

Trait theory of leadership: The attempt to derive leadership principles from examples of eminent leaders in history – and thus a theory that implies that leaders are 'born not made'.

Transformational leadership: A widely espoused style of leadership that involves winning the hearts and minds of followers and engages with colleagues on a person-focused rather than task-focused level.

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10

Safeguarding adults at risk of abuse and neglect

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Contents

Fundamentals of Paramedic Practice: A Systems Approach, Second Edition. Edited by Sam Willis and Roger Dalrymple.

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Learning otutcomes

On completion of this chapter the reader will be able to:

- Define a person who meets the criteria for safeguarding duties to apply.
- Describe the main types of abuse and their potential signs.
- Describe the practice principles of safeguarding.
- Identify the relevant legislation and policy related to current paramedic practice.
- Identify the key responsibilities of the paramedic when responding to a safeguarding concern.

Case study

An ambulance is called to the home of a 45-year-old man with learning disabilities. The man meets the ambulance car in the street. He has obvious injuries to his face and appears shaken. His friend informs the team that the man has had too much to drink and fell forwards in the toilet whilst pulling up his trousers. It is clear that alcohol has been consumed and loud music is heard coming from his flat. Laughter can be heard from the open window of his flat, indicating other people present at the property. The injuries do not require stitching and the man reports that he did not lose consciousness. During the consultation you notice that he allows his friend to answer all the questions that you ask and appears withdrawn and nervous. You leave feeling sceptical about the 'friends' and the explanation for the injury. You complete a safeguarding adults referral and send it to the local authority.

Introduction

Adult safeguarding is the term that describes the function of protecting adults from **abuse** or neglect. This is an important shared priority of many public services and a key responsibility of local authorities (Care Act 2014). Health services have a duty to safeguard all patients, but also to provide additional measures for patients who are less able to protect themselves from harm or abuse (Department of Health 2011a), such as the man in the example above.

As frontline health service practitioners, paramedics play an increasingly important role in recognising and reporting abuse and neglect. Ambulance personnel deal daily with a wide range of urgent and unscheduled medical, traumatic, health, and social care (including mental health care) conditions (Stone 2014).

This chapter will therefore enable the student paramedic to define and recognise different types of abuse. It will introduce the principles of safeguarding and will outline key roles and responsibilities.

Legislation and policy

The 2014 World Health Organization (WHO) global status report on violence prevention highlights data from 133 countries, covering 6.1 billion people and representing 88% of the world's population. It found that whilst many countries have laws in place to prevent violence, only half of the 133 countries reported that the laws had been fully enforced. Hundreds of thousands of people internationally have received emergency treatment as a result of violence since 2000, and it is therefore imperative that health and social care professionals familiarise themselves with the relevant laws and policies for their own working areas.

In the UK, the Department of Health and Home Office (2000) guidance, 'No Secrets', was central in establishing a framework for adult safeguarding that improved interagency working. It arose in response to several incidents of serious abuse and provided a structure to enable agencies to be alert to signs of abuse taking place, and to respond appropriately (Faulkner and Sweeney 2011). The Care Act (2014) subsumed this and sets out the first clear legal framework for how local authorities and other parts of the system should protect people at risk of abuse or neglect. This aligned adult safeguarding responsibilities in law with those applied to children. It includes a requirement for local authorities to establish a safeguarding adults board (SAB) made up of representatives of key agencies to help and protect adults in its area. Local authorities also take the lead in safeguarding children and host safeguarding children boards (SCB). More information regarding the statutory framework relating to children can be found in HM Government (2015a) statutory guidance 'Working together to safeguard children'.

Under Section 42 of the Act, a local authority must undertake a safeguarding enquiry where there is reasonable cause to suspect that an adult in its area has needs for care and support (whether or not the authority is meeting any of those needs); is experiencing, or is at risk of, abuse or neglect; and as a result of those needs is unable to protect themselves against the abuse or neglect or the risk of it.

During 2015–2016 there were 102 970 individuals in the UK with enquiries under Section 42. Of these enquiries, 60% were for females and 63% of individuals at risk were aged 65 or over. The most common type of abuse was neglect and acts of omission, followed by physical abuse. The location of risk was most frequently the home of the adult at risk (43% of enquiries) or a care home (36%) (NHS Digital 2016).

A serious case review (SCR) or safeguarding adults review (SAR) takes place after an individual dies or is seriously injured and abuse or neglect is thought to be involved. It is a required process (Care Act 2014) for all partner agencies to identify the lessons that can help prevent similar incidents from happening in the future. A regular finding of these relates to professionals' own confidence and competence in recognising and responding to abuse and neglect (Institute of Public Care 2013).

Due to the frontline nature of their role, paramedics may be the first to become aware that people are experiencing difficulties. The work they do is challenging, emotional, at times dangerous, and often highly rewarding (Stone 2014). The ambulance service is in a unique position to note predisposing factors in the home and the history of events in each case (South Central Ambulance Service NHS Foundation Trust 2012). In being alert to and informed about presenting signs and complex patterns in potential safeguarding situations, such as cluster calls to certain addresses, emergency services may save many lives outside of those minority calls that require admission to hospital due to life-threatening circumstances (Department of Health 2005).

Responsibilities for safeguarding are enshrined in legislation (NHS England 2015). Where abuse has taken place, the potential use of relevant legislation is decided upon in consultation with police and legal services (Association of Directors of Social Services 2005). Due to the complexity and variation between countries, it is outside the scope of this chapter to provide a detailed legal precis. However, several laws may be invoked depending on the type of abuse experienced.

Some abuse constitutes a criminal or civil offence (e.g. sexual abuse – Sexual Offences Act 2003). Involvement of the police is indicated in incidents of suspected theft, common assault, and assault causing actual bodily harm. It is the responsibility of the police to lead investigations where criminal offences are suspected by preserving and gathering evidence at the earliest opportunity. They have a duty under the Code of Practice for Victims of Crime (Ministry of Justice 2015) to assess the immediate needs of victims and consider the long-term requirement to enable that person to be appropriately supported through the criminal justice system.

Mental **capacity** is a key legal concept in responding to safeguarding adults concerns. The Mental Capacity Act (2005) provides the statutory framework that underpins issues relating to capacity, and protects the rights of people where capacity may be in question. It is therefore integral to safeguarding adults (Department of Health 2011b). However, adults with capacity have the right to make decisions, even if those decisions are perceived as unwise. They may make decisions that put their right to privacy, autonomy, and family life ahead of their right to live and to be free from inhumane or degrading treatment (Skills for Health 2016). In these situations, it is imperative that any safeguarding responses follow the practice principles of 'Making Safeguarding Personal' outlined in Lawson (2017), which will be explored later in the chapter.

Whilst maintaining confidentiality is paramount, the Public Interest Disclosure Act (1998) sets out the parameters for sharing information when it is in the public interest to do so, such as whistleblowing about abuse and or neglect. An 'overriding public interest' refers to a situation where it is essential to share information in order to prevent a crime or to protect others from harm. Similarly, 'vital interest' is a term used in the Data Protection Act (1998) to permit sharing of information where it is critical to prevent **significant harm** or distress, or in life-threatening situations (SCIE 2015). The Caldicott principles (Department of Health and Caldicott Committee 1997) inform staff very clearly about information-sharing standards. In SCRs and SARs, another persistent theme is pieces of information being held by different agencies on varying recording systems, which, had they been shared and integrated, would have shown a clear pattern of neglect and/or abuse and might have prevented harm. It is extremely important that we understand the line between protecting confidentiality and preventing harm. It is always better to share concerns responsibly within the parameters of good, ethical practice.

Types of abuse and neglect

Sometimes it can be difficult to discern whether something that causes concern constitutes actual abuse or neglect. This is compounded by the lack of a legal definition of adult abuse. The most widely accepted definition came from 'No Secrets' (Department of Health and Home Office 2000):

> Abuse is a violation of an individual's human and civil rights by any other person (s) …. Abuse may consist of a single act or repeated acts … it may be physical, verbal, or psychological … It may be an act of neglect or an omission to act. … Abuse can occur in any relationship and may result in significant harm to, or exploitation of, the person subjected to it. (Department of Health and Home Office 2000, p. 9)

Abuse is complex, due to many interrelated factors. Often, due to the dynamics of the victim–**perpetrator** relationship, there is more than one type of abuse happening at once. It is thus useful to subdivide abuse into the categories shown in Table 10.1.

Practice insight

Whenever you suspect that the patient has experienced or is experiencing any form of abuse, be confident enough to report it through the channels set up by the ambulance service for which you work. It is better to report abuse and neglect and be wrong, than not to report it and for harm to occur.

Recognising abuse and neglect

Internationally, violence of all types is strongly associated with social determinants such as weak governance; poor rule of law; cultural, social, and gender norms; unemployment; income and gender inequality; rapid social change; and limited educational opportunities. Cross-cutting risk factors such as ease of access to firearms and other weapons and excessive alcohol use are also strongly associated with multiple types of violence (WHO 2014).

Abuse can be intentional or unintentional, can take place anywhere, and the perpetrator could be anyone. However, more often than not it is someone known to the person, the most likely perpetrator(s) being paid staff or a family member (Health and Social Care Information Centre 2012).

Table 10.1 Types and examples of abuse.

Type of abuse	Examples
Physical abuse	Pushing/pulling, hitting, kicking, biting, burning. Including misuse/ overuse of medication, restraint, inappropriate sanctions.
Sexual abuse and exploitation	(Direct or indirect) rape and sexual assault or sexual acts to which the adult at risk has not consented, or could not consent, or was pressured into consenting. This includes use of the internet, or visual/photographic means.
Psychological abuse (including emotional abuse)	Threats of harm or abandonment, deprivation of contact, humiliation, blaming, controlling, intimidation, coercion, harassment, verbal abuse, isolation, or withdrawal from services or supportive networks.
Financial or material abuse	Theft, fraud, exploitation, pressure in connection with wills, property, inheritance, or financial transactions, or the misuse or misappropriation of property, possessions, or benefits, or internet scamming.
Neglect and acts of omission	Ignoring medical or physical care needs, failure to provide access to appropriate health, social care, or educational services, or withholding the necessities of life, such as medication, adequate nutrition, and heating.
Discriminatory abuse	Discrimination on the grounds of race, gender and gender identity, disability, sexual orientation, religion, and other forms of harassment, slurs, or similar treatment. Such discriminatory abuse can sometimes constitute a crime, termed a 'hate crime', which can be committed against a person or property.
Organisational (and professional) abuse	The mistreatment of people brought about by poor or inadequate care or support, or systematic poor practice that affects the whole care setting. It occurs when the individual's wishes and needs are sacrificed for the smooth running of a group, service, or organisation and can include physical, chemical, or environmental restraint, and extreme rules and regulations about mealtimes or bedtimes.
Modern slavery	The recruitment, movement, harbouring, or receiving of children, women, or men through the use of force, coercion, abuse of vulnerability, deception, or other means for the purpose of exploitation. Individuals may be trafficked into, out of, or within a country, and they may be trafficked for a number of reasons, including sexual exploitation, forced labour, domestic servitude, and organ harvesting.
Domestic abuse	Can involve domestic violence, or the threat of violence, but often includes coercive and controlling behaviour designed to make a person subordinate and/or dependent by isolating them from sources of support, exploiting their resources and capacities for personal gain, depriving them of the means needed for independence, resistance, and escape, and regulating their everyday behaviour.
Self-neglect	Covers a wide range of behaviour, including neglecting to care for one's personal hygiene, health, or surroundings, and behaviour such as hoarding, which can result in loss of accommodation, failure to meet own basic nutritional and health needs, and neglect of the environment, encouraging insanitary conditions.
Radicalisation	Occurs when a person's thinking and behaviour become significantly different from how most members of the society and community view social issues and participate politically. Only small numbers of people become radicalised and they can be from a diverse range of ethnic, national, political, and religious groups.

Source: Adapted from Braye et al. (2018), Crown Prosecution Service (2017), Davies (2017), Department of Health and Home Office (2000), DH (2014), Harrow Council (2017), JRCALC (2016), The Care Act (2014).

Some situations which may predispose towards abuse are where there is a relationship of unequal power; the adult in need of safeguarding has a chronic, progressive, and disabling condition requiring help beyond the ability of the carer to cope; there is a family history of abuse, violent behaviour, alcoholism, substance misuse, or mental illness; the perpetrator is emotionally and socially isolated, has personal difficulties, or is vulnerable themselves; the carer has been forced to substantially change their lifestyle; there is a poor relationship between the service user and the carer, perhaps reflected in them disliking each other or having minimal or no communication or lack of personal insight; or there are poor living conditions or financial problems.

These factors could be helpful for the practitioner to consider in emergency situations where the injury and the history or context given are incongruent. The practitioner should always be alert to the possibility of abuse or neglect, particularly where the person is considered to have care and support needs. These situations can often involve substance use and present as a social need. However, diligence is required, as well as good interagency working between the police and ambulance services.

Physical abuse

A person being physically abused can present with any of these signs:

- Fractures.
- Blisters.
- Pinch marks.
- Bruising (*striped* bruising may indicate the imprint of fingers; *tramline* bruising indicates the use of belt or stick; a *partial circle* may indicate bite marks; and round *small* bruising may indicate the force of a grip).
- Burn marks (abusive burns are often deep, small and may show the outline of the object, whereas accidental burns will not, because reflexively the person would pull away; cigarette burns are round and deep and have a red flare around a flat brown crust).

There is a fuller list of potential signs in Table 10.2.

In questioning a patient about potential signs of abuse, a paramedic may encounter avoidant behaviours and suspicious explanations from both the patient and potentially the caregiver. The explanations given for injuries may not seem plausible or consistent with the situation or lifestyle of the patient; unexplained falls may be

Table 10.2 Signs of potential organisational abuse.

Signs in patients	Lack of homely environment, stark living conditions Lack of privacy for personal care areas Unexplained bruising/burns Unauthorised deprivation of liberty Repeated falls Pressure sores Weight loss Being left on a commode for long periods Repeated infections Recoiling from specific individuals
Signs in staff	No or little evidence of training programmes or professional development Staff seeing people using the service as a nuisance Rough handling Inappropriate administration of medication Seemingly uncaring attitude and cold detachment from the individual

provided as a reason for fractures and bruising. In cases of domestic abuse, it is clearly important that the paramedic protects their own safety and works in partnership with the police.

Domestic abuse also includes 'honour'-based violence, forced marriage, and female genital mutilation. The JRCALC supplementary guidelines (2016) give specific advice for paramedics supporting a person where domestic abuse is suspected. They recommend that the paramedic note the person's body language, as fear may prevent any reporting, particularly if the perpetrator is present. In this case, the paramedic should not let the suspected perpetrator know that they are suspicious. The paramedic must collect good information, yet not begin to interview the person at risk. Suspicions must be passed on, and the person must not be left at risk of further abuse or intimidation. A careful balance is needed between seeking critical information and leading or probing. Domestic abuse is a reportable crime and is complex in nature. It is recommended that professionals remind themselves particularly of signs of nonaccidental injury and do not accept explanations of caregivers without due curiosity and consideration. Professionals must develop 'professional uncertainty' and remain sceptical of the justifications or excuses they may hear (Lord Laming 2009) where a child or adult with care and support needs may not be able to advocate for themselves.

Sexual abuse

A person being sexually abused can present with a range of signs to which paramedics will need to be sensitive. Physical signs include genital irritation, soreness, or discharge; unusual difficulty walking; bruising to breasts, buttocks, upper thighs, or lower abdomen; and torn, stained, or bloody clothing. The presence of sexually transmitted diseases may also be a sign of such abuse. Behavioural signs include drug and alcohol abuse; self-harm; eating disorders; nightmares; fear at bath or bedtime; fear of medical help; the wearing of clothes that cover all parts of the body, regardless of the season; unnatural compliance; overt sexual language; and recoil from physical contact (Braye et al. 2018; Crown Prosecution Service 2017; Davies 2017; Department of Health and Home Office 2000; DoH 2014; Care Act 2014; JRCALC 2016; Harrow Council 2017).

Attending to sexual assault situations requires the paramedic to provide sensitive physical and emotional care. In the case of assault, it is important to consider that forensic evidence may be required, and to ensure that the person feels in control and is not rushed. Interventions should be explained clearly and **consent** sought before proceeding. Dignity and privacy should be protected at all times. The JRCLAC (2017) supplementary guidelines for UK ambulance services give specific advice with regard to responding to an emergency situation involving sexual assault. Whilst causing a person to engage in any sexual activity without consent is an offence, these guidelines state that healthcare professionals are not required by law to report cases of sexual violence to police unless one of the following applies:

- The patient does not have capacity to consent.
- The patient is classed as 'vulnerable' (i.e. has care and support needs).
- There is a clear and present danger of immediate risk to the patient or public.

Financial abuse

In addition to physical and sexual abuse, financial and psychological abuse can also occur, including over wills and property. It is common for types of abuse to coexist. It is likely that some of the signs of psychological abuse may indicate that there are other abusive practices in operation. It is again important for the paramedic to collect any relevant information using cues in the environment and nonverbal communication to document and pass on any suspicions or concerns. This can also be considered within the parameters of the Modern Slavery Act (2015) and forced labour, as well as 'mate crime', where the gains for the perpetrator are often material.

Signs of financial abuse are generally not clinical in nature, but certain behaviours may be suggestive, such as an individual being unable to account for money being spent or being overprotective of their money and property. Likewise, the perpetrator of financial abuse (who may present as a friend or a carer) may be evasive when discussing finances or show a sense of ownership over another individual's property.

Organisational abuse

It can be particularly challenging for a healthcare practitioner to encounter and address abuse at an organisational level. With the vast majority of practitioners aiming to provide an excellent level of care in all their dealings with patients, it can cause significant cognitive dissonance to encounter systematic failings in care at an organisational level. Likewise, in the case of organisational abuse, it may be difficult for someone who does not have continued contact with a service to know how widespread or entrenched any troubling behaviours or practices are.

Studies of organisational abuse have found that in environments with deficient care, certain institutional factors tend to be in place, including:

- A closed, inward-looking culture and weak management at ward and locality level.
- A poor institutional environment.
- Low staffing levels.
- High use of temporary (bank) staff.
- Little staff development.
- Poor supervision.

Within such environments patients can become dehumanised, and an assumption can develop amongst staff that safeguarding is the responsibility of 'someone else', with the result that neglect and abuse can grow unrecognised or unchallenged (Department of Health 2011b).

The Francis Inquiry (2013) proposed an overhaul of the NHS following the investigation of deficient care in the Mid-Staffordshire General Hospital NHS trust, where patients were routinely neglected. The report made recommendations to ensure a culture of zero-harm and compassionate care is maintained. This involved the development of national safety and quality monitoring practices, including the Friends and Family Test, which is a tool to enhance understanding about where and how improvements could be made (Department of Health and NHS Midlands and East 2012).

Some settings, such as residential care homes, will already be subject to regulatory controls in legislation and relevant guidance (Leicestershire County Council 2010). Despite this, there has been growing attention in the media to organisational abuse with the popularity of 'undercover' television such as *Exposed*, which filmed abuse of people with learning disabilities by staff at Winterbourne View in 2011. The SCR (South Gloucestershire Safeguarding Adults Board 2012) revealed that there had been 78 accident and emergency attendances, which were mostly the result of epileptic seizures, injuries/accidents, and self-harm. It confirmed that clinical staff would not have been aware of patients' previous attendances, as there was no **alerting** system in place. It is therefore important to report any concerns so that links can be made between apparently isolated incidents where such monitoring systems do not exist.

Recognising neglect

Neglect and abuse arise in the absence of effective prevention and early warning systems (Department of Health 2011b). It is therefore important that the paramedic responds to any concerns that they may have. Failing to act on neglect and abusive relationships is collusion (see also the later discussion of whistleblowing). We have already considered many of the signs of neglect in the preceding sections, but other indicators include dehydration; social isolation; poor personal hygiene; deterioration of health; weight loss/poorly fitting clothing; the absence of necessities including food, water, and heat; and substance misuse.

In the UK, self-neglect has relatively recently been included in safeguarding under the Care Act (2014) due to its impact on health and well-being. Braye et al. (2018) reported that there are international variations in this area, with countries such as the USA considering it a core component of adult protection work. The Care Act (2014) defines self-neglect as wide-ranging, covering neglecting to care for one's personal hygiene, one's health, or one's surroundings, and hoarding.

Choice and capacity are central in responding due to the various factors leading to self-neglect, and so knowledge of the Mental Capacity Act (2005) is important. Braye et al. (2018) reviewed 32 SARs in order to understand some of the key themes. One of their findings was that professionals tended to disengage from the individual when following the principle of 'assumption of capacity' without fully and effectively assessing this. The Care Act (2014) does not carry any powers of intervention and it is good practice to work gently and carefully, with sensitivity and negotiation. However, there are times when interventions may need to be imposed (Braye et al. (2018):

- Where the Mental Health Act (1983) is used for compulsory admission for psychiatric treatment.
- Where environmental and public health legislation permits enforced clearance of materials or cleaning of infected and filthy premises.
- Where housing legislation permits eviction on grounds of breach of tenancy or interventions to make unsafe premises safe.
- Where anti-social behaviour legislation permits injunctions to prevent nuisance and annoyance to others.
- Where animal welfare legislation permits intervention to ensure that animals are appropriately treated.

Self Neglect Toolkits such as Deborah Barnett's (n.d.) can be useful in analysing the complex emotional and behavioural factors associated with self-neglect. Positive outcomes have occurred with strong interagency ownership and compassionate, relational approaches, which take time (Braye et al. 2018). The importance of reporting to and liaising with other agencies and SABs is essential in promoting multiagency working. This includes the fire service, which can provide advice and assistive equipment, and also consider risks to other properties nearby where hoarding presents an increased risk of fire.

Radicalisation and extremism

Radicalisation, the process by which a person comes to support terrorism and extremist ideologies associated with terrorist groups, is also increasingly recognised in discussions of abuse and neglect. The radicalisation process can be seen as similar to 'grooming', where a vulnerable person with low self-esteem, or a victim of bullying or discrimination, is targeted. Extremists might tell the person they can be part of something special, later brainwashing them into cutting themselves off from their friends and family, and potentially leading to violence, hate crimes, or financial exploitation. This can often happen online due to the isolation, and possible alienation, of the targeted person (HM Government 2015b). This is an international phenomenon and must be reported, which occurs in the UK via safeguarding channels as part of the PREVENT strategy for terrorism. Possible signs of radicalisation include:

- Unusual changes in behaviour, friendships, or actions and requests for assistance.
- Use of extremist or hate terms to exclude others or incite violence.
- Writing or artwork promoting violent extremist messages or images.
- Unwillingness or inability to discuss views.
- Increased secretiveness, especially around internet use.
- Self-isolation from family and friends.
- A sudden disrespectful attitude towards others.
- Talking as if from a script.
- Increased levels of anger.

In the UK, any healthcare staff member who is concerned that a patient is at risk of radicalisation or may have become radicalised must contact the Safeguarding Adults Team to raise this concern.

Practice principles of safeguarding

'Making safeguarding personal' (Lawson 2017) is now at the heart of UK safeguarding policy and practice in order to ensure that safeguarding:

- is person-led,
- is outcome-focused,
- engages the person and enhances involvement, choice, and control, and
- improves quality of life, well-being, and safety.

Where the paramedic decides that there are safeguarding concerns, it is important to work in partnership and keep in focus the person for whom the alert is raised. Table 10.3 highlights the principles of safeguarding and illustrates some questions that will ensure that any actions taken reflect best practice in this area.

It is of paramount importance that the person feels in control and informed, and is able to preserve a therapeutic relationship with the service that is supporting them following a safeguarding alert. An honest and transparent partnership will enable the best plan to be made with the person for their safety and independence.

Paramedic responsibilities

A paramedic is in a valuable position to identify possible abuse factors, and in some situations may hold a key piece of information that is essential to safeguarding (Whitnell cited in Blaber 2008). The Health and Care Professions Council (HCPC) standards of proficiency for paramedics (HCPC 2012) state that a paramedic should ensure that the well-being of service users is safeguarded at all times. It is therefore your responsibility to ensure that you understand and adhere to any policies within your area of practice, and seek out and attend any training that will help you to practise in the best interests of your patients. In addition, the standards state that a paramedic should be able to assess a situation, determine the nature and severity of a problem, and call upon the required knowledge and experience to deal with it. Inquiries into organisational abuse have repeatedly found that some staff held serious concerns, but were too frightened or unsure of how to raise them. Workers such as students can bring fresh insights to established institutions, but they can often feel too powerless or compromised by their position to challenge behaviour (Department of Health 2011b).

In 2013, Public Concern at Work set up a Commission to focus on workplace whistleblowing, which covers workers raising concerns about actual or potential wrongdoing within the organisations for which they work. For instance, an individual who works for an NHS organisation and contacts an external body like NHS England with a concern about that organisation and its services would be termed a whistleblower (NHS England 2015). Following the Francis Report (Francis 2013), most UK organisations have a whistleblowing policy to aid staff who may not feel able to raise concerns through the usual channels.

The Department of Health (2011b) states that the practitioner should know it is their responsibility to act and do the following:

- Be aware and receptive to signs of harm, neglect, and abuse.
- Look beyond first impressions.
- Help patients express what is happening to them.
- Recognise patterns of concern.
- Help patients to voice what they want to happen.

In the case of an unwell or injured child or adult, immediate necessary treatment should be given, and the person should be taken to the nearest accident and emergency department with a parent, guardian, or carer as escort where possible. Where nonaccidental injury is suspected, concerns must be reported to the senior doctor or nurse on duty, plus the local procedure for reporting and documenting concerns must be followed.

Table 10.3 Practice principles of safeguarding.

Principle	Description	Questions to ask to embed the principles in decision-making
Empowerment	*Presumption of person-led decisions and informed consent*. Where a person is not able to control the decision, they will still be included in decisions to the extent that they are able.	What does the person want? What rights need to be respected? Are there duties to act – are others at risk of harm?
Protection	*Support and representation for those in greatest need*. There is a positive obligation to take additional measures for patients who may be less able to protect themselves.	Does this person have care and support needs? What support do they need? Is capacity an issue? Does the patient need representation – advocate/independent mental capacity advocate, carer?
Prevention	*It is better to take action before harm occurs*. Prevention involves helping the person to reduce risks of harm and abuse that are unacceptable to them. Prevention also involves reducing risks of neglect and abuse occurring within health services.	What potential risks are inherent in the person's situation? What actions might be taken to minimise harm?
Proportionality	*Proportionate and least intrusive response appropriate to the risk presented*. Responses to harm and abuse should reflect the nature and seriousness of the concern.	Have risks been weighed up? Does the nature of the concern require referral through multiagency procedures? What is the least intrusive way of investigating? Are investigations proportionate to the risk? Is the protection plan the least restrictive way of managing risks?
Partnership	*Local solutions through services working with their communities*. Safeguarding adults will be most effective where citizens, services, and communities work collaboratively to prevent, identify, and respond to harm and abuse (Department of Health 2011b).	What is the view of others involved? How do multiagency procedures apply? Who should be involved in the investigation and protection plan?
Accountability	*Accountability and transparency in delivering safeguarding*. Working in partnerships also entails being open and transparent with partner agencies about how safeguarding responsibilities are being met.	Is the decision well made? Is it defensible? Does the patient know who is doing what, by when, and to what outcome? Is the investigation and protection plan justifiable? Is it clear what went wrong and what is being done to put it right?

In addition:

- All staff have a duty to ensure that adults at risk receive the protection of the law.
- All staff have a duty of care and must take professional/personal responsibility for responding to any concerns about possible abuse.

- All staff have a duty to share information appropriately, to act and to cooperate with colleagues across all agencies, consistent with safeguarding policies and the information-sharing agreements and protocols.
- Action taken must reflect a commitment to anti-discriminatory practice, to ensure that services are culturally appropriate and promote human rights.

The JRCALC (2016) UK Ambulance Service Clinical Practice Guidelines cover the full range of paramedic treatments available, and stipulate the response required, in both overall assessment and specific treatment options. Paramedics should follow these and local protocols when responding to potential abuse. Specific JRCALC (2017) supplementary guidelines with regard to safeguarding adults at risk are designed to ensure that all clinicians involved in a case of reported abuse are aware of possible outcomes and of any subsequent actions.

Practice insight

When carrying out the vehicle daily inspection (VDI) at the start of the shift, make sure that there are enough safeguarding adult and child reporting forms on board. This will minimise the likelihood that a case goes unreported due to an absence of appropriate paperwork.

Receivers of alerts and referrals should make a reasonable response to possible cases of abuse and neglect in the following ways:

- Ensure that any emergency action needed has been taken.
- Demonstrate empathy and remain calm.
- Listen to any information given directly by the adult concerned and record it carefully, using the person's own words, only clarifying the bare facts of the reported abuse or grounds for suspicion, and not asking leading questions (e.g. suggesting names of those who may have perpetrated abuse).
- Give information about the steps that will be taken, informing the person that feedback will be given about the result of the concerns raised and from whom.
- Give the person contact details so that they can report any further issues or ask questions.
- Do not discuss the incident with anyone without agreeing this with a line manager.
- Inform the person that their right to confidentiality will be respected as far as possible, unless further harm is indicated.
- Do not take any actions which might alert the alleged perpetrator.
- Record all factual evidence accurately and clearly in line with the organisation's requirements and policies.
- Do not prevent or dissuade another person from raising concerns or suspicions or presenting evidence.

When staff or volunteers who have received the alert have no access to a supervisor or line manager, including those working outside office hours, they will need to be aware of the circumstances under which the police should be called in an emergency. They will also need access to information on how to contact adult social services to report those incidents that do not constitute an emergency (Department of Health and Home Office 2000; Association of Directors of Social Services 2005).

Protection is the most important concern. However, the person must feel in control of decisions that are made, and the response must be proportionate. No decision should be taken alone, and the paramedic should seek support immediately, through the safeguarding framework.

Conclusion

Recognising and acting upon abuse and neglect constitute one of the many duties required of the paramedic. This chapter provides a comprehensive summary of the many forms of abuse and neglect which the paramedic may encounter.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. What is an adult at risk?
2. What is abuse?
3. What might the signs of abuse be?
4. What is the difference between risk management and safeguarding?
5. Why is 'Making safeguarding personal' important?

Activity 10.1

What might the complicating factors be when the victim of abuse knows the perpetrator?

Activity 10.2

Why do you think that people are harmed more by people who know them than by strangers? Why might such abuse be unreported?

Glossary

Abuse:	Violation of an individual's human and civil rights by any other person(s).
Alert:	A concern that an adult at risk is or may be a victim of abuse or neglect.
Capacity:	The ability to make a decision about a particular matter at the time the decision needs to be made.
Consent:	The voluntary and continuing permission of the person based on an ability to understand what they are consenting to.
Perpetrator:	The person who has carried out the abuse.
Significant harm:	Ill-treatment (including sexual abuse and forms of ill-treatment that are not physical), and the impairment of, or an avoidable deterioration in, physical or mental health, or physical, intellectual, emotional, social, or behavioural development.

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11

Essential toxicology for prehospital clinicians

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Contents

Fundamentals of Paramedic Practice: A Systems Approach, Second Edition. Edited by Sam Willis and Roger Dalrymple.

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Learning outcomes

On completion of this chapter the reader will be able to:

- Discuss the importance of toxicology in the prehospital setting.
- Identify key pharmacological processes involved in overdose.
- Understand how advanced life support may be modified in poisoned patients.
- Identify the eight most pertinent toxidromes to paramedic practice.
- Understand the importance of public health and prevention in toxicology.

Case study

A call is received to attend a corn farm 45 minutes from the closest hospital. On the farm a 74-year-old male has been found by his wife unconscious in the stock shed. On arrival the patient is slumped up against his tractor with a sandwich and a small unlabelled bottle of liquid spilled next to him. He has been incontinent of urine, has constricted pupils and has laboured, wet breath sounds. The paramedic takes a radial pulse and notes that it is weak but regular at 32 beats per minute.

Introduction

What is toxicology and why is it important?

It is of paramount importance for prehospital practitioners to have a thorough grasp of the identification and treatment of toxins. There are very few patient presentations that will not include toxicity as a differential diagnosis, and being able to confidently assess for toxic symptoms and respond appropriately will undoubtedly save lives. Consider that every presentation from altered level of consciousness to chest pain to polyuria could be attributable to toxins. Even cases that seem clear in aetiology such as road traffic crashes could be caused by toxins. Often it is these clouded circumstances that lead to a missed diagnosis and a later scramble to explain a deterioration and fix it. Further, toxins may render some treatments inert unless they are addressed first, which is especially pertinent to critically unwell patients. The paramedic who understands toxicology can pick up on the subtle and obvious cues that might indicate toxins.

Many common toxicology presentations have a significant direct impact on the patient in the short term, and all toxicology presentations put the patient at risk of significant lifelong disability or death due to the sequelae associated.

What makes a toxin?

It is important for paramedics to understand that any ingested, injected, inhaled, or otherwise absorbed substance that exceeds the human body's ability to adequately neutralise and excrete it is a toxic substance. It is not the substance itself that determines toxicity, but its dose in the context of the patient's ability to cope with it. Many substances traditionally regarded as toxic (think cyanide) are regarded as such due to their common availability in easily absorbed, toxic doses. The common culinary herb parsley contains considerable quantities of

Table 11.1 Paediatric high-risk substances.

One to two pills can kill	One sip can kill
Amphetamines Baclofen Calcium channel blockers Carbamazepine Chloroquine and hydroxychloroquine Clozapine Dextropropoxyphene Opioids Propranolol Sulphonylureas Theophylline Tricyclic antidepressants Venlafaxine	Organophosphates Paraquat Hydrocarbons Camphor Corrosives Naphthalene (moth balls) Strychnine

Source: Bar-Oz et al. (2004).

arsenic (Madeira et al. 2012). However, the doses typically ingested by people are far below the necessary amounts to create a toxic effect and the human body is able to adequately cope with its ingestion. In contrast, there are many substances automatically regarded as inert by most people that can become toxic if absorbed in enough quantity. Indeed, even water can become a toxic substance with a high enough dosage (Tilley and Cotant 2011). This concept is especially pertinent in the paediatric population, where just one pill or sip can be fatal (Table 11.1). The key learning point is that the beginning paramedic practitioner must be vigilant to the signs of toxicity and understand the relationship between dose and toxicity, so as to avoid complacency clouding sound clinical judgement based on substance alone.

Pharmacokinetics in toxicology

Whilst pharmacology has been explored thoroughly elsewhere in this text, it is useful to revisit the concepts of absorption, distribution, metabolism, and excretion in the context of toxicology. Each stage of this process can determine the toxicological risk, outcomes, and management of toxicology patients.

Absorption

Absorption describes the logistical path via which a substance enters the human body. Examples of paths common to the prehospital setting include inhalation (into the lungs), ingestion (into the gut), parenteral (into the circulatory system), and topical (onto skin and membrane). However, further routes exist such as intranasal (into the nose), intraocular (into the eye), and intrathecal (into the brain), amongst others. Each mode of absorption carries different implications for each substance. Topical administration typically involves slow absorption and a low percentage of the total substance applied finding the central circulation. However, if the effect of the substance is topical, this route may have devastating consequences. Ingested substances depend on factors such as stomach acidity, digestion, and gut perfusion as to the speed and quantity of the substance that will be absorbed. The risk inherent in ingested substances is the ongoing absorption of the substance as it is dissolved. This is particularly important for slow-release medications, which may continue to diffuse over hours to days. As such, anticipating the trajectory of a long duration of supportive care should influence the decision-making on appropriate facilities for transfer.

Distribution

The topic of distribution is concerned with the movement of chemicals through the bloodstream to their target receptors. Remember that chemicals only exert their effect when free in blood plasma and able to attach to their target, and when they are stored or bound to other molecules they are not activating their receptors. The allotment of chemicals to receptors and storage areas within the body depends on their solubility in different tissues, acidity, and physical size. Some chemicals will easily infiltrate all tissues of the body, whilst some will only enter certain compartments. Some chemicals can pass the blood–brain barrier and affect the central nervous system directly, whilst others cannot. Consider being called to a child who has potentially overdosed on antihistamines. Imagine how your management might change if you found that the agent was a first-generation antihistamine that crosses the blood–brain barrier and sedates, compared to a second generation that does not.

Exactly how far chemicals will disperse in the body is represented by their volume of distribution. This is a complex concept to understand, but in brief the volume of distribution represents the theoretical amount of tissues the chemical will disperse into, represented in litres. A drug with a lower volume of distribution will remain mainly in plasma. Drugs with a larger volume of distribution will require a larger dose to reach therapeutic level, but tend to take longer to be excreted as they slowly leach from their storage places. This is important, as some drugs with high volumes of distribution may continue to bind to their receptors after their low volume of distribution antidotes have worn off. An example of this concept would be using naloxone to reverse a slow-release **opioid** overdose. Naloxone is likely to be metabolised before the slow-release opioid. This puts the patient at risk of lapsing back into a toxic state unless adequate antidote levels are maintained.

Biotransformation

Biotransformation is the process by which the body breaks down a chemical in preparation for excretion. Biotransformation may be secondary to enzymes degrading the substance, and molecular change associated with acidity, hydrolysis, or oxidation. Much of the body's capability to prepare drugs to be excreted is vested in the liver. An impairment in these processes will lead to either the drug or a byproduct accumulating and creating a toxic level of the substance. Where a dose of a substance exceeds the capability of the liver to keep up with excretion, this principle will also apply. There are many chronic conditions too that affect the ability of the body to biotransform substances in preparation for excretion.

Excretion

Excretion is the physical removal of the substance or its derivatives from the body. Most excretion is performed by the kidneys, intestinal tract, or sweat glands. Where an impairment in one of these vehicles exists, toxicity may form due to nonexcreted poisons building up. Where chronic or acute excretion impairment exists, doctors will down-titrate regular medicines to appropriately compensate for the inevitable build-up. However, where sudden changes in the body's ability to excrete drugs occur, patients may continue to take their normal doses, resulting in toxicity. A final consideration is the possibility of excretion becoming a mode of absorption for infants being breastfed or in utero, as seen when mothers continue to use illicit drugs during pregnancy and breastfeeding (Vajjah et al. 2012).

The importance of clinical context and vulnerability

Clinical context is perhaps the most subjective factor of the approach to a toxicology patient, but serves as the foundation on which the prehospital clinician can assess, plan, implement, and evaluate appropriate care. It is important to understand that what might be a lethal toxic dose to one patient could be a standard daily dose of a medicine to another. The dose of a drug that determines toxicity will be different between adults and children, the young and the old, the fit and the ailing.

Where appropriate, first consider the dose compared to the weight of the patient. This will often indicate the severity of the situation or deterioration to come. Further, consider the patient's ability to cope with the drug. A terminal liver cancer patient will be more susceptible to overdose on drugs that are hepatically metabolised than a healthy person. In patients who are vulnerable, always carry a low threshold to escalate their care, and either bring the patient to a facility that can provide critical management or arrange for critical care back-up to come to the patient.

Remembering all possible toxic doses and their associated at-risk patient cohorts is not feasible for the general prehospital practitioner, and there is no easy metric to apply to all patients to simplify the question of clinical context. Instead, the beginning practitioner should learn common **toxidromes** and agents well, approach all toxic patients with a low threshold for calling for help, and appreciate that any toxic presentation has the potential to become life-threatening very quickly and often in subtle and unpredictable ways. The experience of the prehospital practitioner will define how the clinical context is interpreted, and it is important to continually reflect, seek new knowledge, and maintain a humble stance in the face of toxic presentation.

The initial resuscitative approach in toxicology

The prehospital environment is the least resourced but often the most critical part of a toxicology patient's medical journey. It is imperative for the prehospital practitioner to use their knowledge and understanding of toxicology as the key to good outcomes for the patient. The goal should always be to stabilise the patient for safe transport and to proceed to the most appropriate facility quickly. Toxicity can manifest rapidly, and it is best to have as narrow a window of opportunity for this to happen prehospitally as possible. The following segment is an adaptation of the contemporary framework for toxicology management abridged to the resource-limited paramedic setting (Daly et al. 2006; Sivillotti et al. 2018).

As with all prehospital cases, the primary survey and primary response form the first step to treating a toxicology patient. Where immediate life-threatening complications are present, approach the patient according to your advanced cardiac life support (ACLS) scope and protocols, with supplementary adjustments for toxicology as follows.

Resuscitation

Airway

A thorough assessment of airway is always pertinent in the toxicology patient. Risks to the airway could include swelling from caustic agents, airway collapse in obtunded patients, airway spasm, inhaled foreign bodies, aspirated vomitus, and exacerbation of preexisting conditions. Management is as with any other patient and should consider the possibility of complicating or worsening pathology. Advanced practitioners often consider the clinical context of the patient's toxicity, and may opt to gain advanced airway control to preempt airway deterioration that may make securing an airway risky later on.

Breathing

A proper assessment of the presence, rate, rhythm, and effort of breathing should be conducted to assess the potential need for respiratory support. **Sedative** toxidromes may depress respiratory drive, which could be detrimental to the obtunded patient, whilst other toxidromes such as the **sympathomimetic** may have a hyperventilation effect which could be just as harmful. When assuming control or support of respiration, it is important to consider the effects of ventilation on the toxin present. Some overdoses such as those from sodium channel blockers may benefit from more aggressive ventilation as an antidote. Further, auscultation of the lungs should be performed to assess for risks such as excessive secretion in **cholinergic** overdose, wheeze indicative of bronchospasm, or aspiration.

Circulation

Ensuring adequate blood flow is important in the toxic patient, as without adequate circulation the sequelae of toxicity will exponentially worsen. A primary check of the patient's pulse is necessary, noting rate, regularity, and strength followed by blood pressure, heart rate, and electrocardiogram (ECG) monitoring. Most toxidromes can eventuate in significant or catastrophic reduction in cardiac output, making access for intravascular medicine important, but also difficult to obtain. Where safe access is not precluded by agitation, seizure, or other clinical issues, early intravenous access is imperative. When cardiac complications exist, both acute and critical, it is important to consider the likely toxins involved, as some toxidromes may make resuscitation futile without appropriate antidotes in parallel with standard advanced life support.

Hypotension should be addressed with intravenous fluid challenge as a first port of call. Inotropic medications may be required where hypotension persists; however, clinical consultation is recommended to ensure the agent is not contraindicated by interactions with differential poisons.

Symptomatic bradycardia, in isolation, should be treated according to local protocol and is usually addressed with an **anticholinergic** agent such as atropine. Bradycardia may present in a toxidrome that necessitates an anticholinergic response, and therefore close attention should be paid to developing toxic signs. Other causes of symptomatic hypotension in poisoned patients may include digoxin toxicity, beta blocker toxicity, calcium channel toxicity, or sodium channel blocker toxicity.

Wide complex tachycardias are masked enormously by toxins. What may look like ventricular tachycardia may actually be supraventricular tachycardia that has been augmented by sodium channel blockade. In these cases, sodium bicarbonate is often used to stabilise the sodium channels. Cardiotoxic drugs can induce **Torsades de Pointes**; however, treatment remains the same, with magnesium sulphate to stabilise the myocardium.

Narrow complex tachycardia is usually associated with sympathomimetic drugs such as cocaine and amphetamines. Rate control should be approached with titrated benzodiazepines and beta blockers should generally be avoided.

Asystole and ventricular fibrillation are managed according to standard ACLS protocols. If a wide complex tachycardia deteriorates to fibrillation with reasonable suspicion of sodium channel blocker overdose, then sodium bicarbonate may assist in resuscitation.

Seizure control

Many toxins can eventuate in seizures. Even substances that cannot cross the blood–brain barrier may have secondary effects which can induce seizure or make underlying seizure risk more prominent. As a rule of thumb, toxic seizures are generalised and a patient presenting in a toxidrome with focal seizures should be assessed thoroughly for alternative causes for the seizure. Initial management should be responsive to the seizure, ensuring safety of the patient and bystanders, ensuring adequate oxygenation, and reducing seizures through use of benzodiazepines or other anticonvulsants. Whilst indicated in some other seizure groups, phenytoin is contraindicated in seizures secondary to acute poisoning.

Correct hypoglycaemia

Some medications such as insulin can deplete available blood glucose. Other situations may include excessive metabolism of glucose due to a process secondary to toxicity, such as seizures. Hypoglycaemia should be immediately treated in the most appropriate way for the clinical scenario. Use standard protocol, but be mindful of the patient's ability to tolerate oral input without aspirating. Closing the treatment loop by reassessing blood glucose after treatment should be conducted to ensure a blood sugar level of >4 mmol/l is achieved and maintained.

Achieve normothermia

Poisoned patients may present in both hypothermic and hyperthermic states, depending on the agent. The goal should always be normothermia and the mode of treating an elevated temperature should be determined by its severity. The risks associated with hyperthermia are seizure and organ failure, with risk increasing greatly as hyperthermia increases. Hypothermia may precipitate or mimic cardiac arrest. Whether hypothermia stems from the toxidrome, the environment, or a mix, it should be treated to achieve normothermia, especially in apparent arrest.

Resuscitation antidotes

Whilst emergency antidotes are listed last in this approach to poisoned patients, they should be considered in parallel to all resuscitation. Some critical complications will not be able to be resolved using standard resuscitative practice without antidotes. For example, in severe cardiac compromise from tricyclic antidepressant (TCA) overdose, lethal arrhythmias will generally be extremely difficult to revert without sodium bicarbonate administration and hyperventilation to alkalise the blood and decreased the effect of sodium channel blockade. These antidotes will often be in the critical care practitioner scope and will be considered with the 'Hs and Ts'.

Risk assessment and disposition

As soon as the patient is stable enough for the clinician to divert their thinking away from resuscitation, a thorough risk assessment should be conducted. Each poisoned patient will have a unique response to their toxin based on their dose, weight, habitus, and organ function. The risk assessment in toxicology is a considered, holistic analysis of the patient and their likely clinical trajectory. A risk assessment in the prehospital setting will aid in determining which facility to transport to, which preemptive treatments to initiate, and what further resources may be necessary, both prehospital and once the patient is handed over. It is always better to overestimate needs and prepare resources greater than the needs of the patient than to underestimate and be unable to treat the patient appropriately.

The five key components to risk assessment are agent(s), dose(s), time since ingestion, clinical progression, and patient factors (Cameron et al. 2015).

Most assessment data in toxicology risk assessment is either subjective or objective, with a large possibility of inaccuracy; as such, critical thinking is paramount at this stage. If the patient is able to communicate what they ingested, the paramedic may be able to get a guide as to what agent and doses are involved. Be cautious of any altered mental status, indication of recreational drug use, or deliberate overdose, as these factors may influence the patient's willingness and ability to give an accurate account of what they have taken. Other information that may assist could lie in empty pill packets, signs of drug use, medical records, and conversations with family or bystanders. Remember that whilst primary information can be inaccurate, secondary information should be taken with even more diligence, as it has an increased likelihood of not being accurate.

Where it is unclear what has been ingested, the prehospital clinician must synthesise their patient assessment and their environment to find likely agents. For example, music festivals may give rise to stimulant recreational drugs, older farms may hold organophosphates improperly, and a whisky home brewer may be prone to methanol poisoning.

The time since ingestion is another key influencer of prognosis in the context of clinical progression. Whilst paramedic practice has limited use for this information due to the symptomatic treatment of the patient and high index of transport to hospital regardless, this is extremely useful for the hospital team to know. Many agents have defined time-related courses which can determine risk at given points in the patient's progression. For example, it is known that in TCA overdose critical instability is most likely to occur within the first six hours of ingestion, and that if the patient remains stable at six hours they are unlikely to deteriorate. This may influence where the patient will be treated in the emergency department and where they will be transferred to from there.

Paediatric patients pose an escalated susceptibility to poisoning. A smaller habitus, developing organ capability, and inability to understand the risk of ingesting agents make children high-risk toxicology patients. Most paediatric poisoning is also unwitnessed and may not become apparent until symptomology is advanced and critical. A worst-case scenario should always be employed in the paediatric toxicology patient, and drawing on available resources should occur very early, preempting a complex paediatric resuscitation.

Toxicology sequelae

The dangers of toxicity are not isolated to the toxin itself. Most toxic presentations will have the potential for significant sequelae that could cause more damage than the toxin. Sequelae generally pertain to symptoms and are logical complications of how the patient has presented. An example of a sequela would be the possibility of long downtime in an overdose causing **rhabdomyolysis** secondary to tissue breakdown. This may cause electrolyte disturbances and may need preventative and resuscitative care. It is not possible to explore all possible sequelae, because every patient and presentation will host its own set of risks. Consider history, environment, behaviour, drug, and dose when looking for potential sequelae. As with most toxicology understanding, these skills will build as your experience builds. Often verbalising your thought processes with other clinicians to collaborate each individual's knowledge and experience will yield better results.

Learning activities

As a primer for situations you may face, consider the following scenarios and note possible sequelae for these patients.

1. 75-year-old John has a history of myocardial infarction and ventricular fibrillation. He accidentally ingests his grandson's attention deficit hyperactivity disorder (ADHD) medication, dexamphetamine.
2. 37-year-old Brett was found lying in a puddle after trialling a new dealer's 'extra strong' heroin.
3. 17-year-old Tim tried gammahydroxybutyrate (GHB) at a friend's house for the first time. He felt unwell and decided to ride his bike home. He has a new bruise to his left temporal region.
4. 84-year-old Betty had a fall last week and suffered a skin tear on her right shin. She has cognitive disabilities and has accidentally taken 3 g of aspirin.

Source: https://www.pexels.com/photo/full-length-of-man-with-arms-raised-320442

Toxidromes

Toxidromes are groups of symptoms that are specific to certain classes of overdose. The term toxidrome was established in 1970 by Mofenson and Greensher as a way of quickly and accurately identifying paediatric overdose substances. In contemporary practice, toxidromes are used on all age groups and are especially useful for prehospital clinicians, who often do not have drug screening capabilities in their work environment, yet need to make informed treatment decisions. The following segment will highlight the key toxidromes to remember, how to identify them, and what treatment goals are appropriate. First, the fundamentals of physiology and pharmacology behind toxidromes must be briefly reviewed (Volle 1963).

Physiology

A toxidrome is a combination of signs and symptoms that can be used to isolate a group of toxins likely to be the culprit of overdose based on the receptors on which they act. The foundation of toxidrome signs and symptoms is the **autonomic nervous system (**ANS**)**. By sending information between the body and the brain, the ANS regulates most involuntary processes of the body, such as breathing, heart rate, blood pressure, and digestion.

The ANS has two divisions, the **sympathetic** and **parasympathetic** nervous systems.

The sympathetic nervous system, otherwise known as the fight-or-flight system, is responsible for preparing the body for maximal exertion by increasing the capacity for high-intensity activity and decreasing nonessential processes. The sympathetic nervous system increases heart rate, dilates pupils, relaxes airways, relaxes the bladder, and prevents digestion.

In contrast, the parasympathetic nervous system, otherwise known as the rest-and-digest system, prepares the body for periods of restoration and digestion. The parasympathetic nervous system decreases heart, constricts pupils, tightens airways, contracts the bladder, and promotes digestion. Both the sympathetic and parasympathetic nervous system work competitively around the body and appropriate physiological response is mediated by balancing both divisions. To do this, the central nervous system uses information from the afferent (information heading to the brain) part of the ANS to regulate the efferent (information heading away from the brain) sending of neurotransmitters to the receptor sites around the body.

The parasympathetic nervous system exerts its effect in a cholinergic manner, meaning that its primary neurotransmitter is acetylcholine. Acetylcholine activates muscarinic and nicotinic receptors around the body to produce the rest-and-digest effect. Acetylcholinesterase is an enzyme that cleans up the acetylcholine and ceases its effect on target receptors.

Whilst acetylcholine is also part of the process of sympathetic innervation, the sympathetic nervous system is adrenergic as opposed to cholinergic, and its primary neurotransmitters are adrenaline and noradrenaline. Both the sympathetic and parasympathetic nervous system can be influenced positively and negatively by drugs.

Pharmacology

Drugs that encourage the action of a receptor and its associated neurotransmitter are called agonists. A drug that agonises a receptor will elicit a toxic response that is appropriate for the receptors division of the ANS. For example, cocaine is an agonist of adrenergic receptors. Therefore, an increase in sympathetic activity is expected in overdose and signs such as tachycardia and dilated pupils are anticipated. In contrast, drugs that inhibit the action of a receptor and its associated neurotransmitter are called antagonists. An antagonist will elicit the opposite effect of the intrinsic receptor on which it acts. For example, a muscarinic antagonist such as atropine will also increase heart rate and dilate the pupils. It does this by suppressing the parasympathetic nervous system and allowing the sympathetic nervous system to dominate. For this reason, antagonists of the parasympathetic system will have the same effects as agonists of the sympathetic nervous system and vice versa.

In paramedic practice there are five key toxidromes to understand comprehensively: cholinergic, anticholinergic, sedative, opioid, and sympathomimetic. Additionally, there are three further toxidromes that can develop with drugs commonly used in the prehospital setting: serotonin syndrome, malignant hyperthermia, and neuroleptic malignant syndrome.

Cholinergic toxidrome

Cholinergic toxins are few and far between in paramedic practice. They are usually isolated to two environments: agricultural settings and terrorist attacks. Cholinergic agents are found in organophosphate pesticides as well as chemical nerve agents. Whilst organophosphate pesticides are slowly being removed from farming practice, there is ongoing use of nerve agents in terror attacks.

Pharmacology

Cholinergic poisons work by either enhancing the ability of acetylcholine to exert its effect or by blocking acetylcholinesterase. In essence, these drugs will increase parasympathetic activity either directly or indirectly.

Signs and symptoms

- *Central*: agitation, respiratory depression, disorientation, coma, seizures.
- *Peripheral*: urinary incontinence, abdominal cramping, bradycardia, bronchoconstriction, diarrhoea, lacrimation, **miosis**, vomiting.
- *Nicotinic* (reserved only for nicotinic agents): muscle cramps, tachycardia, weakness, fasciculations.

Possible agents

Key agents involved in cholinergic syndromes fall into either acetylcholinesterase inhibitor or acetylcholine agonist categories. In the acetylcholinesterase inhibitor category there are organophosphate pesticides, carbamate pesticides, and chemical nerve agents, as well as drugs used for dementia and myasthenia gravis. Acetylcholine agonists include muscarinic agents, nicotinic agents, and mushrooms.

Treatments

Treatment for cholinergic toxidromes focuses on rapid response to symptoms and preemptive management of respiratory decline. Any muscarinic signs or symptoms that indicate airway, breathing, or circulation compromise should be challenged with an anticholinergic agent such as atropine. Administration should be responsive to the patient's condition, with increasing dosages and frequency as needed. Continued administration may be required in order to maintain a safe condition. Where adequate gas exchange is not achieved quickly, advanced airway placement and ventilation will be necessary.

Mnemonics and insights

As a rule of thumb, any patient with an altered level of consciousness and excessive output from many orifices should be suspected of possible cholinergic crisis. The mnemonic SLUDGE or DUMBELS is useful for remembering muscarinic signs and symptoms, whilst MTWTF is useful for nicotinic signs and symptoms (see Table 11.2).

Table 11.2 Mnemonics for cholinergic toxidrome.

Muscarinic symptoms		Nicotinic symptoms
S – Salivation	D – Diarrhoea	M – Muscle cramps
L – Lacrimation	U – Urinary incontinence	T – Tachycardia
U – Urinary incontinence	M – Miosis	W – Weakness
D – Diarrhoea	B – Bronchospasm	T – Twitching
G – Gastrointestinal upset	E – Emesis	F – Fasciculations
E – Emesis	L – Lacrimation	
	S – Salivation	

Anticholinergic toxidrome

Anticholinergics are typically associated with 'anti' medicines. The symptomatology is largely the opposite of cholinergics, meaning if you can remember one the other is simply the opposite. Take extra care when treating patients with chemical restraints, as often these agents can worsen the situation.

Pharmacology

Anticholinergic agents work by competitively blocking central and peripheral cholinergic receptors. The outcome of this is disproportionate sympathetic activity to parasympathetic activity and therefore sympathetic signs.

Signs and symptoms

- *Central*: restlessness, fluctuating mental status, confusion, hallucinations, and fidgeting.
- *Peripheral*: **mydriasis**, dry mucous membranes, tachycardia, flushing of the skin, hyperthermia, urinary retention, and decreased gut motility.

Possible agents

Key agents involved in anticholinergic syndromes are antiparkinsonian drugs, antihistamines, antidepressants, antipsychotics, anticonvulsants, antispasmodics, and some mushrooms.

Treatments

Key treatments for anticholinergic syndromes include treating seizures, correcting hypoglycaemia, and correcting hyperthermia. Maintaining staff, public, and patient safety is paramount during the period of delirium. It is important to treat delirium and agitation with agents that will not add to the anticholinergic effect, such as haloperidol or droperidol. Instead, benzodiazepines are key to management.

Mnemonics and insights

A simple way to remember anticholinergic symptoms is a simple Alice in Wonderland poem:

Hot as a hair
Hyperthermic

Dry as a bone
Dry membranes/urinary retention

Blind as a bat
Mydriasis

Red as a beet
Flushing of the skin

Mad as a hatter
Agitation/delirium

Another simple phrase to remember is:

'Can't see, can't pee, can't sit, can't poo'

Opioid toxidrome

Opioids are analgesics that are widely used and abused. Whilst identifying opioid toxicity in a patient on arrival may seem easy, it is often harder to detect approaching opioid toxicity when the clinician is administering analgesics such as fentanyl or morphine. Always be vigilant for the signs and symptoms.

Pharmacology

Opiates bind to four subtypes of opioid receptors with the intention of providing analgesia to moderate to severe pain. In opioid-naive patients or when taken in excess, they can cause depression of the central nervous system.

Signs and symptoms

Signs and symptoms include decreased mentation, euphoria, sedation, apnoea/respiratory depression, miosis, decreased heart rate, decreased blood pressure, and decreased gut motility.

Possible agents

Agents include short- and long-release oral opioids, over-the-counter combined opioids, intravenous opioids, inhaled opioids, and heroin.

Treatments

Key treatments for opiate overdose are supportive. Maintaining a patent airway and adequate ventilation are paramount in treating opiate overdoses. The competitive opioid receptor antagonist naloxone can be administered to reverse the effects of opioid overdose. Naloxone works by having a higher affinity to opioid receptors than the overdose substance without the negative side effects. Care must be taken where the biological lifespan of the overdose lasts longer than the relatively short duration of action of naloxone (30–60 minutes), as patients may become renarcotised as the substance rebinds to opiate receptors. For this reason it is not appropriate for administration without transport to an appropriate facility for close observation. Further, the effect of clearing the opioid receptors of someone dependent on opiates is immediate progression to withdrawal. This may include vomiting, diarrhoea, aggression, and seizures.

Mnemonics and insights

The signs and symptoms of opioid overdose are quite vague and vary depending on the dose and agent. Any patient with pinpoint pupils, altered level of consciousness, and signs of respiratory depression should have opioid overdose considered as a differential diagnosis.

Sedative toxidrome

The sedative toxidrome is very similar in presentation to the opioid toxidrome. The distinction is made due to the differences in treatment in each toxidrome, necessitating the ability to distinguish between the two.

Pharmacology

The pharmacology of sedative agent varies based on what class of drug is causing the sedation. Typically, sedatives depress the reticular activating system (RAS) by affecting gamma-aminobutyric acid (GABA) neurotransmitter activity in a variety of ways.

Signs and symptoms

The signs and symptoms include decreased mentation, sedation, ataxia, stupor, apnoea/respiratory depression, coma, nystagmus, diplopia, lack of coordination, and flaccidity.

Possible agents

Possible agents for sedative overdoses are benzodiazepines, barbiturates, GHB/Fantasy, baclofen, and clonidine.

Treatments

Supportive care is paramount in sedative overdose. Maintaining a patent airway and adequate ventilation are primary measures for treating sedative overdose. Enhanced elimination is possible for some sedatives in the hospital setting; however, there is limited range of available treatments in the prehospital setting at present. Flumazenil has previously been advocated as a naloxone equivalent for benzodiazepines, although its significant risk of inducing seizures usually means that its costs are greater than its benefits (Sivilotti 2015). Where the benzodiazepine overdose is induced by the clinician and benzodiazepine withdrawal risk is minimal, there is some scope for its use.

Mnemonics and insights

Whilst most sedatives are anticonvulsant, GHB lowers the seizure threshold and may induce paradoxical seizures in patients in overdose. Care should be taken to monitor for seizure activity in such patients.

Sympathomimetic toxidrome

Most sympathomimetic overdoses will be recreationally abused stimulants. Take care to observe for signs of worsening toxicity or development of further toxic signs such as serotonin syndrome.

Pharmacology

Sympathomimetic drugs are mimics of sympathetic adrenergic neurotransmitters. They work by agonising alpha and beta receptors, creating excessive sympathetic drive.

Signs and symptoms

The general toxidrome of sympathomimetics is very similar to an anticholinergic toxidrome. The characteristic hyperactive bowel sounds and sweating of sympathomimetics, in contrast to the hypoactive bowel sounds and dry skin of anticholinergics, are used to differentiate.

Other signs and symptoms are agitation, paranoia, delusions, hyperreflexia, seizures, mydriasis, tachycardia, hypertension, diaphoresis, piloerection, sweating, hyperthermia, and increased gut motility.

Possible agents

Agents include amphetamines, cocaine, stimulants, and monoamine oxidase inhibitors (MAO-Is).

Treatments

Treatment of sympathomimetic toxicity is centred around responding to the symptoms of the toxin and preventing seizure. Cooling hyperthermia with noninvasive methods or cool intravenous fluid and providing a low-stimulus environment are primary responses. Like anticholinergic toxicity, staff, public, and patient safety becomes an issue in sympathomimetic toxicity. Benzodiazepines and/or antipsychotics may be required to manage delirium in a safe manner. Where tachycardia or hypertension becomes an issue, it is best to titrate intravenous benzodiazepines to effect. In general, it is best to avoid beta blockers due to a risk of unopposed alpha stimulation, causing dangerous paradoxical hypertension.

Mnemonics and insights

One way to remember the sympathomimetic toxidrome is using the mnemonic GET SMASHD. The first letter of each element is imperative for differentiating sympathomimetic toxicity from anticholinergic toxicity.

G Gut sounds increased
E Erection
T Tachycardia
S Sweats
M Mydriasis
A Agitation
S Seizures
H Hyperthermic, hypertensive
D Delusional

Serotonin syndrome

Serotonin syndrome varies from mild to critical. It overlaps significantly with other toxidromes and, as always with toxicology, a worst-case scenario mindset will prevent patients being undertreated or underprioritised when the lines are not clear.

Pharmacology

Serotonin syndrome is an excess of central nervous system serotonin secondary to overagonism of serotonergic receptors. It is usually associated with ingestion of multiple serotonergic agents, although it can be caused by single-agent ingestion.

Signs and symptoms

Signs and symptoms include agitation, aggression, seizures, mydriasis, increased reflexes, hyperthermia, clonus, tremor, sweating, and diarrhoea.

Possible agents

Agents that precipitate serotonin syndrome are vast and diverse; however, all are serotonergic in some way. These agents include selective serotonin reuptake inhibitors (SSRI), ecstasy (methylenedioxymethamphetamine, MDMA), MAOI, cocaine, tramadol, antiemetics, serotonin noradrenaline reuptake inhibitors (SNRI), St John's wort, TCAs, amphetamines, and pethidine.

Treatments

The first response to serotonin syndrome should be to discontinue the agent(s) causing excess serotonin. Agitation may need to be managed with benzodiazepines. Butyrophenones (haloperidol/droperidol) should be avoided, as their anticholinergic properties may reduce the body's ability to regulate hyperthermia. Responding to hyperthermia using active cooling may be necessary. If the patient's condition warrants, further measures such as serotonin antagonists, intubation, and paralysis may be required.

Mnemonics and insights

One tool that has been validated as a simple, accurate identifier of serotonin syndrome is the Hunter criteria. To be positive for serotonin syndrome according to the Hunter criteria, the patient must have ingested a serotonergic agent and have at least *one* of the following:

- Spontaneous clonus
- Inducible clonus *plus* agitation or diaphoresis
- Ocular clonus *plus* agitation or diaphoresis
- Tremor *plus* hyperreflexia
- Hypertonia *plus* temperature above 38 °C *plus* ocular clonus or inducible clonus

Malignant hyperthermia

Malignant hyperthermia is rare, but life threatening. It is only relevant to paramedic practice due to the use of **inhaled anaesthetics** for acute pain. The best treatment for malignant hyperthermia is prevention. Taking a proper history before administration can determine whether someone may be safer receiving alternative modes of analgesia. Avoid complacency and ask for a familial history first.

Pharmacology

Whilst little is known about the exact pathophysiology of malignant hyperthermia, it is understood that it is caused by continuous skeletal muscle activation due to a genetic condition. People susceptible to malignant hyperthermia have been found to have abnormal skeletal muscle receptors. When under the influence of certain anaesthetic agents, susceptible patients may accumulate calcium around skeletal muscle receptors, leading to cellular hypermetabolism, rhabdomyolysis, acidosis, and anaerobic metabolism.

Signs and symptoms

- *Early*: tachypnoea, tachycardia, muscle rigidity, spasms aches/cramps with no explanation.
- *Late*: extreme hyperthermia (sometimes >40 °C), dark urine.

Possible agents

Possible agents are inhaled anaesthetics, and the key perpetrator prehospitally is methoxyflurane (green whistle/penthrox) and depolarizing muscle relaxants (succinylcholine).

Treatments

Key treatments for malignant hyperthermia are active cooling and commencing high-flow oxygen therapy, removing the offending agents, and removing the patient from hot environments. Ice packs should be applied in the axilla and groin along with cool saline intravenously.

Mnemonics and insights

Before administering methoxyflurane, ensure that the patient is asked about familial cases of malignant hyperthermia. Parents, siblings, and children with a history of malignant hyperthermia impose a 50% risk of malignant hyperthermia, whilst other close relatives impose a 25% risk. Other analgesics will generally be more appropriate for patients with a family history due to the significant risk of malignant hyperthermia.

Whilst the condition is called malignant *hyperthermia,* hyperthermia is a late sign. By having a baseline set of observations along with an assessment of muscle tone, the paramedic can identify early signs that may be suspicious of malignant hyperthermia and escalate care appropriately.

Neuroleptic malignant syndrome

Neuroleptic malignant syndrome is a serious reaction to antipsychotic medication. Wherever there has been a change in dose or new agent started, there lies a risk. ‘Lead pipe rigidity’ is a hallmark sign.

Pharmacology

Neuroleptic malignant syndrome is poorly understood and most current theories do not fully explain the entire symptomatology. The most comprehensive explanation to date is that the syndrome involves central dopamine receptor blockade in the hypothalamus, leading to dysautonomia.

Signs and symptoms

Signs and symptoms include tachycardia, confusion, agitation, labile blood pressure, muscle rigidity (‘lead pipe rigidity’), hyperthermia, sweating, and bradykinesia.

Possible agents

Agents include neuroleptics, including typical and atypical antipsychotics as well as some antiemetics. First-generation (typical) antipsychotics are most likely. The syndrome also occurs on withdrawal of antiparkinsonian drugs.

Treatments

Treatment of neuroleptic malignant syndrome should start with ceasing the offended agent. Supportive care should be followed. Active cooling may be necessary and in this case ice packs should be applied in the axilla and groin, along with cool saline intravenously. Care should be taken to maintain normotension whilst being mindful of the lability of blood pressure in neuroleptic malignant syndrome. If treatment of agitation is necessary, benzodiazepines are first-line treatments, whilst antipsychotics should be avoided.

Mnemonics and insights

The key to distinguishing neuroleptic malignant syndrome from other toxicity is 'lead pipe' muscle rigidity. Table 11.3 and Figure 11.1 provide quick reference guides to toxidromes.

Table 11.3 Toxidrome quick guide.

	Essential					Useful	
	Mental Status	**Eyes**	**Lungs and Skin**	**Vitals**	**Bowels**	**Reflexes**	**Tone**
Cholinergic	Normal	Miosis	Wet	Stable	Increased	Normal/ Reduced	Fasciculations
Anticholinergic	Agitated	Mydriasis	Dry	Increased	Reduced	Normal	Reduced (late)
Sedative	Lethargic	Normal	Dry	Reduced	Reduced	Reduced	Reduced
Opioid	Lethargic	Miosis	Dry	Reduced	Reduced	Normal	Normal
Sympathomimetic	Agitated	Mydriasis	Wet	Increased	Increased	Increased	Normal
Serotonin syndrome	Agitated	Mydriasis	Wet	Increased	Increased	Lower > upper	Increased
Neuroleptic malignant syndrome	Agitation	Normal	Wet	Increased	Normal	Reduced	Lead pipe rigidity
Malignant hyperthermia	Agitation	Normal	Wet	Increased	Normal	Reduced	Normal/rigidity

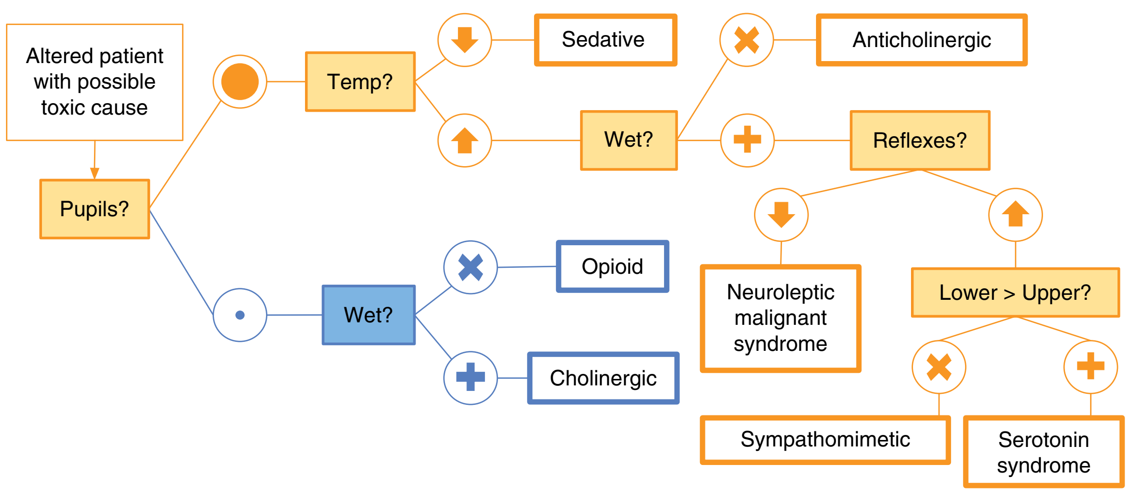

Figure 11.1 Toxidrome flowchart.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your understanding of toxidromes with these learning activities.

1. You are called to a music festival where the medical team have initiated treatment on a 26-year-old male who was brought in by security for agitated behaviour that has persisted despite verbal de-escalation. The festival medics state on handover that he has become increasingly hypertensive, tachycardic, and hyperthermic, as well as delusional. Given the context of the presentation, what is the likely toxidrome he is facing? What agents could be to blame? Considering how illicit drugs could be brought into a music festival, how could you explain the escalating clinical symptoms?
2. As a military medic on tour, you are tasked to medivac as many patients as possible following an enemy attack on a village. On arrival at the village, you notice the local people are vomiting, sweating profusely, and have constricted pupils. As you triage victims, you see most patients are having difficulty breathing due to excessive secretions. What is the likely toxidrome affecting the victims? What kind of agent could be causing these symptoms? What would be the primary class and an example of an antidote to treat this toxidrome?
3. At 0715 you are called to a residential aged care facility, where the nurse on shift gives handover on a 76-year-old female who was found with an altered level of consciousness by a carer. She has a history of depression, Parkinson's syndrome, and hypertension. The nurse reports she has been reusing her medicines for the past three days, including her antiparkinsonian agent. She was increasingly agitated yesterday and a dose of sublingual antipsychotic medication was administered to settle her for bed last night. On assessment the patient is tachycardic, hypertensive, febrile, and completely rigid. What syndrome could be implicated in this scenario? How would you manage this prehospitally?
4. You are called to a 47-year-old female by her husband late at night. He awoke to find his wife in the living room, slumped on the couch with an empty bottle of wine next to her. He states this is a normal behaviour for his wife since her mother's funeral, but became worried when he could not rouse her. On assessment she withdraws to pain, but does not open her eyes or respond verbally. Her respiratory rate is 6, heart rate is 45, and you notice she is holding an empty packet of valium. What toxidrome is she displaying? What assessments would help you gauge what level of supportive care she needs?
5. Whilst off duty at the beach, you notice the lifeguards are treating a 12-year-old male by their buggy. The patient has a triangle bandage on his left arm and is holding a methoxyflurane whistle. He is flushed and inconsolable. His mother is trying to settle him whilst the lifeguards arrange a meeting place for an ambulance. You introduce yourself and clinical background to the lifeguards, and they reveal the boy was previously settled and has started getting worked up in the last 10 minutes. The mother calls the lifeguards over because she feels the boy is becoming rigid, just like when his younger sister had a reaction to anaesthetic when having her tonsils out. Given this presentation, what toxic process could be occurring? What would your first action be? Thinking about the environment and resources likely to be available to you, what could you do to begin treating the toxidrome?

Glossary

Anticholinergic:	Drugs that enhance the effects of the sympathetic nervous system by blocking acetylcholine.
Autonomic nervous system:	The part of the body's nervous system that controls bodily functions not consciously directed, such as heart rate, breathing, and digestion.
Cholinergic:	Drugs that either enhance the neurotransmitter acetylcholine or block its breakdown, causing increase in parasympathetic activity.
Inhaled anaesthetic:	Anaesthetic agents used to induce anaesthesia, reduce pain, and calm patients. Most notably methoxyflurane (green whistle/penthrox) in the prehospital setting. Key instigator of malignant hyperthermia.
Miosis:	Constriction of the pupil.
Mydriasis:	Dilation of the pupil.
Opioid:	Analgesic and anaesthetic drugs that act on opioid receptors throughout the body to reduce pain, produce euphoria, and depress the central nervous system.
Parasympathetic nervous system (PNS):	The branch of the autonomic nervous system that handles 'rest-and-digest' functions. When activated it increases peristalsis, causes bronchoconstriction, moistens mucous membranes, and constricts pupils, amongst other effects.
Rhabdomyolysis:	Systemic syndrome characterised by vomiting, confusion, darkened urine, and renal failure as a result of muscle breakdown due to sustained compression, excess muscle activation, and some medications.
Sedative:	Broad category of drugs that can include barbiturates and benzodiazepines, with the intention of inducing sleep, central nervous system depression, or induced coma.
Sympathetic:	The branch of the autonomic nervous system that handles 'fight-or-flight' functions. When activated it increases heart rate, stops digestion, and causes bronchodilation, amongst other effects.
Sympathomimetic:	A drug that mimics or instigates a sympathetic response, e.g. cocaine.
Torsades de Pointes:	A form of ventricular tachycardia where the cardiac electrical pattern revolves around the centre of the heart. The pattern of the outer edges of the ECG trace looks like sine waves.
Toxidrome:	A syndrome comprising a collection of signs and symptoms that can identify toxicity from specific groups of drugs.

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12

Medical terminology

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Contents

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Learning outcomes

On completion of this chapter the reader will be able to:

- Recognise the importance of medical terminology in relation to paramedic practice.
- Identify how to break down medical terms in order to understand them.
- Analyse, recognise, and define medical terms and medical acronyms.
- Pronounce key medical terms.
- Interpret and apply both written and verbal medical terminology.

Case study

A paramedic crew have been directed to transfer a patient from the local emergency department to a cardiac catheter lab for primary percutaneous coronary intervention (PPCI). The transferring crew receive a handover from the medical team at the hospital and go on to read the case notes from the medical team, in order to gain a deeper understanding of the patient's medical condition. This is vital to ensure they are appropriately prepared for the transfer. The notes state that the medical team will insert a stent in the patient's left anterior descending (LAD) coronary artery.

Introduction

As health professionals, paramedics are required to document all the cases they attend, using patient report forms (PRFs). A PRF should record what you found on scene, the assessments you undertook, and confirmation of what you did for the patient, including administration of drugs and other paramedic interventions.

A PRF not only acts as a report for the ambulance service (which can then be used to change practice and influence service provision), and for use by other health professionals in the patient's treatment, but it can also be called on to prove or disprove action that you took. Therefore it is vital that the PRF is accurate and that there are no 'grey areas' in your report writing.

Medical terminology helps achieve this level of consistency and accuracy and leaves no room for confusion by anybody else who may be reading your report, facilitating communication in the medical field (Walker et al. 2013). A well-written document utilising medical terminology will ensure accuracy and efficiency when communicating with other healthcare professionals. Medical terminology is the standardised means of communication in the healthcare industry. Look around a general hospital and you will see people from all different nationalities. Their background does not matter, if correct medical terminology is used; confusion will be minimised when passing on the information regarding your patient. Medical terminology is also recognised legally, so in the event that you have to recall your information subsequently, there will be no room for misinterpretation of your document.

If you ask a person from a nonmedical background if they have ever listened to healthcare professionals using language that is difficult to comprehend, often the answer is yes. Most nonmedical people will question why medical terminology is used in the industry when simple English would suffice (Koch-Weser et al. 2009). However, the rationale for employing medical language is important, as it provides a precise method for the following:

- Accurately locating anatomical landmarks.
- Describing medical conditions.
- Describing prescribed treatments and interventions.

Although there is not a governing body to regulate the professional use of medical terminology, being able to use medical terminology accurately is a specified standard laid out by employers and regulatory bodies, and is advocated by professional bodies. Historically, medical terminology was principally used by doctors, specialists, and academics, but it is now equally vital for nurses, paramedics, and most allied health professions to be proficient in medical language. Equally, the evolution of primary and secondary healthcare has caused many medical/health support staff such as medical assistants, orderlies, and administration staff to become proficient in medical terminology in order to streamline reporting, billing, and patient care pathways. Indeed, anyone employed in the health and medical industries who is unversed with medical terms will be largely unable to function effectively.

This chapter introduces medical terminology, and provides a discussion of medical acronyms, medical abbreviations, and a brief 'Hx' of the development of medical terminology (our first abbreviation = Hx meaning history), showing the respective influences of Greek, Latin, Arabic, and finally English vocabulary.

A brief history (Hx) of medical terminology

Greek influence

The origins of modern Western medicine are often traced to Hippocrates (460–377 BCE), a Greek physician widely accepted as the founder of medicine in the fourth century BCE (Panourias et al. 2012). The 'Hippocratic writings' ascribed to him may well be the work of more than one writer, but they recorded many foundational features of medicine that are still accepted today. These Hippocratic writings were in Greek (despite this being a long period of Roman occupation in Greece), with no equivalent Latin medical text reaching the same degree of prominence or influence (Repas 2013). Interestingly, even throughout the three centuries of Roman occupation, many of the practising doctors were Greek, which caused the original Greek text to continue (Wulff 2004). A fuller list of the medical terms deriving from this Greek inheritance is given later in the chapter, but familiar examples include diarrhoea (through flow), dyspnoea (difficulty breathing), and podagra (a foot trap).

Latin influence

Modern medical terminology owes an equal debt to Latin vocabulary and in particular to the first-century text *De Medicina*, attributed to Roman aristocrat Aulus Cornelius Celsus (Wulff 2004). This work, the first surviving attempt at a medical encyclopaedia, shows the extensive influence of Hippocrates and Greek terminology; Celsus had to import Greek medical terms directly where no Latin equivalent was available. Celsus also adopted the Greek process of likening and describing the shape of anatomical structures to objects of comparable shape, for example musical instruments (e.g. tuba = trumpet, tibia = flute) or plants (glans = acorn).

Arabic influence

During the Middle Ages, many of the classical Greek medical texts were translated into Arabic throughout the modern-day Middle East. Arabic scholars contributed to the prevailing medical literature and although their influence was relatively small, some Arabic terms found their way into Western medicine (e.g. nucha; Thomas et al. 2013).

These three influences on medical terminology were cemented in the Renaissance of the sixteenth century when a renewed emphasis on Latin learning and culture saw the retranslation into Latin of the foundational medical texts and the establishment of 'medical Latin' as a body of vocabulary that is still used to this day.

Contemporary english dominance

The final phase in our brief history of the development of medical terminology is the dominance of English terms in the medical lexicon, a dominance which can be directly attributed to the postwar settlement following the Second World War. Although during the twentieth century medical science still used three languages equally

(German, English, and French), in the postwar years English established itself as the preferred language at international conferences; just as medical Latin had formed a common language for Renaissance scholars, so today medical doctors have increasingly chosen English as the single language for international communication. The ongoing impact of this development can be seen in the proliferation of English clinical terms in other languages. For example, the term 'bypass' has been adopted in Italian, German, Dutch, and Romanian, whereas the Polish and French retain their own terms of *pomostowanie* and *pontage*, respectively (Wulff 2004). The dominance of modern English in medicine is also represented statistically by the collective increase in the percentage of English-language journals in the American journal catalogue Medline from 35% to 89% over the last 100 years; in the same time period, German-language journals in Medline have decreased from approximately 25% to 1.9% (Baethge 2008).

Medical terminology and word structure

Whilst medical terminology can sound complex, fortunately there are some general rules relating to basic word structure which can help us to understand and remember its meaning. In the English language, most words have three possible components (see Table 12.1):

- Root words
- Affixes (prefix and suffix)
- Combining vowel

Root words can stand alone in a sentence and make meaning in and of themselves. Affixes (a prefix at the start of a word; a suffix at the end of a word) make meaning only when they are attached to a root word. An example would be the relationship between the root word 'appendix' and the suffix '-itis'. The suffix '-itis' (meaning inflammation of) by itself is not a word; however, add '-itis' to the root word 'appendix' and you have formed 'appendicitis', the accepted terminology for an inflamed appendix. Much medical terminology is organised on this principle of root words and affixation; knowledge of both elements helps to understand and recognise key terminology. Table 12.1 summarises these organising principles of medical terminology.

You will find some common examples of medical root words in Table 12.2. This is not intended to be a comprehensive list, but rather a visual introduction to root words and adjoining vowels. A much more comprehensive list of medical root words can be found in most medical dictionaries.

Prefixes and suffixes

As we have seen, a prefix is attached to the start of a root word, a suffix to the end. In medical terminology, a further difference can be observed: here, a prefix at the start of a word often specifies the location, time, or number, whereas a suffix at the end of the word reflects the condition, disorder, disease, or procedure (Walker et al. 2013). Tables 12.3–12.5 indicate this distinction in greater detail.

Table 12.1 Description of basic word structure.

Word root	Fundamental meaning of a medical term, usually used to describe a body part. Usually derived from a source language, e.g. Latin or Greek
Prefix	Attached to the beginning of the medical term to modify its meaning, by giving additional information about the location or number of parts involved
Suffix	Attached to the end of the word root to add meaning to the term, such as procedure or disease process
Combining vowel	Used to allow ease of pronunciation where suffixation has taken place; usually an 'o'

Table 12.2 Root words and meanings.

Medical root words	Meaning
Angi/o	Blood vessel
Cardi	Heart
Cepahl/o	Head
Chrom/o	Colour
Enter/o	Intestine
Derm/o	Skin
Gastr/o	Stomach
Haem/o	Blood
Lapar	Abdomen
Laryng	Lower throat
Myo	Muscle
Myel/o	Spinal cord
Onych/o	Nail
Oro	Mouth
Osteo	Bone
Phag/o	Eat/swallow
Pharyng	Upper throat
Phleb/o	Vein
Pulmon/o	Lungs
Vascul	Blood vessel

Table 12.3 Common prefixes.

Prefix	Meaning
an/a-	Without/lack of
ab-	Away from
ad-	Towards, near
ante-	Before
brady-	Slow

Table 12.3 (*Continued*)

Prefix	Meaning
dys-	Bad/difficult
ec-, etc-	Out, outside of
end-	In, within
epi-	Upon/over/above
hyper-	Excessive/high
hypo-	Under/below/low
intra-	Within
mon-	One
peri-	Surrounding
poly-	Many, much
post-	After, behind
tachy-	Fast
trans-	Across, through
supra-	Above

Table 12.4 Common suffixes.

Suffix	Meaning
-aemia	Blood
-algia	Pain
-centesis	Puncture, tap
-desis	Binding, fusion
-ectomy	Excision, surgical removal
-graphy	Act of recording data
-itis	Inflammation
-ology	Study of
-pathy	Disease
-pexy	Surgical fixation
-phagia	Eating/swallowing

(*Continued*)

Table 12.4 (*Continued*)

Suffix	Meaning
-phasia	Speech
-plasty	Plastic repair/surgery
-plegia	Paralysis
-phobia	Fear
-rrhagia	Flow
-rrhage	Burst
-rrhea	Discharge
-scopy	Examine
-sclerosis	Hardening
-tripsy	Crushing
-uria	Urine, urination

Table 12.5 Prefixes relating to colour.

Prefix	Meaning
alb-	White
cirr-	Yellow
cyan-	Blue
erthr-	Red
glauco-	Grey
leuk-	White
melan-	Black

The building blocks of medical terms

Once we have understood the principles set out in Tables 12.3–12.5, we can identify the building blocks of a whole range of medical terms. Familiar examples of terms using a prefix include 'hypertension' (meaning 'high blood pressure'), where the prefix 'hyper-' (meaning 'above' or 'more than normal') is added to the root word 'tension', which in medical terminology means blood pressure. Likewise, the word 'malnutrition' means 'poor nutrition', a meaning generated by addition of the prefix 'mal-', meaning 'bad'.

Similarly, familiar medical terms using suffixation include 'dermatitis' (an inflammation of the skin), where '-itis' is added to the root word term 'dermat', meaning skin. Indeed, the suffix '-itis' appears in a wide range of medical terms describing inflammation, including gastritis, meaning inflammation of the stomach.

Prefixes and suffixes can also be combined to form a medical term. Anaemia is a term used in medicine to describe reduced red blood cells. This term is created by the combination of the prefix 'an-', meaning no, not without, and the suffix '-aemia', meaning condition of the blood. Tachypnoea is a medical term used to describe fast breathing. It is created by combining the prefix 'tachy-', meaning fast, with the suffix '-pnoea', used to describe breathing.

The final word component is a combining vowel. This is usually the letter 'o', which is added to a word root. An example is the medical term cardiology. The root word 'cardi', meaning the heart, is combined with the letter 'o' to form cardio, which is then combined with the suffix '-logy', meaning the study of. Despite the letter 'o' being the most common combining vowel, 'e and i' are occasionally found in medical terms, with 'a and u' being less common.

Activity

Can you break down the word disinfection?

Dis meaning ______________
Infection meaning ___________
Disinfection: free from infection

To summarise, our understanding and recall of medical terminology can be enhanced by recognising that the building blocks of medical terms are typically a root word and either a prefix and/or a suffix, and that where the process of affixation has taken place, there will often be the use of an adjoining vowel. Once we are aware of these principles, we can break down and comprehend quite difficult and lengthy terms such as those in Table 12.6.

Pronunciation of medical terms

For healthcare professionals it is essential that the correct pronunciation of medical terms is used. Information that is being provided needs to be clearly understood and this helps to avoid any errors or confusion from occurring. Despite appearing daunting at first glance, medical terminology is not difficult to grasp with practice and exposure. The systematic use of component words allows for ease in pronunciation. The complexity occurs with some letters being pronounced differently in some words, with pronunciation rules not the same for all terms. The majority of terms can be pronounced phonetically, though there are exceptions which are best discovered with experience. There are many different study tools that will assist with pronunciation, such as apps, websites, and discussion with medical professionals.

Table 12.6 Putting it all together.

Word	Prefix	Root word	Combining vowel	Suffix
Intravenous	Intra	-ven	No combining vowel	-ous
Osteoarthritis	Oste, 'bone'	-arthr, pertaining to limbs	'o' in this instance	-itis, inflammation

Forming plurals

Although forming plurals in medical terminology can be problematic, most plurals will follow normal English language guidelines, such as changing words ending in *y* to *ies* (pregnancy/pregnancies). However, it is important to be aware of exceptions to these rules that are accepted in common medical terminology. Table 12.7 provides some examples of nonconventional plurals.

Eponyms

Eponyms are not just an interesting part of medical terminology, they are an interesting part of language itself. An eponym is a word that is derived from the name of a real person, a mythical character, or a fictitious person, and can be identified as a medical procedure, disease, body part, or medical instrument (Duque-Parra et al. 2006). Usually an eponym is associated with the first person to identify the procedure, instrument body part, or disease. However, it can also be named according to the first person to reflect a common interest.

Although widely employed in English-speaking countries, the use of eponyms can cause problems in identification and meaning, as some eponyms have multiple meanings and others do not describe the location, shape, or structure of a feature, like so many other medical terms.

Although discouraged, the use of eponyms is sufficiently widespread in the medical field that clinicians must be familiar with their usage. In Table 12.8 you will find a small number of eponyms to increase your awareness of the notion.

Table 12.7 Forming plurals.

Singular word	Singular word ending	Plural rule	Plural word
Deformity	-y	Drop the *y* and add *ies*	Deformities
Stimulus	-us	Drop the *us* and add *i*	Stimuli
Lumen	-en	Drop the *en* and add *ina*	Lumina
Enterobacterium	-um	Drop the *um* and add *a*	Enterobacteria

Table 12.8 Eponym examples.

Eponym	Meaning	Named after
Down syndrome	A genetic disorder affecting the 21st chromosome	John Langdon Down (1828–1896)
Fallopian tubes	The tubes that carry the ova to the uterus	Gabriele Falloppio (1523–1562)
Wrigley's forceps	Obstetric forceps used to provide traction when the baby's head is on the perineum	Arthur Wrigley (1904–1984)
Addison's disease	An endocrine disorder (adrenal insufficiency)	Thomas Addison (1793–1860)
Alzheimer's disease	A chronic neurodegenerative disease	German neurologist Alois Alzheimer (1864–1915)

Interestingly, the word *eponym* itself, like so much of the medical terminology we have already covered, originates from ancient Greek. The Greek word eponymous means 'giving name' (Duque-Parra et al. 2006). There are thousands of eponyms in common usage today and a study of their origins often yields a fascinating insight into historical culture and development.

Anatomical positions

A number of anatomical positions exist, which are described in Table 12.9. However, the first position for discussion is known simply as 'the anatomical position'.

When a person is presented facing forwards, feet flat on the floor, arms by their side, and palms facing forward, this is known as the anatomical position (Figure 12.1). It is used to avoid any confusion when describing areas of the body. From this position, any movement or location of the body can be precisely described without any confusion using common movement terminology.

Other medical terms are used to describe other patient positions. This can be helpful when describing the position a patient was found in, or may be used to assist in treating a patient with a certain diagnosis. For instance, a patient with a head injury will ideally be transported in a supine position with the head slightly elevated; a patient who is having trouble maintaining their own airway may be transported in the lateral position. It is important to include positions in any reports on the patient.

Anatomical directional terms

When viewing a map we use the cardinal directions (North, South, East, and West) to locate regions and assist with directions. We can consider the human body as a map and use directional terms to locate and describe body regions. Despite the patient's position, directional terms are derived from a patient in the anatomical position (see previous section and Table 12.10).

As a general rule, these terms are paired with their opposite:

- *Superior and inferior*. Superior means above, whilst inferior means below. The knee is superior (above) the foot, the hand is inferior (below) the elbow.
- *Medial and lateral*. Medial indicates towards the midline of the body, whilst lateral indicates away from the midline. Of the different ligaments in the knee, the medial collateral ligaments are on the *inside* of the knee joint, joining the tibia to the femur, whilst the lateral collateral ligaments are on the *outside*, joining the fibula and the humerus.
- *Anterior and posterior*. Anterior means towards the front, whilst posterior means towards the back. The sternum bone in the chest is anterior, whilst the spine is posterior.

Table 12.9 Anatomical positions.

Position	Description
Supine	Body is lying face up
Prone	Body is lying face down
Lateral	Body is lying on either side (left or right)
Semi-recumbent	Partially reclined, head of bed at 45°
Trendelenburg	Lying down, legs elevated, face up
Sitting	You are probably doing it right now

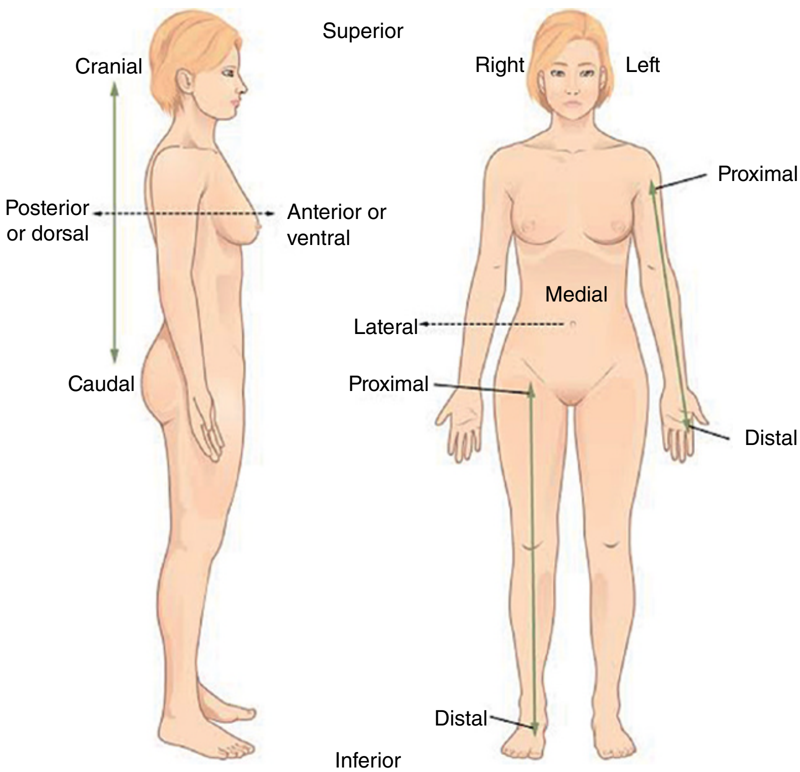

Figure 12.1 The anatomical position.

Table 12.10 Anatomical directional terms.

Superior	Above
Inferior	Below
Midline	An imaginary vertical line that divides the body (down the middle)
Medial	Towards the middle
Lateral	Towards the side
Anterior/ventral	Towards the front
Posterior/dorsal	Towards the back
Proximal	Towards the attachment/origin of a limb
Distal	Farther from the attachment/origin of a limb
Superficial	Towards/close to the body surface
Deep	Away from the body surface

- *Proximal and distal:* Proximal means closest to the point of origin or the trunk of the body, whilst distal means farther away, towards the extremities. When describing an arm, the elbow is proximal compared to the distal wrist.
- *Superficial and deep:* Superficial means towards the body surface, whilst deep is away from the body surface. When describing burns we use the terms superficial burn (on the surface) or deep burns (full thickness).

Anatomical planes

A plane is an imaginary line, vertical or horizontal, that dissects through the body in an anatomical position (see Figure 12.2). The division of the body or parts allows us to describe the view from which we study the patient.

- A sagittal or median plane runs from front to back, dividing the body into left and right.
- A frontal or coronal plane runs from side to side, dividing the body into dorsal (back) and ventral (front) parts.
- A transverse or axial plane is a cross-section through the body or limb, dividing the body into upper and lower.

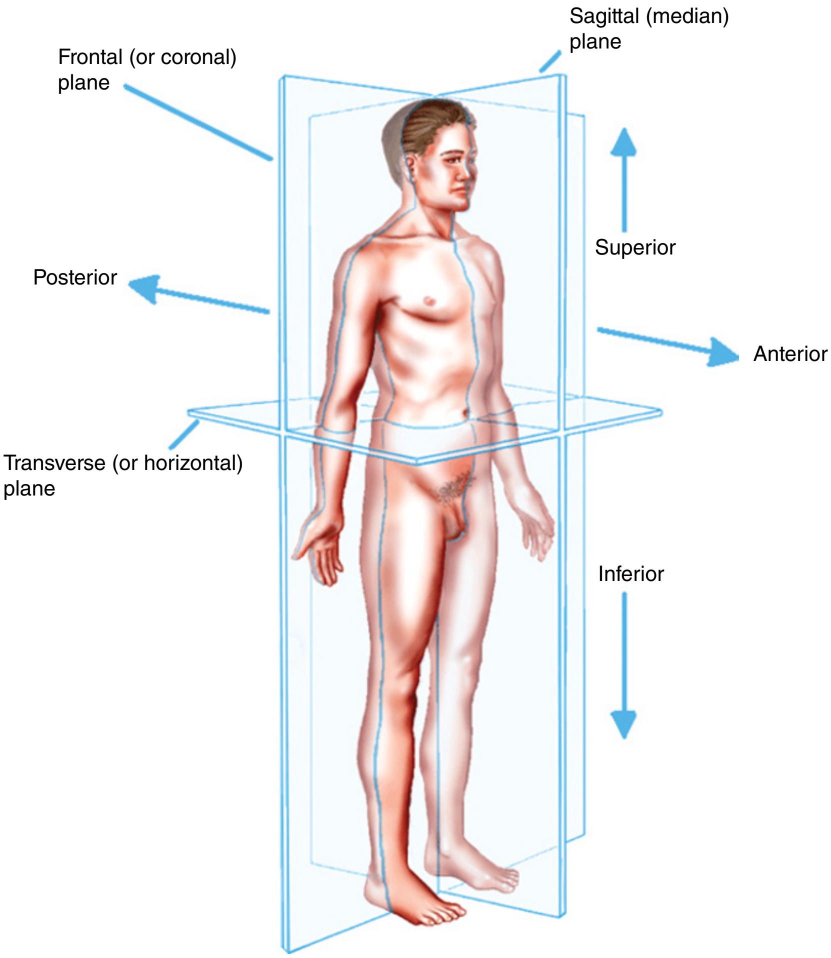

Figure 12.2 Anatomical planes.

Movement terminology

Muscular contractions and relaxation produce movement of joints and subsequently mobility of the skeleton. These actions can be accurately described using anatomical movement terminology (Table 12.11). As a reference point we use the anatomical position, as stated earlier.

Flexion and *extension* are movements that occur in the sagittal plane, describing the increasing and decreasing angles between two body parts. Flexion describes the movement that decreases the angle between two parts, e.g. the movement of your forearm towards your shoulder, decreasing the angle between your ulna and radius and your humerus. Extension is the opposite, increasing the angle between two parts. So in this example, straightening of your arm increases the angle between your forearm and your humerus.

Adduction and *abduction* are terms used to describe the movement *towards* and *away* from the midline of your body. They can also be used in relation to fingers and toes, although the midline used here is not the body but rather the hand or foot. Adduction is movement towards the midline, whilst abduction is the opposite, movement away from the midline.

Internal and *external* rotation describes movement of limbs on their long axis. Internal rotation is movement towards the midline, e.g. internal rotation of the hips will rotate a straight leg to point the toes inwards. External rotation is the opposite, pointing the toes out.

Pronation and *supination* are terms used to describe movement of the hands, in regard to which way the palms are facing, but are also shared with the rest of the body. If the body is laying on its back, it is said to be in the supine position; similarly, if the palms are facing up, then this movement is supination. Likewise, lying facedown is referred to as prone, and the movement of pronation will rotate the palms to face downwards.

Medical abbreviations and acronyms

With the proliferation of medical English, some English acronyms have actually become accepted nouns. Acronyms such as CT (computed tomography), MR (magnetic resonance), PCI (percutaneous coronary intervention), and AIDS (acquired immunodeficiency syndrome) are commonly used by non-English-speaking clinicians. Considering the initials that the letters represent do not translate to their spoken language, the acronyms have become nouns. There are exceptions, however. France refers to AIDS as SIDA, which represents the translated acronym in French, and Russia refers to it as SPID, again reflecting the order of the corresponding words in the Russian language (Wulff 2004). There is a list of medical abbreviations in Table 12.12.

Table 12.11 Anatomical movement.

Flexion	Bending of a part or movement that decreases the angle between two body parts
Extension	Straightening movement that increases the angle between body parts (opposite to flexion)
Adduction	A motion that pulls the body part towards the midline of the body
Abduction	A motion that pulls a body part away from the midline of the body
Internal rotation	Pointing toes or flexing forearm inwards
External rotation	Pointing toes or flexing forearm away from midline
Pronation	Rotation of the forearm that points the palm downwards
Supination	Rotation of the forearm that points the palm upwards

Table 12.12 Medical abbreviations and acronyms.

Abbreviation	Meaning
AAA	Abdominal aortic aneurysm
ABG	Arterial blood gas
ACS	Acute coronary syndrome
AED	Automatic external defibrillator
AF	Atrial fibrillation
AICD	Automated implantable cardioverter defibrillator
ALOC	Altered level of consciousness
ALS	Advanced life support
AMI	Acute myocardial infarction
APO	Acute pulmonary oedema
AV	Atrioventricular
BGL	Blood glucose level
BLS	Basic life support
BP	Blood pressure
bpm	Beats per minute
BSA	Body surface area
BVM	Bag-valve-mask
CAD	Coronary artery disease
CCB	Calcium channel blocker
CCF	Congestive cardiac failure
CCU	Coronary care unit
CHF	Congestive heart failure
CNS	Central nervous system
c/o	Complaining of
CO	Carbon monoxide
CO_2	Carbon dioxide
COPD	Chronic obstructive pulmonary disease
CPAP	Continual positive airway pressure

(*Continued*)

Table 12.12 (*Continued*)

Abbreviation	Meaning
CPG	Clinical practice guideline
CPR	Cardiopulmonary resuscitation
CSF	Cerebrospinal fluid
CT	Computerised tomography
CVA	Cerebrovascular accident
DCCS	Direct current countershock
DCI	Decompression illness
DIC	Disseminated intravascular coagulation
DKA	Diabetic ketoacidosis
DM	Diabetes mellitus
DOA	Dead on arrival
DVT	Deep vein thrombosis
ECG	Electrocardiogram
ENT	Ear, nose, and throat
$EtCO_2$	End-tidal carbon dioxide
ETT	Endotracheal tube
FAST	Focused assessment with sonography for trauma
FG	French gauge
FiO_2	Fractional inspired oxygen concentration
FRC	Functional residual capacity
GA	General anaesthetic
GABA	Gamma amino butyric acid
GCS	Glasgow coma scale
GI	Gastrointestinal
GIT	Gastrointestinal tract
GTN	Glyceryl trinitrate
Hb	Haemoglobin
HI	Head injury

Table 12.12 (*Continued*)

Abbreviation	Meaning
HR	Heart rate
Hx	History
IM	Intramuscular
IO	Intraosseous
IV	Intravenous
ICC	Intercostal catheter
ICD	Implantable cardioverter defibrillator
ICP	Intracranial pressure
ICS	intercostal space
ICU	Intensive care unit
IDC	In-dwelling catheter
IHT	Interhospital transfer
ILCOR	International Liaison Committee on Resuscitation
INR	International normalised ratio
IPPV	Intermittent positive pressure ventilations
J	Joules
JVP	Jugular venous pressure
kg	Kilogramme
LBBB	Left bundle branch block
LLQ	Left lower quadrant
L/min	Litres per minute
LMA	Laryngeal mask airway
LOC	Loss of consciousness
LUQ	Left upper quadrant
LVF	Left ventricular failure
MAOI	Monoamine oxidase inhibitor
MAP	Mean arterial pressure
MCI	Multicasualty incident

(*Continued*)

Table 12.12 (*Continued*)

Abbreviation	Meaning
mg	Milligramme
MI	Myocardial infarction
min	Minute
ml	Millilitre
mmHg	Millimetre of mercury
mmol	Millimole
MOI	Mechanism of injury
MV	Minute ventilation
Mx	Manage/management
NAD	No abnormality detected
NEB	Nebulised
NG	Nasogastric
NMDA	N-methyl D-aspartate
NOF	Neck of femur
NPA	Nasopharyngeal airway
NSAID	Nonsteroidal anti-inflammatory drug
NSTEMI	Non-ST-elevation myocardial infarction
O/A	On arrival
O/E	On examination
OPA	Oropharyngeal airway
PAC	Premature atrial contraction
$PaCO_2$	Partial pressure of carbon dioxide (arterial)
PaO_2	Partial pressure of oxygen (arterial)
PCI	Percutaneous coronary intervention
PE	Pulmonary embolus
PEA	Pulseless electrical activity
PEARL	Pupils equal and reactive to light
PEEP	Positive end expiratory pressure

Table 12.12 (*Continued*)

Abbreviation	Meaning
PHx	Past history
PJC	Premature junctional contraction
PPE	Personal protective equipment
PPH	Postpartum haemorrhage
PSA	Perfusion status assessment
Pt	Patient
PVC	Premature ventricular contraction
RBBB	Right bundle branch block
RLQ	Right lower quadrant
ROSC	Return of spontaneous circulation
RSA	Respiratory status assessment
RSI	Rapid sequence induction
RTC	Road traffic collision
RUQ	Right upper quadrant
RV	Right ventricle
Rx	Treatment
SA	Sinoatrial
SAH	Subarachnoid haemorrhage
SCI	Spinal cord injury
SFM	Simple face mask
SOB	Short of breath
SpO_2	Saturation of haemoglobin with oxygen
SR	Sinus rhythm
SSRI	Selective serotonin reuptake inhibitor
STEMI	ST-elevation myocardial infarction
SUBCUT	Subcutaneous
S/S	Signs/symptoms
SV	Stroke volume

(*Continued*)

Table 12.12 (*Continued*)

Abbreviation	Meaning
SVT	Supraventricular tachycardia
TBI	Traumatic brain injury
TCA	Tricyclic antidepressants
TCP	Transcutaneous pacing
TIA	Transient ischaemic attack
TKVO	To keep vein open
TPT	Tension pneumothorax
Tx	Transport
URTI	Upper respiratory tract infection
UTI	Urinary tract infection
VF	Ventricular fibrillation
VSS	Vital signs survey
VT	Ventricular tachycardia
WNL	Within normal limits
WOB	Work of breathing
#	Fracture
1/60	One minute
1/24	One hour
1/7	One day
1/52	One week
1/12	One month
<	Less than
>	Greater than

Common similarities in terminology

There are several word roots in medical terminology that can be easily confused without a degree of attention, and it can be difficult to distinguish their meanings. This means it is imperative to pay close attention to the root words to ensure the correct message is communicated. In Table 12.13 you will find some commonly confused medical word roots.

Table 12.13 Common similarities.

Agonist – a type of pharmacological agent that stimulates cellular activity	Antagonist – a substance that inhibits or counters the action of another substance	
Cyst/o – cyst or sac of fluid	Cyt/o – the word root for cell.	
Dysphasia – disorder of speech	Dysphagia – difficulty swallowing	
Ileum – part of the intestinal tract	Ilium – the pelvic bone	
My/o – muscle	Myc/o –fungus	Myel/o – spinal cord or bone marrow

Table 12.14 British versus American spellings.

British	American
Oedema	Edema
Haematology	Hematology
Paediatrician	Pediatrician
ECG	EKG

Spelling – British versus American English

There are often two acceptable ways of spelling medical terms in British and American English (Australia adopts the British spelling).

Spell checks will often autocorrect words to the American spelling and will not adopt or acknowledge any silent vowels in British English (meaning that the silent 'o' or 'a' is not spelt out). The other major difference to note is that American spelling will spell words with a 'k' whereas British spelling will utilise a 'c'.

Although these differences are easy to identify and pose no real threat of miscommunication, an awareness of these differences is paramount in accurately communicating in medical language.

You will find some common examples in Table 12.14.

Conclusion

In order to effectively communicate accurately and clearly in the prehospital setting, paramedics and emergency medical technicians need to possess a basic understanding of medical terminology. By exploring and familiarising ourselves with common grammatical rules and word structure, we can understand medical terms and use them more efficiently and accurately, thus improving patient care in the prehospital setting.

This chapter has provided an introduction to medical terminology, describing its origins in Greek, Latin, and Arabic; the building blocks by which different medical terms are constructed; an overview of some of the principles for identifying and understanding medical terms; and a guide to some of the acronyms widely employed. In the process, we have seen how medical terminology is a rich and multilayered language whose roots in other cultures continue to influence and shape the way medicine is studied today.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. What is a prefix?
2. What is a suffix?
3. What does the word root '-itis' mean?
4. Which body part is represented by cardi/o?

Activity 12.1

Break down the following medical terms to decipher their meaning:

Tachycardia ____

Gastritis ____

Dyspnoea ____

Cardiovascular ____

Activity 12.2

Describe a circumstance where inappropriate pronunciation or misspelled medical terminology could be detrimental to a patient's condition.

Glossary

1/52:	1 week
ALOC:	Altered level of consciousness
BGL:	Blood glucose level
RxBA:	Treatment before ambulance arrives
CCF:	Congestive cardiac failure
DKA:	Diabetic ketoacidosis
NSAID:	Nonsteroidal anti-inflammatory drug
NSTEMI:	Non St-segment elevation myocardial infarction
PEARL:	Pupils equal and reactive to light
RBBB:	Right bundle branch block

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13

Research methods and paramedic practice

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Learning outcomes

On completion of this chapter the reader will be able to:

- Explain key research methods for paramedic practice.
- Identify opportunities for research in their own practice and formulate an appropriate research question.
- Identify a suitable study design and outline a research plan.
- Contribute meaningfully to ongoing research projects.
- Carry out a critical literature review.

Case study

Whilst sitting on station waiting for the next call, your crewmate engages the team room in a discussion relating to the use of adrenaline during cardiac arrest. One paramedic acknowledges the effect of adrenaline on the human body just before another paramedic makes the statement that there is no strong evidence to support the use of adrenaline during a cardiac arrest situation.

Introduction

Research is important to paramedics as a reliable source of evidence for best practice; it increases the evidence available to practitioners through systematic investigation and scientific evaluation.

This chapter is written with the beginner or intermediate paramedic researcher in mind. It will explore common research designs, discuss how one might first get involved in research, and explore opportunities for undertaking research within the busy schedule of the practitioner. The chapter moves from methods that are more suitable to the beginner in research to those that require larger budgets and research groups. It also considers in detail the research approach that most paramedics encounter in the course of their initial studies: the critical literature review.

The world of research has, over time, developed its own terms, outlined in Box 13.1. Although these terms may sound complicated, the concepts rarely are, and by reading research articles you will soon become familiar with them.

Qualitative and quantitative research

Our first key distinction is between quantitative and qualitative research. **Quantitative** research produces numerical data for the purpose of measurement. This can help in understanding how commonly something occurs in the data set. The data can also be used to determine a correlation, i.e. when two instances tend to occur together. This kind of research is suitable for testing a hypothesis, i.e. a possible explanation that the researcher has previously developed from theory. Good quantitative research is only possible when the researcher already has some understanding of the matter under investigation that can help in interpreting the numerical data.

Qualitative research does not require this level of prior knowledge. Qualitative research is about finding out about a phenomenon through word or observation data. Often qualitative research projects aim for a much

Box 13.1 Common terms used to describe research projects

Quantitative study: A project concerned with measurement. Data that can be analysed with statistics is collected, i.e. findings can be expressed in numbers.

Qualitative study: A project concerned with deeper understanding of issues. Data that is rich in description and concerned with meaning is collected, i.e. findings are expressed through descriptive text.

Retrospective study: A project looking back at something that has already occurred, for example by asking patients to remember a disease outbreak or by looking at routinely collected operating information.

Prospective study: A project that plans to observe something in the future, such as participants' response to being given a substance in a drug trial.

Primary data collection: Information gathering directly from research participants.

Secondary data collection: Information gathering that relies on other sources, such as published materials.

Cross-sectional study: A study collecting data at one point in time (or over a short period), providing a snapshot of the moment.

Longitudinal study: A study collecting data over a longer period of time with repeated data collection/measurements.

deeper understanding of human behaviour, opinions, and emotions than would be possible with quantitative data. Qualitative investigations can also be used to lay the groundwork for the design of a quantitative project. Table 13.1 shows the different kinds of study and data collection that can be conducted using a qualitative or quantitative approach.

Table 13.1 Different types of research studies.

Research method	Type of study	Relation to time	Data collected
Literature reviews	Qualitative or quantitative or both	Retrospective	Secondary
Case reports	Qualitative or quantitative	Retrospective	Primary
Case control studies	Quantitative	Retrospective	Primary
Questionnaire studies	Qualitative or quantitative or both	Retrospective or cross-sectional	Primary
Interview studies	Qualitative	Retrospective or cross-sectional	Primary
Focus group studies	Qualitative	Retrospective or cross-sectional	Primary
Observational/participatory studies	Qualitative	Prospective	Primary
Before-and-after studies	Usually quantitative	Usually prospective	Primary
Studies using routinely collected data	Usually quantitative	Usually retrospective	Secondary
Randomised controlled trials (RCTs)	Quantitative	Prospective	Primary
Longitudinal cohort or panel studies	Usually quantitative	Usually prospective	Usually primary

Many research projects use more than one method. Indeed, our understanding of a process tends to be best when it is supported by evidence from a range of studies – an approach that is sometimes called triangulation (Wisdom et al. 2012).

Most research projects start with a question. It is good practice to develop a question that is specific and that can realistically be answered with the methods and resources available. The easiest way to develop a question is to read other research: this will familiarise you with the puzzles that other colleagues are engaged in, and it will make you think about your own practice.

Ethics

Ethics is an important consideration in research: the same ethical principles of beneficence, confidentiality, informed consent, and nonmalfeasance govern research as well as practice. Under an international voluntary code called the Declaration of Helsinki, researchers must weigh the benefits of research against likely harms to participants (Boulton 2008; Townsend and Luck 2012). In practice, this is usually done by requiring authorisation from a **research ethics committee** – you should check with your employer or educational institution about their local requirements before commencing research on humans, i.e. before collecting primary data.

Practice insight

Get used to reading research in order to become familiar with qualitative and quantitative methods. Make it stimulating by selecting research articles that are of interest to you. Your university will have subscriptions to many journal databases, so accessing articles should not be a problem.

Case reports

A **case report** is a concise report of a single patient's or small group of patients' problems (Patterson et al. 2010). It is compiled by the treating paramedic (or, more traditionally, the emergency doctor). As case reports often focus on unusual or new diseases or injuries, they can mirror social changes and foretell epidemiological developments.

Whilst the use of case reports by paramedics in academic publications is still in its infancy, these are widely used on the internet and in professional publications, and form a good starting point for an aspiring paramedic researcher.

Case control studies

A **case control study** is a development of a case report. It takes cases of ill or injured patients and compares them to 'healthy' individuals, called controls. The purpose is usually to identify a possible cause of the illness or injury. If there is a systematic difference between patient and healthy person, this difference might have either caused or contributed to the illness. Even if the difference is not as clear as affecting all patients or all controls, statistical trends can be sufficient indicators to warrant further investigation. This is the same principle by which the role of smoking in lung cancer was detected: it could be shown that patients with lung cancer were proportionally more likely to be smokers than other members of the population (Paneth et al. 2002).

The main challenge for case control studies is the selection of suitable controls. Control participants should be representative of the population, and they need to be similar enough to the patients to allow a meaningful comparison. If a disease is known to be one of old age, for example, there is little benefit in comparing patients with university students. At the same time, if the controls are too similar ('matched' too well) to the patients, then a causal factor might be missed in the comparison – such as old age in the previous example. Random selection of controls from the population (see later discussion) can be one way to reduce bias.

If you wish to carry out a case control study, you need to think about the selection and recruitment of controls early on. In practice, you would need to find healthy volunteers to compare against patients. As case controls are something of a fishing expedition for possible causal factors, you will also need to ask both patient and control participants as many questions about the circumstances of their affliction and their lifestyle as possible.

Questionnaire studies

Questionnaires are commonly used for obtaining information about facts and opinions. A census is a questionnaire study sent to every individual in a population, whilst a survey is targeted at a sample of the population. Often researchers use questionnaires because of their relatively low cost and time requirements, but there are some important pitfalls to avoid in designing a questionnaire study.

You will probably be aware of the most common types of survey questions. Open (qualitative) questions that allow the participants to write in any answer they wish can be contrasted with closed questions that only allow a limited number of answers, such as yes/no or a multiple-choice selection (Boynton and Greenhalgh 2004). A popular matrix format is called a Likert scale, where the participant will rank a number of statements on a five-point scale (usually these are 'strongly agree', 'agree', 'undecided/don't know', 'disagree', 'strongly disagree'). Closed questions allow for statistical analysis, whilst open questions normally do not.

Practice insight

Research questions start with curiosity and enquiry. Raising questions and engaging in research-based conversations whilst on standby or on the ambulance station can help a paramedic move from enquiry to research.

It is important to arrange questions in a logical order. Not only will grouping questions make matters easier for participants, but it can also prevent 'leading' them to one or the other statement. People typically have conflicting views, motivations, and perceptions, particularly in matters of opinion. A previous question can shape how they think about questions to come. Therefore, you should always ask about general principles before asking about more specific issues. Similarly, ask about factual issues before asking about behaviour, and ask about behaviour before beliefs and opinions. Leave questions that may trigger an emotional reaction until later – in person, you are more likely to have built a rapport with the participant at this stage, and even on paper, starting with a sensitive question may deter participants.

The phrasing of questions must not lead the participant, i.e. favour a particular answer. If the question is closed, make sure that all possible answers are available. Avoid double-barrelled questions, ambiguous terms, or negative phrasing. Do not ask questions that make unreasonable assumptions or might not be understood by someone from a different culture. You should use simple questions and a simple layout wherever possible. See Table 13.2 for further illustration.

It is rarely possible to contact all members of a population and a sample has to be selected instead. If working alone on a study, your sample might be every patient you encounter in your ambulance, or it may include every patient seen by the service over a period of time. Larger and appropriately funded studies will require more thought to be spent on sample size. For a quantitative study, this would involve a sample size calculation by a statistician.

It is best if the sample is as representative of the overall population as possible, so that one can draw wider conclusions from the study. This is normally most likely to be the case when the sample is selected randomly.

Table 13.2 Typical errors in questionnaire design.

Type of error	Poor phrasing	Better phrasing	Reason
Leading question	Did you receive good service?	Did you receive good service or bad service?	Phrasing can imply that good service is more likely
Too few answers	How severe was your pain? *Very severe, severe, mild*	How severe was your pain? *Very severe, severe, mild, no pain, do not know*	Participant may not have felt pain, or may not remember or wish to say
Double-barrelled	Rate how efficient and friendly our service was today	(1) Rate how efficient our service was today (2) Rate how friendly our service was today	Service might have been efficient but unfriendly, or friendly but inefficient
Unreasonable assumption	Have you stopped beating your spouse yet?	(1) Are you married? (2) If yes, have you ever beaten your spouse? [Warning: very sensitive!] (3) If yes, do you expect this to happen again?	Assumes that person beats their spouse Likely to be interpreted as an insult
Vague	How much do you drink per week?	In an average week, how many units of alcohol do you drink? (Assist with calculation of units)	Participant may quantify in amount of fluid drunk (10 beers), amount of money spent (£50 worth), or units of alcohol
Negative phrasing	Do you never wear a cycle helmet?	Have you worn a cycle helmet one or more times in the past year?	Unclear whether a 'yes' answer to the first question means 'yes, never' or 'yes, I wear a helmet'
Ambiguous	Are you physically active?	During the last month, how many minutes were you physically active (at work or leisure) on an average day?	Unclear what level of activity constitutes being 'physically active'

A selection is random, when every person in the population has an equal likelihood of being selected for inclusion. In practice, this means that the decision between inclusion or exclusion should be left to chance. There is now a variety of excellent and free research websites that can assist with random sample selection, including random number generation.

Surveys can be delivered by post, telephone, the internet, or in person. Postal surveys can be sent to large groups of people, but suffer from a very low response rate (typically below half).

Telephone surveys are more time-consuming, and those who agree to take part in telephone surveys are disproportionally people with time on their hands. The internet is able to reach a large number of people, but response rates to online surveys are not high. Where the survey is advertised on a website or, worse, via mass emails, there will be some selection bias: only people with a relatively strong interest in the topic will respond, whilst a silent majority with different views will desist. Email surveys have a lower response rate than postal surveys (Shih and Fan 2009).

Obtaining answers to a questionnaire in person has by far the highest response rate, but is very time-consuming for the researcher. If your plan is to deliver a questionnaire in the ambulance, consider whether the patient realistically will be able to consent to and concentrate on a survey in this situation. If you ask the patient to take the survey to hospital and home, make plans for them to post it back to you, and expect a low response rate.

Interview studies

A structured interview is little more than a questionnaire, involving pre-prepared questions. An unstructured interview is an open invitation to the participant to talk freely about a topic and any aspect of it that they wish to address. For a beginner, a semi-structured approach is the best starting point. Here, you prepare a list of topics and some specific questions to take to the interview, but you then have a conversation with the participant. It is the interviewer's job to keep the conversation focused on the topics of interest, sometimes asking the pre-prepared questions. As long as the participant is speaking on topic, it is best not to interrupt unnecessarily. Where you feel that a statement is unclear, ask a follow-up question, even if it is not on your list.

It is common practice to audio record an interview, for which you must obtain the written consent of the participant before commencing the interview. Once you have completed the interview, it is best to transcribe it and then complete a thematic analysis of the content – much as you would do for a **literature review**. There are a number of good software products for thematic analysis available commercially.

The most common selection strategy for interviews is a purposive approach, where participants are invited who are most likely to have valuable insights into a topic. Random selection is unusual because of the small numbers recruited to most interview studies. Where participants are hard to reach, for example because they are homeless or because they are a powerful elite, a snowball technique can assist in recruitment (Sadler et al. 2010). This involves asking every person who has already agreed to take part whether they know someone else who it would be relevant to interview. Unless you are recruiting participants in a clinical setting or you are dealing with some particularly marginalised populations, such as the homeless, it is most effective to send potential participants an explanatory invitation letter before telephoning them about possible participation. Ideally, a study will keep recruiting participants until no significantly new themes emerge in new interviews – a state of affairs that is called data saturation.

Focus group studies

Focus groups involve inviting several participants to engage in the research process at the same time and asking them to discuss an issue. This way, you will find out what the participants can agree on through discussion, and you will also discover the issues on which they openly disagree.

The researcher acts as a facilitator and moderator to the discussion. The procedure is similar to interviews: the most straightforward recruitment approach is purposive; it is best to semi-structure the discussion with pre-prepared topics and some questions; you should audio- or video-record the discussion; and you should transcribe and conduct thematic analysis on the recording. The practice of conducting focus groups instead of interviews simply to save time should be avoided. It results in a loss of detail and focus groups can deter participants from speaking about views or practices that embarrass them.

Observational and participatory studies

An observational study involves watching participants in action, whilst a participatory design involves taking part in the human activity under study. An observational study of community first responders might involve following such a person for several hours a day like a 'fly on the wall' and noting observations

(Fitzpatrick and Boulton 1994). A participatory study of the same would involve volunteering/working as a community first responder for a while, and then writing about this. The longer you spend with a research participant, the less likely they will be to change behaviour due to your presence, especially when observing actions that form part of daily routines (O'Reilly 2012). Almost uniquely to paramedical research, there is also the possibility of observing behaviour in simulated settings, such as studies that examine participants' practice on physical models (Woollard et al. 2008).

Before-and-after studies and routinely collected data

A before-and-after study – as the name suggests – compares data before and after an event, most commonly a change in practice or service. Data is collected, then a change in the service provision is made, and then further data is collected. For example, when regional trauma centres were first introduced in Britain, a study compared patient survival rates before and after their introduction (Nicholl and Turner 1997).

Before-and-after designs are particularly suitable where changes are too systemic and far-reaching to be investigated on a patient-by-patient basis. However, such studies are very limited, as there is no reliable mechanism for controlling confounding factors and demand for prehospital care fluctuates substantially from day to day and year to year (Martin et al. 2012).

Randomised controlled trials

Randomised controlled trials (RCTs) are seen as the most conclusive kind of investigation into the effectiveness of treatments with moderate or limited effectiveness. RCTs compare outcomes for patients receiving a new treatment with outcomes for those receiving either an ineffective treatment, called a placebo, or standard care. Participants in the trial are assigned to treatments by chance, i.e. randomly, and then outcomes are compared. Paramedics are often very positive about the experience of carrying out a trial (Rhys et al. 2018).

One of the hallmarks of RCTs is the allocation to treatment groups by chance, which is called randomisation. Each participant should have the same chance of being allocated to a treatment group. Randomisation is the best safeguard against systematic differences between the treatment and the control group.

Note that this is not the same as random recruitment (discussed earlier), as recruitment to RCTs usually involves advertising freely for volunteers.

Health improvement in response to a medically ineffectual treatment is called the placebo effect (Kaptchuk 1998). As the group receiving the new treatment may have this effect, it is compared against a control group that must also receive a placebo. When administering a placebo is unethical due to the seriousness of patients' conditions, RCTs will administer standard care to the control group instead of a placebo. The placebo effect is strongest when the patient believes they are receiving an effective treatment. Hence, the patient is kept unaware whether they were assigned to the control or the intervention group. This process is called blinding. Similarly, there is a risk that the assessor – typically the research paramedic – of the patient's improvement or deterioration is biased by expectations. Hence, some studies are designed so that the patient's assessor is also unaware which group the patient belongs to. When both patient and paramedic are blind to group allocation, this is called double-blinding.

Analysis of RCTs will always be statistical in nature, and you should not embark on such a project without an experienced statistician who can calculate an appropriate sample size and interpret the statistical significance (or lack thereof) of results.

Longitudinal cohort and panel studies

Longitudinal studies follow participants over a prolonged period of time. Cohort studies follow a group of people who share the experience of an event in a selected time period. The most typical arrangement is that cohort studies follow a group or cohort of people born within a year in one area. By contrast, a longitudinal panel study will merely follow a smaller sample of the group. Methods used in longitudinal studies may vary, and often include questionnaires and physical measurements of health. The key advantage of longitudinal studies is that they allow examination of the effects of time and of long-term factors contributing to ill-health. However, by the same token, longitudinal studies take a long time to complete, experience a high dropout rate due to the need for follow-up over time, and are accordingly extremely expensive. In order to take part in a longitudinal study, you would need to be part of a research team that has secured long-term funding.

Critical literature reviews

Each of the research approaches described here will start with a literature review – a critical survey of all the authoritative material currently published on a topic, and an evaluation of how far this literature provides a full and robust account of that topic or leaves gaps for further investigation and collection of new data (Griffiths and Mooney 2011; Aveyard 2014). This is important, as obviously the more comprehensive a literature review is, the less likely it is that a research project will unnecessarily repeat existing work.

Paramedic students are usually tasked with undertaking a literature review as a core part of their studies and as a first step in engaging with the research process. Students will normally undertake a literature review in the form of a dissertation or assignment, where they will be required to summarise the existing evidence based on a defined topic. Accordingly, the last section of this chapter will outline the steps you need to take for writing a successful literature review.

Step 1: The topic of the literature review

It may be that you are assigned a topic for your literature review or that you have scope to decide your own. If the latter, aim for a topic that is relevant to your practice, but not too broad. For example, if you were interested in paramedic students' experience of attending major incidents, it may be helpful to restrict the scope of the research to certain categories of major incident, or to focus on a particular aspect of paramedic students' experience such as their decision-making processes. You will be given opportunities to discuss your topic with university tutors and peers, which will help you to refine the focus.

Step 2: Searching for the literature

It is important that your critical literature review identifies the most appropriate literature in a systematic manner. This includes finding the most up-to-date literature; often, locating all relevant literature from the last 10 years is sufficient for a critical literature review, as this will tend to encompass or supersede any earlier material.

To help you locate the literature, you can draw on a number of relevant publication databases. Your access to databases will depend on your institution or employer – a librarian can advise – but paramedic students will generally have access to the databases PubMed and CINAHL (Cumulative Index to Nursing and Healthcare Literature). Electronic databases are searched with search terms in a process that is similar to a common internet search, except that database searches employ 'Boolean operators' and inclusion and exclusion criteria. Boolean operators (named after the nineteenth-century mathematician George Boole) are simply the terms AND, OR, and NOT. To use these effectively with your search terms, the steps you should take are as follows:

- Identify the key words that describe the issue you are interested in (e.g. paramedic and major incident and decision-making). It is important to be aware of synonyms and to include these in your search (e.g. *paramedic* and *pre-hospital professional; major incident* and *mass casualties*).

Table 13.3 Example search strategy.

Synonyms		Synonyms		Synonyms
Alcohol	AND	Paramedic	AND	Falls
OR		OR		OR
Drink		Ambulance		Fall accidents
OR		OR		
Ethanol		Emergency medicine		
Complete search string: (alcohol OR drink* OR ethanol) AND (paramedic OR ambulance OR emergency medicine) AND (falls OR fall accident*)				

- Then connect the key words and synonyms with the Boolean operators. When two words are connected with AND, a database search engine will only return papers that contain *both* words. When two words are connected with OR, the search engine will return articles containing either term or both. When a word is preceded by NOT, the search will not return any paper containing this word. Hence, OR broadens the search, whilst AND and NOT narrow the range of results returned. An illustration is given in Table 13.3.

You may now need to add inclusion and exclusion criteria to your search. These are effectively filters enabling you to rule certain studies in or out of consideration. These criteria include language of publication (usually all studies not in English would be excluded); publication date (usually only literature produced 5–10 years from the date of your search would be included); and nature of the study (you might choose to include only qualitative studies, for example).

Designing a good search protocol usually requires time and effort to refine the search and adjust the key terms and inclusion/exclusion criteria. An overly broad search that returns thousands of papers is as useless as an overly narrow search that returns no result.

Step 3: Critical appraisal of the literature

Once you have completed your literature search, you will be probably be able to exclude some items as less relevant or irrelevant based on a reading of the article abstracts. The remaining articles need to be assessed for their scientific value and their rigour as research. This is best done by applying standardised critical appraisal questions to each article in turn, such as those provided by the Critical Appraisal Skills Programme (CASP). This helpful resource supplies checklists of standardised questions tailored for qualitative and quantitative studies. The checklist for qualitative studies includes such questions as (CASP 2018):

- Was there a clear statement of the aims of the research?
- Is a qualitative methodology appropriate?
- Was the research design appropriate to address the aims of the research?
- Was the recruitment strategy appropriate to the aims of the research?

The checklist goes on to address issues of data collection, research ethics, data analysis, and data reporting. Applying the relevant checklist consistently to each of your selected items of literature is a surefire way to bring rigour and method to your literature review.

Step 4: Thematic analysis and discussion of the findings

Once you have critically appraised the different items of literature and narrowed down your body of literature to the most robust and rigorous research items, you will be able to undertake an analysis of your findings when taken as a whole. If dealing with quantitative literature, this will likely take the form of conducting a meta-synthesis of the findings (collating the different data sources and combining their findings into a greater whole). In the case of qualitative literature, this will take the form of a thematic analysis, in which you draw out the overarching themes and concerns reported in a body of qualitative data. Identifying the themes in a body of data is known as coding, and computer software and various coding packages such as NVivo are available to help undertake this process. However, when conducting a smaller-scale literature review on the kind of defined topic conventionally addressed in a paramedic undergraduate dissertation, it is usually a relatively simple task to complete the thematic analysis by assembling your own theme map or grid and including this in your analysis chapter. An example theme map is given in Figure 13.1.

Step 5: Reaching conclusions and recommendations

Once you have undertaken a thematic analysis of your literature, you should be in a good position to address your initial research question and to indicate to the reader how far the existing literature base covers the core issues, or whether gaps in the research base have been identified. Usually, the conclusions and recommendations

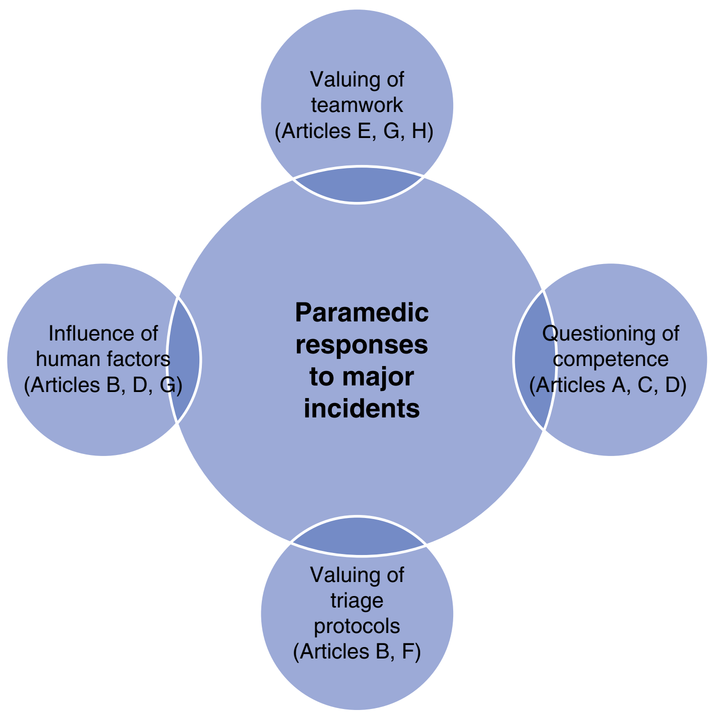

Figure 13.1 Example theme map.

section of your literature review will be your opportunity to confirm the limits of current knowledge on a topic and the areas where new work might helpfully be undertaken to deepen knowledge further.

Undertaking a critical literature review is an excellent introduction and grounding in research, preparing you for a career of research-informed practice. By ranging across a selection of studies from different methodological approaches and research traditions, a literature review enables you to develop a respectful but sceptical approach in dealing with research, equipping you with one of the key tools for effective evidence-based paramedic practice.

Conclusion

This chapter has introduced some of the most common research methods available to the paramedic practitioner and has emphasised the importance of the literature review as a research method employed by most trainee paramedics. Research activity is a journey of personal development – it is advisable to start with specific, answerable research questions and smaller research projects to build links in the research community. Once you are working with other researchers, you can carry on developing the evidence that underpins paramedic practice every day.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. What is research?
2. How do you identify the search terms from your research question?
3. What is random about a randomised controlled trial?

Activity 13.1

What are the main differences between quantitative and qualitative research?

Activity 13.2

In order to practise literature searching, explore your university's databases and search for a subject of interest to you. See how the results are displayed, how many are listed, and the other features that are available to you.

Activity 13.3

Visit the Critical Appraisal Skills Programme website at https://casp-uk.net/. Download the checklist for qualitative and quantitative studies and, selecting one article from the most recent issue of a paramedic practice or healthcare journal, apply the relevant checklist methodically to a selected article.

Glossary

Case control study:	A development on a case report. It takes cases of ill or injured patients and compares them to 'healthy' individuals, called controls.
Case report:	A thorough but concise report of a single patient's or small group of patients' problems.
Literature review:	A systematic method for analysing a phenomenon using published research.
Longitudinal study:	A study that follows participants over a given period of time.
Qualitative research:	Finding out about a phenomenon through word or observation data.
Quantitative research:	Research that produces numerical data for the purpose of measurement.
Randomised controlled trial (RCT):	An experiment that compares outcomes for patients receiving a new treatment with outcomes for those receiving either an ineffective treatment, called a placebo, or standard care. Participants in the trial are assigned to treatments by chance, i.e. randomly, and then outcomes are compared.
Research ethics committee:	A committee of research experts who approve or deny research applications.

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14

Trauma

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Fundamentals of Paramedic Practice: A Systems Approach, Second Edition. Edited by Sam Willis and Roger Dalrymple.

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Learning outcomes

On completion of this chapter the reader will be able to:

- Identify the prevalence of minor and major trauma.
- Summarise the most prevalent forms of trauma a paramedic is likely to encounter.
- Recognise key symptoms of minor and major trauma relating to head, face, neck and back, abdomen, pelvis, and limbs.
- Reflect on the connection between external signs of trauma and the possibility of associated imperceptible injury.
- Identify the key treatments and interventions appropriate in prehospital care for each of these forms of trauma.

Case study

You have been despatched to attend a road traffic collision. On the way to the case, despatch updates you to state that the incident is a motorcycle versus a car. On arrival at the scene you notice a motorcyclist lying still, who appears to have hit the car. On closer assessment the motorcyclist is conscious, looks pale, and has a Glasgow coma score (GCS) of 15. He is complaining of severe pain (10/10) in his pelvic region and is finding it difficult to breathe. You suspect that he has a tension pneumothorax and a pelvic injury. You decompress the chest first, apply oxygen, provide full spinal immobilisation along with a pelvic binder, and strong pain relief followed by rapid transportation to the nearest major trauma centre.

Introduction

The paramedic will attend many traumatic incidents across the span of their career, involving both minor and major trauma. This chapter will provide an overview of the trauma cases that a paramedic is most likely to encounter, including traumatic injury to the face, neck, back, abdomen, pelvis, and limbs.

Head injuries

Each year in the UK 1.4 million people attend accident and emergency departments (A&E) with a head injury, with males making up more than 70% of reported head injuries (NICE 2014). Head injuries, like all injuries, can be either minor or major, and less than 0.2% prove to be fatal (NICE 2014). Minor head injuries, such as cuts and bruises, require at most a few stitches or glue, and 90% of all reported head injuries are classified as minor. However, major injuries such as a fractured skull or bleed on the brain often require intensive treatment and can be potentially life threatening.

Minor head injuries

Minor head injuries do not cause any long-term damage to the brain, a common example being scalp wounds, which may or may not lead to concussion, depending on the mechanism of injury (MOI). Minor head injuries are common in people of all ages and can be caused by the following mechanisms:

- **Falls** – estimated as causing 22–43% of minor head injuries.
- **RTCs** – estimated as causing 25% of minor head injuries.
- **Assaults** – estimated as causing 30–50% of all minor head injuries (NHS Choices 2015).

Injuries to the scalp often look worse than they actually are: a small laceration to the skin of the highly vascular tissues of the scalp may bleed profusely, even when the wound is less than 1 cm long.

Scalp injuries generally stop bleeding with a dressing and firm pressure to the site. Even though the head injury may appear minor, a full neurological assessment must be performed in order to confirm this.

Major head injuries

In the UK, the largest cause of major head injuries is road traffic collisions (RTCs). Other causes include falls, accidents, and assaults (NHS Choices 2015). Serious injuries to the head often cause internal damage with no signs of external injury, making them more difficult to assess. It is important to utilise all the information available to the paramedic when assessing head-injured patients. Look specifically at the patient's level of consciousness, patients with a Glasgow coma score (GCS) of 9–12 or <8 are the majority of fatalities from a major head injury (NICE 2014). Establish if high-impact forces were involved in the injury. Where the patient has been involved in an RTC, check for a bullseye in the vehicle windscreen – a clear sign that the patient's head has collided with the glass.

Major head injuries can also elicit a systemic (whole-body) response due to the control centres of the brain being either directly or indirectly involved. Systematic responses can be present in many head-injured patients, including those with skull fractures, base-of-skull fractures, subdural haematomas, and subarachnoid haemorrhage.

Skull fracture

Skull fractures occur with direct, blunt, and penetrating trauma to the skull, for example in RTCs, sporting injuries, or assaults. A skull fracture can occur anywhere around the cranium and can be a simple fracture with only one break, or a multiple fracture with depressed sections of skull that could damage the brain. A simple fracture that does not involve the brain may be difficult to spot: you may find localised bruising and a small amount of bleeding, but body systems will not be affected. Skull fractures are generally caused by high-impact blunt forces and are often not apparent without in-hospital investigations (e.g. X-ray and computerised tomography [CT] scan).

Base-of-skull fracture

The base of the skull comprises a network of bones located slightly above and behind the nasal cavity that surround, protect, and support the brain. Base-of-skull injuries generally occur with blunt force trauma to the face or to the sides of the skull. As these injuries are associated with high-impact forces, patients will usually present with additional injuries and may be unconscious. There are many indicators that can help form a provisional diagnosis, such as:

- History of trauma to the head or face.
- Major bruising behind the ears (late sign).

- Bruising around both eyes ('Battle's sign'; late sign).
- Bleeding from the ears or nose with cerebrospinal fluid (CSF) present. CSF gives the blood a glossy look and does not mix with the blood, but instead separates from it.

These patients are often seriously ill and require rapid packaging and transport. Diagnosis of a base-of-skull fracture is usually by signs and symptoms; they are difficult to identify using medical imaging (Morgan 1999), making the importance of history taking and assessment paramount.

Subdural haemorrhage

Also known as a subdural haematoma, a subdural haemorrhage is a collection of slow-moving blood below the inner layer of the **dura mater**, which forms around the surface of the brain. Often the result of trauma and sometimes forming spontaneously, these injuries can be slow in progression and patients may appear without symptoms initially (Meagher and Young 2013). The increasing pressure on the brain can lead to:

- Confusion
- Agitation
- Slurred speech

Any patient presenting with these symptoms or other neurological deficiencies (such as poor balance, nausea, or lack of coordination; see Chapter 17, Assessing the Nervous System) that are of new onset since a trauma requires transport to hospital to ensure that appropriate scans are completed, and, if necessary, surgery to repair the bleed.

Subarachnoid haemorrhage

Subarachnoid haemorrhage is bleeding between the brain surface and the fine membranes that surround it. This is generally fast-flowing blood and patients will often present with decreased levels of consciousness, nausea, seizures, and confusion. In this type of injury blood can form rapidly within the **subarachnoid space** and force the brain downwards. This pushes the cerebrum into the brain stem and the body's control centres. It can therefore produce a rapid systemic reaction known as **Cushing's triad** (Figure 14.1), which is a clear sign of raised intracranial pressure (ICP). The three aspects of Cushing's triad are:

- Hypertension
- Bradycardia
- Altered breathing

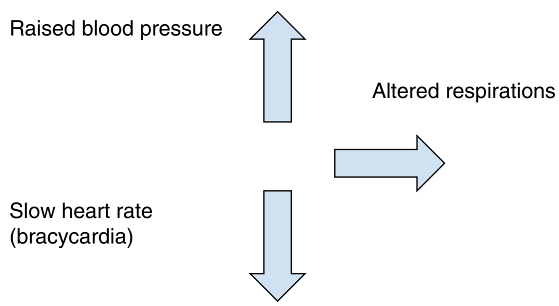

Figure 14.1 Diagrammatic representation of Cushing's triad.

Cushing's triad is a late sign of increased ICP within the skull, and the patient should be transported rapidly to the nearest trauma unit for assessment.

Practice insight

When managing a patient with a significant head injury, *listen carefully* to the bystanders. In all the noise and chaos it is easy to miss vital clues from those who were there when it happened. History taking is so critical when managing the patient with a head injury, as it will not only help the paramedic decide what actions to take and how quickly to apply these, for example to immobilise or not immobilise the patient, but will also allow the receiving hospital to take the necessary course of action, e.g. perform a CT scan.

Facial injuries

Paramedics will treat many facial injuries, ranging from simple lacerations to serious fractures with airway compromise. Injuries to the face include:

- Soft tissue lacerations.
- Temporary or permanent blindness due to trauma affecting the eyes.
- Nasal injuries including epistaxis (nosebleed) and septal deviation following a fight or other high-energy trauma.
- Le Fort fractures of the mid-face involving the mandible.
- Tooth damage and/or tooth loss.

Nasal and mandible fractures can impede the use and efficacy of airway adjuncts, making airway management a challenge in patients with facial injuries.

Laceration

Lacerations can present as small, simple cuts to the skin or deep, long wounds that involve damage to underlying muscular and nervous tissue. Simple lacerations can be cleaned and dressed on scene to guard against infection, but larger lacerations often require transport to the A&E department, where they can be artificially sealed with such items as steristrips, glue, or stitches.

Practice insight

Avoid applying a steristrip or glue to a wound if you have not had the appropriate training. Applying a steristrip is simple, but if the wound is not assessed accurately or cleaned well enough, infections could result. In the case of an isolated minor laceration that requires assessing for minor intervention, refer such minor injuries to the most appropriate unit and avoid referring the patient to the A&E department.

Nasal injury

The nose is highly prone to sustaining trauma due to both its protuberance and the cartilaginous make-up of its main structure. When the nose sustains trauma, it often causes rupturing of internal blood vessels and lacerations. Fractures often cause the nose to be swollen and misshapen. Prehospital treatment of nasal injuries mainly concerns airway management, control of blood loss, neurological assessment, and pain management.

Facial fracture

Jaw fractures can be extremely painful and debilitating, reducing the patient's ability to move and clench the jaw. Fractures of the jaw often involve damage to the teeth and airway compromises due to blood loss or foreign-body airway obstructions. Most jaw fractures are relatively simple in nature and require minimal intervention, but more serious injuries such as a Le Fort fracture may require manual airway management or postural drainage to ensure that the airway is maintained. Fractures to the cheekbone or brow can cause compromises to the eye sockets and severely affect eyesight if mismanaged. Fractures may present with palpable pain, and localised swelling and bruising, which can mask damage to underlying structures through loss of palpable landmarks. As such, any facial injury displaying significant swelling or bruising should be treated as a potentially major injury and transported to hospital for further assessment and treatment, until proven otherwise within A&E. Patients with significant pain, regardless of their condition, should have their pain managed using strong pain relief as soon as possible to make them comfortable.

Practice insight

When assessing for any fracture, use the mnemonic SLIPDUCT B: Swelling, Loss of movement, Irregularities, Pain, Deformity, Unnatural movement, Crepitus, Tenderness, Bruising.

Neck and back injuries

Patients with neck or back injuries must be assessed with the utmost care. Injuries in this region can range from strains of the musculature that supports the neck and back, creating nothing more than discomfort, to serious fractures with the potential for life-changing or life-threatening consequences. It is vital that the paramedic assesses and manages these patients correctly to prevent permanent disability or death.

Ambulance services have begun to apply common-sense approaches to spinal immobilisation in order to minimise harm to patients by putting them through lengthy and unnecessary spinal immobilisation procedures. A commonly used cervical spine (C-spine) clearance tool based on evidence-based criteria was formed by the National Emergency X-Radiography Utilisation Study (NEXUS; Ackland and Cameron 2012). As part of this guideline, patients who present with any of the following should receive spinal immobilisation:

- Midline cervical tenderness
- Altered mental status
- Focal neurological deficit
- Evidence of drug or alcohol intoxication
- Presence of other injury considered painful enough to distract from neck pain

Spinal immobilisation

There remains an absence of strong evidence for the use of spinal immobilisation. The decision to provide spinal immobilisation should be based on clinical findings, patient history, by reading the scene (mechanisms of injury), knowledge of local guidelines, and best available evidence as to which is the best method for spinal immobilisation. Generally speaking, spinal immobilisation requires the following equipment:

- Cervical collar
- Immobilisation device such as a rescue board, scoop stretcher, or ambulance trolley
- Straps (stretcher or rescue board)
- Head blocks and tape

C-spine fractures

Fractures of the cervical spine are potentially life threatening due to this area being the exit point for many important nerves. The nerves that exit the spinal cord along the neck are responsible for the control of the diaphragm and intercostal muscles, and therefore of respiration. If the cord is severed high in the neck, there is a high likelihood that the patient will not survive; if the fracture is lower in the spine, the patient can be left without mobility of the lower limbs. Fractures to the neck or back often present as central spinal pain that worsens on palpation of the cervical spinal processes (the protruding part of each vertebra). If any centralised neck or back pain is present, then the patient should undergo full spinal immobilisation to prevent further damage to the spinal cord, and pain management should always be administered. Fractures where the spinal cord has been damaged may also present with neurological changes, such as:

- Loss/altered sensation
- Loss of movement or peripheral vascular dilation below the injury site
- Tingling sensation

Practice insight

Remember, C3–C5 (nerves C3–C5) keep the diaphragm alive. Be extra cautious when suspecting a patient may have an injury to C3–C5. Even in the absence of neck pain, C-spine immobilisation may be necessary in cases in which there is a high MOI. Manual in-line stabilisation of the head can be achieved with your hands or knees and is important before a cervical collar can be placed.

Cervical collars and immobilisation

A number of ambulance services have moved towards immobilising the spine with soft collars, away from traditional hard or semi-rigid collars, due to reported cases of patient discomfort, tissue ulceration, time delays when measuring the collar, and the potential for increased ICP (Figure 14.2).

When making the decision to immobilise the patient, be sure to consider how long they will need to spend on a hard board. If the time spent on a rescue board is to exceed 20 minutes, consider using a vacuum mattress or immobilising straight onto the ambulance bed to minimise the possibility of pressure sores.

Practice insight

If your patient is to receive full spinal immobilisation, ensure they are given an anti-emetic (anti-sickness medication) for the transport to hospital if this is indicated by your ambulance service. If the patient vomits whilst they are lying flat and strapped to a board, the airway will be soiled so quickly that you might not have enough time to clear it.

Figure 14.2 Application of a soft collar.

Muscular injuries

Muscular injuries of the neck can be incurred through rapid movement of the head in low-velocity impacts, sometimes referred to as 'whiplash' (Skinner and Driscoll 2013). These injuries, whilst temporarily debilitating, rarely have life-changing effects. The pain is caused by localised inflammation of muscle fibres within the neck or back muscles due to tearing/strain through overextending the muscles. These injuries often present as pain to the sides of the neck or back, characterised by being within the muscle with no involvement of the spinal column. It can often be difficult to determine if neck pain is caused by muscular or spinal involvement. If in any doubt, neck pain should be treated as a C-spine injury.

Practice insight

When palpating a patient's spine for tenderness, remember that there are large muscles around the neck area, so be sure to palpate the central vertebral column and not the musculature. Someone with a pulled muscle in the neck should not receive spinal immobilisation.

Chest injuries

Chest injuries caused by high-impact **velocity** can be very serious due to the life-sustaining nature of the contents of the chest. Chest injuries can range from rib fractures to sucking chest wounds or ruptured blood vessels. Due to the difficulties in assessing chest injuries in a prehospital environment, life-threatening injuries can often be misdiagnosed or mismanaged. Amongst the more serious chest injuries are:

- Rib fractures (due to associated complications)
- Flail segment
- Pneumothorax

- Tension pneumothorax
- Haemothorax
- Ruptured blood vessels

Rib fractures

A rib fracture on its own is not considered an emergency. As a stable rib fracture will not be likely to cause any damage to underlying tissues, these are mainly treated with pain management, support, and rest. Rib fractures often present with localised bruising and pain that worsens on inspiration, movement, and palpation. If a patient presents with a rib fracture as well as other signs, such as shortness of breath, hypoxia, or diminished breath sounds on the affected side, suspect damage to the underlying lung.

Flail segment

Flail segment is defined as a fracture of two or more ribs in two or more places. This injury can present with abnormal chest movement (a seemingly floating segment of chest wall that moves separately to surrounding areas), shortness of breath, and acute pain. In the prehospital setting it should be considered a serious injury, with airway support and pain relief being applied promptly.

Pneumothorax

A pneumothorax is an abnormal build-up of air in the space between the pleura (between the lung and the chest wall). There are many different types, including:

- Simple pneumothorax
- Open pneumothorax
- Tension pneumothorax
- Haemo-pneumothorax

A pneumothorax can be caused by underlying pathologies (such as a severe asthma attack) or by surgical or traumatic injuries such as a flail segment or penetrative injury. A *simple pneumothorax* may present with shortness of breath, mild pain, and minimally reduced air entry and hyper-resonance on the affected side. A simple pneumothorax does not require needle thoracocentesis (needle chest decompression).

A *tension pneumothorax* is a severe life-threatening emergency and this patient can rapidly deteriorate. A tension pneumothorax occurs when air collects within the **potential space** between the visceral and parietal pleura, usually due to penetrating trauma to the chest or through the progression of a simple pneumothorax. During a tension pneumothorax, inhaled air does not escape through the normal mechanisms of respiration (through the trachea via exhalation), but remains within the potential space due to a skin flap that prevents exhalation. The collection of air within the potential space starts to compromise respiration and blood flow. The most common symptoms include chest pain and respiratory distress, with decreased air entry and hyper-resonance on the side of the pneumothorax. Late signs of a tension pneumothorax can include tracheal deviation and **surgical emphysema**. The prehospital treatment of this injury is primarily respiratory support, needle thoracocentesis (Figure 14.3, chest decompression), and rapid transportation to an A&E department. In-hospital treatment includes a surgical chest drain or further surgical interventions.

An *open pneumothorax* occurs in any situation where there is a hole in the chest wall and air enters the pleural space through the hole in the chest wall instead of through the usual route. In this situation, a three-sided dressing should be applied to prevent air being sucked in through the hole, but allowing any air to leave. Finally, a *haemo-pneumothorax* is a mixture of both blood and air in the pleural space.

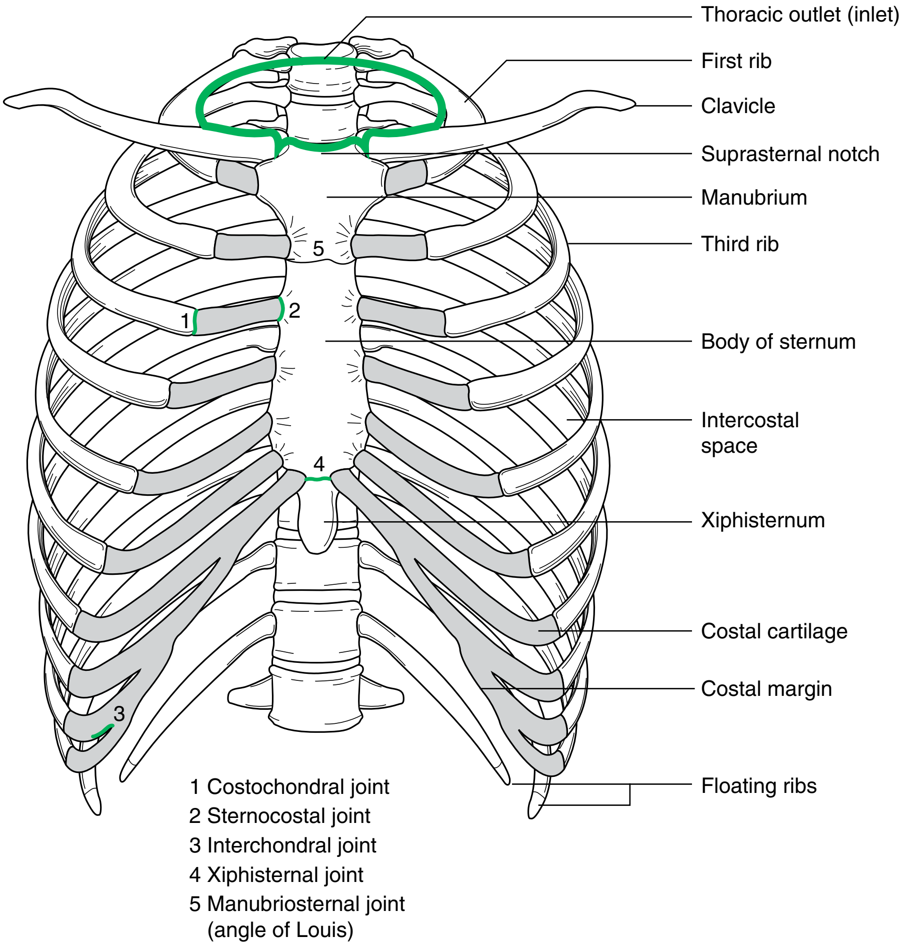

Figure 14.3 Needle thoracocentesis. Source: Manual of Clinical Paramedic Procedures (2010, p. 277, Figure 14.1 Sternal landmarks for needle thoracentesis).

Practice insight

When assessing for a tension pneumothorax, don't forget to **percuss** the chest. This is a vital skill to help determine if a tension pneumothorax is present (see Chapter 19, Respiratory assessment).

Haemothorax

As the name suggests, a haemothorax is bleeding in the thorax or chest. It is a haemorrhage between the lung and the chest wall, within the potential space. Usually caused by trauma (either blunt or penetrative), this collection of blood can then equalise the pressure between the lungs and the pleural space, which decreases the ability of the lungs to expand. As the chest can hold a large amount of fluid, this type of injury can cause significant compromises to both the respiratory and cardiovascular systems. This condition may present with acute shortness of breath, severe pain, reduced air entry, and **hypo-resonance** on the affected side. The gold standard treatment for this type of injury is a surgical chest drain and, as this can only be enacted within hospital, it is the responsibility of the paramedic to ensure rapid transportation to a receiving centre and to provide supportive care, such as airway management, pain management, and close monitoring.

Ruptured blood vessel

The chest contains many important blood vessels, including the aorta and pulmonary veins. In high-velocity trauma these vessels can be highly vulnerable to tearing or rupturing; vast internal bleeding can occur in a short time and death can follow almost instantly. The only way the paramedic will know this is happening is through physical signs and symptoms of shock. Therefore, treatment focuses around managing ABCs (Airway, Breathing, Circulation), including arresting any external haemorrhage and providing fluid and oxygen therapy, in accordance with current guidelines.

Abdominal injuries

Abdominal injuries due to high-velocity trauma have the potential to be fatal due to the density and make-up of the organs within the abdominal cavity. The abdomen contains the lower sections of the aorta and vena cava, and many other significant blood vessels. Injuries within the abdomen may also include injury to the liver and the spleen, and involve internal or external blood loss. Abdominal injuries can leave patients subjected to life-changing effects such as the need for colostomy bags or catheters due to colon or bladder damage.

In the prehospital setting, without the benefit of advanced imaging, abdominal injuries are possibly the most difficult to assess. Assessment should focus mainly on palpation for masses (see Chapter 18), free fluid, and the assessment of pain whilst performing this technique.

Blood loss in the abdomen

The abdomen can store a large amount of fluid in the free space between organs. In practical terms this means that a patient can potentially lose around half of the circulating volume of blood into the abdomen with relative ease. Free blood in the abdomen can cause:

- An almost solid abdominal wall on palpation.
- A dull sound on percussion.
- Reduced bowel sounds on auscultation.
- Extreme pain.
- Hypovolemic shock requiring **fluid replacement** (previously known as fluid resuscitation) with rapid transport to the nearest **major trauma centre**.

Practice insight

Fluid replacement should be used to maintain perfusion to the major organs by the presence of a palpable pulse. If a trauma patient has a palpable radial pulse, cease fluid therapy. After significant or ongoing **hypovolaemia**, blood products and surgery are urgently required.

Open abdominal injury

Some abdominal injuries involve an open cavity in the abdomen, usually caused by penetrating trauma such as stab or slicing wounds. These injuries leave the abdomen exposed to major risk of infection. The rupture of the **peritoneal membrane** and the muscle tissues that ensure that the organs remain in place can allow the intestines to protrude through the wound. Any organs that protrude outside the abdominal cavity should be kept moist and covered by either clingfilm or a blast dressing to ensure that minimal damage is caused. Close monitoring, pain management, and immediate transport to a major trauma centre are required.

Pelvic injuries

The pelvis is a ring-like structure of bone that supports standing, walking, and most simple movements. Pelvic injuries are amongst the most life-threatening injuries and must be assessed and handled carefully. Many major blood vessels run through or around the pelvis, and genito-urinary organs are also contained within and around this structure. Surgical interventions are often required in the case of pelvic fractures such as 'open-book' fractures and hip dislocations. Historically, paramedics were taught to 'spring the pelvis' during an assessment to check for pain and movement, but this practice is now outdated. Signs of a fractured pelvis are sought instead, which include:

- Establishing the MOI
- Urinary incontinence
- Bleeding
- Deformity
- Nerve damage
- The patient will be heavily guarding the area
- Other lower limb injuries such as a fractured femur

Splinting the pelvis with a pelvic binder has been shown to reduce pelvic fractures and provide stabilisation (Clarke and Stewart 2013), making it more comfortable for the patient and minimising any further damage. However, it is important to do so with the minimal amount of movement possible, and the strongest pain relief will be required prior to applying the device.

Open-book pelvic fracture

An open-book fracture is usually caused by high-velocity trauma to the front of the pelvis in the pubic region, as seen in a motorcycle accident. The pelvis is separated at both the front and the back, and this may cause one or both sides of the pelvis to open 'like a book' at the front. Patients with this injury may present with external rotation of the legs, extreme pain, and also life-threatening internal bleeding. Other significant injuries should also be expected and the patient will require rapid packaging and transport. The pelvis will require stabilising using a pelvic splint. Intravenous (IV) fluid in the presence of shock should be administered to maintain radial pulses, and strong pain relief will also be required. This patient should receive full spinal immobilisation.

Hip dislocation

Hip dislocation occurs when the ball-shaped head of the femur comes out of the cup-shaped acetabulum. This injury can often present in a similar way to a neck-of-femur fracture (see next section), with shortening and rotation of the leg on the affected side and pain in the region of the hip joint. It may be possible to feel deformity in the area of the joint, although this is not always present. Paramedic intervention should focus on immobilising the affected leg in the same way as with a neck-of-femur (NOF) fracture and pain management, preferably with the strongest drug available.

Neck-of-femur fracture

The NOF is located at the proximal point of the femur (Figure 14.4). NOF fractures largely affect the ageing population and are more common in elderly women (Filipov 2014). In Australia, there were approximately 16 518 patients over the age of 40 who had experienced an NOF fracture (ANZHFR 2014). Rates of NOF fractures are

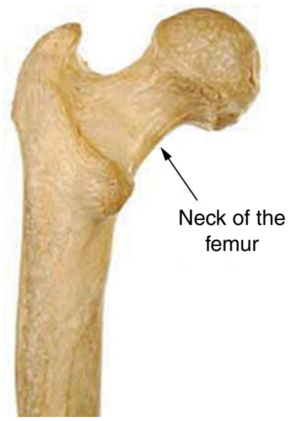

Figure 14.4 Neck of femur.

expected to increase by 15% every five years until 2026 (ANZHFR 2014). NOF fractures are often the result of falls, although they can occur after minor trauma in patients with osteoarthritis and other systemic diseases affecting bone density (NHS Choices 2016). Elderly patients, especially those with osteoporosis, who suffer falls and potentially minor trauma require a higher level of suspicion for NOF fractures.

Mid-shaft femur fractures

Mid-shaft femur fractures are often the result of major trauma, such as an RTC, due to the amount of force required to fracture dense bone through substantial muscle mass (Griffin et al. 2015). These fractures occur below the NOF and above the knee and can be spiral, **comminuted**, or open/compound (Keany and McKeever 2015). The femur itself is extremely vascular and is surrounded by major blood vessels, nerves, large muscles, and tissues (Keany and McKeever 2015). Fractures to this bone can therefore lead to life-threatening hypovolaemia, fat embolism, nerve damage, and in a compound fracture **exsanguination**. Mid-shaft femur fractures can present with bruising, swelling, deformity, and extreme pain to the mid-thigh area (Keany and McKeever 2015). In the absence of considerable blood loss and other life-threatening injuries, management involves the strongest available pain relief, traction splint, and timely transport to an appropriate health facility. The traction splint stops further damage to surrounding tissues and pain, by pulling the fractured bones closer to the correct anatomical position (Griffin et al. 2015). Because of the large muscles surrounding the femur, the fractured ends can be pulled to overlap and cause increased damage to tissue.

Practice insight

When presented with a compound fracture (open fracture), where possible, prior to applying a traction splint, cleaning the wound thoroughly with normal saline can potentially decrease the patient's infection risk.

Limb injuries

The limbs of a human provide the apparatus for undertaking almost all tasks and physical processes. As such, the arms and legs can be subject to many injuries when involved in trauma.

Limb lacerations

Minor limb lacerations can be a common injury and are also simple to treat. After making sure the wound is clean and ensuring major vessels are not damaged, the wound can be dressed and wound closure effected on site by the paramedic practitioner (where appropriate) or in hospital. By contrast, major lacerations of the limb can damage blood vessels, muscular tissues, and also the underlying bones and tendons. With wounds such as this bleeding is to be expected, but can often be halted by firm, direct pressure at the injury site and can be dressed for transport to hospital. Wound assessment should primarily focus on the length, width, and depth of the injury, with an assessment of distal motor and sensory function and pulses. History taking is also vital, as this will help establish whether the injury was caused by mechanical (accidental injury) or medical means.

De-gloving

De-gloving is an injury where the skin and some of the soft tissues are fully removed from the underlying structures like a 'glove'. This can be isolated to one finger or might involve a whole hand, foot, or arm or leg, in some cases leading to surgical amputation of the affected digit/limb. Primary prehospital treatment is to keep the affected area moist and appropriately dressed, and to address any pain the patient may be suffering.

Crush injuries

Crush injuries can result in massive damage to both the soft tissues and the skeletal structures of the limb. Caused by huge pressures on a relatively small area, crush injuries often result in serious blood loss, and need surgical intervention and sometimes amputation. Treatment should focus on controlling any bleeding and managing the patient's pain. Prolonged crush injuries can lead to *crush syndrome* or rhabdomyolysis.

This is the release of myoglobin into the bloodstream from damaged muscle fibres. Myoglobin can cause kidney failure. Recurrent examples of crush injury include the trapped car-crash victim, but consider the elderly person who has fallen and cannot move. They may also be affected by rhabdomyolysis. These patients may require treatment of dialysis and bicarbonate. Some ambulance services encourage paramedics to deliver crystalloids to flush the kidneys.

Amputations

An amputation is a traumatic removal of the distal end of a limb. This injury can be severely life threatening and can result in massive blood loss. Such injuries, resulting from high-impact trauma, leave an open-ended wound with a high risk of contamination and infection. The control of blood loss may require indirect pressure or the use of a tourniquet. Once bleeding is under control, the wound should be dressed with a tight-fitting blast bandage and appropriate fluid (refer to local or national fluid guidelines) and pain relief given. These patients require advanced surgical techniques and should be transported to the nearest major trauma centre.

Upper limb injuries

Fractured/dislocated clavicle

Injuries such as this may present with localised bruising and swelling, along with palpable pain and/or deformity of the bone. A fractured, dislocated clavicle is extremely painful and the patient will usually not allow you to touch them. Strong pain relief is needed early on. The arm on the affected side should be immobilised with a large arm sling in whatever position the patient finds most comfortable, and distal pulses should be carefully monitored.

Table 14.1 Shock classifications and their origins.

Classification	Origin
Hypovolaemic	Low blood volume
Cardiogenic	The heart not pumping effectively
Distributive	A redistribution of body fluids from where it should be to another body cavity, for example anaphylaxis, and burns
Neurogenic	The nervous system not constricting vessels following trauma or in patients with nervous system problems
Septic	Caused by severe infection

Fractured/dislocated shoulder

As the shoulder is a complex collection of joints, it can be difficult to assess whether it is dislocated or broken. The focus of the assessment should be based on pain response, range of movement, and deformity. If the patient is experiencing any pain in the joint, particularly on movement, after experiencing some form of trauma to the upper body or arms, it should be assumed that there is either a fracture of the joint, or a dislocation of some or all the components of the joint. Prior to moving the patient, it may be necessary to administer pain relief and immobilise the affected arm in a comfortable position using a sling.

Shock

Shock is a physiological or psychological response to inadequate tissue oxygenation. The results of such inadequate tissue perfusion end in the same way, but there are a number of causes, as outlined in Table 14.1.

Conclusion

Paramedics routinely face patients who present with some form of trauma. Whilst it will be clear from this chapter that treatment of trauma is central to paramedic practice, it is worth noting that the majority of trauma cases will be *minor* cases. However, each paramedic must be prepared to encounter and respond to major trauma. Regardless of severity, the paramedic must provide interventions that are based on careful assessment and diagnosis and the latest evidence.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. Identify the three major signs of Cushing's triad.
2. What is the mnemonic used to assess fractures and what does each letter stand for?
3. What type of injury describes two or more rib fractures which can cause abnormal chest movement?
4. Describe the major differences between a pneumothorax and a tension pneumothorax.
5. Which type of fracture is most common in elderly women after a fall?
6. Name the type of injury that causes rhabdomyolysis.

Activity 14.1

Ambulance services across the world use different criteria for suspected cervical spine injuries. The NEXUS criteria and the Canadian C-Spine Rule are commonly used both prehospitally and in hospital to determine whether imaging is necessary. Compare and contrast the NEXUS criteria and the Canadian C-Spine Rule. Do they differ to those used by your local (national) ambulance service?

Activity 14.2

According to the National Institute of Health and Clinical Excellence (NICE), prehospitally in the presence of an uncontrolled haemorrhage, fluid replacement should only be used to maintain a palpable central pulse (https://www.nice.org.uk/guidance/ng39/chapter/recommendations#management-of-haemorrhage-in-prehospital-and-hospital-settings). What are the fluid replacement guidelines for an uncontrolled haemorrhage in your local (or national) ambulance service?

Activity 14.3

Increasingly, ambulance services are decompressing chests prehospitally in the presence of tension pneumothorax. What is the practice of your local (or national) ambulance service? What are the major differences between services and their procedures?

Glossary

Comminuted fracture: A fracture segmenting the bone into two or more fragments.

Cushing's triad: A triad of symptoms widely recognised as associated with raised intracranial pressure (raised blood pressure, lowered pulse, and altered respirations).

Dura mater: A thick membrane; the outermost layer of the meninges.

Exsanguination: Severe blood loss causing death.

Fluid replacement: The process of replacing lost bodily fluids through methods such as oral intake or intravenous methods.

Hypo-resonance: A loud, low-pitched, resonant sound.

Hypovolaemia:	Decreased blood volume.
Major trauma centre (MTC):	A hospital that has specialist facilities to deal with major trauma patients.
Percuss:	The process of tapping a certain part of the body to compare percussion notes.
Peritoneal membrane:	A serous membrane that covers the peritoneum of the abdomen.
Potential space:	A space that can exist between two features, for example between the visceral and parietal pleura of the lung.
Subarachnoid space:	A space located between the arachnoid membrane and the pia mater.
Surgical emphysema:	The presence of gas or air within the subcutaneous tissue
Velocity:	A force of motion.

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15

Prehospital electrocardiography

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Contents

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Learning outcomes

On completion of this chapter the reader will be able to:

- Evaluate the components of a basic electrocardiogram (ECG).
- Identify the relationship between the ECG and the cardiac conduction pathway.
- Identify abnormal ECG rhythms.
- Discuss acute coronary syndromes.
- Identify treatments for some of the abnormal cardiac rhythms.

Case study

An ambulance has been called to a male complaining of chest pain. On arrival you find the male is pale, sweaty, clammy, and feeling nauseous. Once an ECG has been undertaken, it is noted there is ST-segment elevation above 2 mm in the anterior leads. The patient is treated for an ST-elevation myocardial infarction (STEMI) and taken to the local cardiac catheter lab.

Introduction

The electrocardiogram (ECG) is recognised as a valuable tool in the assessment of a patient's clinical condition. The ability to use and accurately acquire and interpret an ECG to suggest a range of cardiac conditions is a vital skill. This chapter will give you the tools to examine and identify abnormal ECGs worthy of further investigation. It will also discuss how the ECG is formed, thereby allowing you to understand the ECG, rather than merely recognise its waveform patterns as, so often, we rely on rhythm generators to view what is expected, only to find ourselves baffled and bewildered when a patient presents with something other than those waves generated artificially.

What is an ECG?

An ECG is a pictorial view of the electrical activity of the heart. Through the use of electrodes, we are able to gain a view of the electrical pathway; through analysing this, we can gauge how the heart is functioning electrically. One of the first ECG machines was developed in 1911, when Willem Einthoven immersed each of a patient's limbs in a container of salt solution, enabling him to chart electrical activity, and thus create a rudimentary ECG (Snellen 2008). Einthoven assigned letters to the various positive and negative deflections of the ECG so that they could be charted and measured, selecting the letters P, Q, R, S, and T, which are now used universally to describe ECG waves (Figure 15.1). Each letter refers to an electrical 'wave' (whether it be a **depolarisation** or **repolarisation** wave) located within the heart. Measuring and charting each wave help to evaluate how the heart is working and to confirm whether it is working normally.

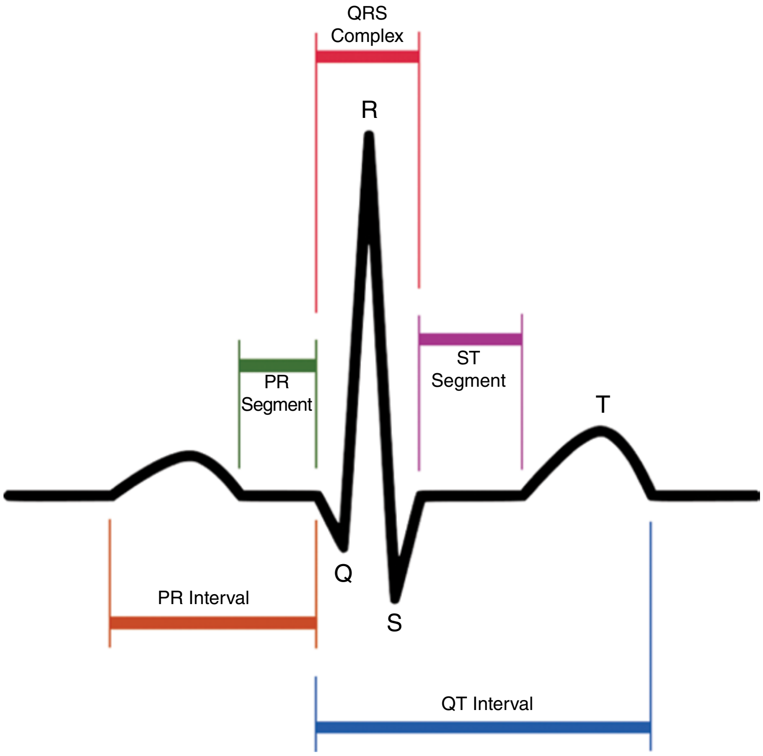

Figure 15.1 Letters code the different waveform deflections of the ECG. Source: Image courtesy of Nathan Puckeridge. https://en.wikipedia.org/wiki/Electrocardiography#/media/File:SinusRhythmLabels.svg

The ECG recording is printed on special paper that gives not only a graphical picture of the electrical activity, but allows the providers to see, in a snapshot of time, the amount of electricity that is occurring and the timeframe as a point of reference of the electrical activity.

The strip is longitudinally broken up into 3-second portions. Within each 3-second bracket there are 15 sets of 0.2-second brackets, which are again broken up into 5 sets of 0.04-second blocks. Each small square is also 1 mm in height, with five small squares making up one large square of 5 mm – two 5 mm squares are equal to 1 mV of electricity detected from the heart's electrical conduction system.

P, Q, R, S, and T waves

It is important to recognise how P, Q, R, S, and T waves 'normally' present in an ECG so as to identify 'abnormal' presentations. The ECG is just a graphical depiction of the electrical conduction through the heart. How the electricity innervates to the heart muscle is a different concept altogether.

A correctly calibrated ECG is produced at 25 mm/s; therefore, this represents one small square as 40 ms, and one large square as 200 ms. Thus, on the x-axis, five large squares together represent 1 second of time. This helps us calculate a cardiac rate if the ECG machine does not give it. To calculate the rate of a *regular* ECG there are a number of different methods for counting.

Practice insight

Remember, a piece of paper doesn't have a heart rate – the patient does, so always feel the radial pulse when recording an ECG. Correlate what you feel with what you see!

After printing a strip of ECG recording, count how many large squares there are between two points (in this case, the peak of an R wave) and divide it by 600 – i.e. seven large squares between two R waves would indicate a rate of 85 beats per minute (bpm). Another method is the 300 method, where you count each large square border backwards with 300–150–100–75–60–50–43–37.

Conversely, the y-axis shows power, or amplitude; therefore one small square measures 1 mm. Each millimetre represents 100 mV, therefore 10 small squares (10 mm high) represent 1 mV. This is particularly helpful when self-calibrating an ECG machine, as one large square (which contains 25 small squares) represents 200 ms (or 0.2 s) and 0.5 mV amplitude.

Evaluating the ECG

To read an ECG we need a structure in which to approach it; therefore, it is sensible to start with the major areas of the ECG, and then progress to greater detail once the important aspects are deemed normal. One of the most important markers in an ECG is the rate at which the heart beats: too slow (**bradycardic**) and **cerebral perfusion** will drop; too fast (**tachycardic**) and the ventricles will not fill properly, lowering the **cardiac output**. Both could lead to **cardiogenic shock** and other significant conditions. In order to evaluate this important aspect first, it is essential to take note of the rate.

There are eight main questions that providers need to ask when reviewing an ECG:

1. What is the pace of the rhythm – fast or slow?
2. Is there a repeating pattern – regular or irregular?
3. Are there P waves before each QRS?
4. Do all the P waves look the same?
5. Are the PR intervals all the same and within normal limits?
6. Is the QRS wide or narrow?
7. Is the ST segment on the same line as the PR interval?
8. Is the T wave upright and asymmetrical?

Heart rate

The rate should be the first observation noted and challenged: if it is outside the norms of less than 60 or greater than 100, then you *may* have an abnormal cardiac presentation.

We say *may*, as there could be reasons why the heart is working at an other than normal rate (such as anxiety, worry, stress, or differing levels of fitness, or as a result of the side effects of prescribed medications). Sometimes, the rate is as fast as it can go because of the origin of the pacing site. Normal pacing starts in the sinoatrial (SA) node, but certain drugs, tissue ischaemia, and infarction or disease can damage cardiac conduction pathways. The pacing site may come from another focus, either within the conduction pathways or the myocardial tissue itself. This is called **automaticity** – an automatic property of cardiac cells with the ability to recognise when things are going wrong. The property of **excitability** means that, when irritated, the cardiac cells can generate their own electrical signal and take over the pacing of the heart.

Heart rhythm

The biggest question to ask is: is there a pattern to the rhythm? Is it regular, is there a regular (or repeating) irregularity, or is it 'all over the place' with no identifiable pattern? Whilst we sometimes make assumptions regarding heart rhythm based on patient age, to do so can be dangerous. It is important to be as sure as you can that the reason for the call/admission you are attending is not the initiating event of any dysrhythmia. Take time to establish whether there is any history of dysrhythmia, or whether a dysrhythmia or irregularity has been clinically detected before. From the ECG, you can observe for any inconsistencies in the 'QRS complex' whether **cardiac conduction** is regular and thus effective. The blood pressure and oxygen saturation will assist in your assessment of whether cardiac output is sufficient. Always correlate what you see with what you feel by palpating the patient's pulse; asking the patient 'how do you feel?' may also assist in making your decision regarding the sufficiency of the cardiac work.

P wave

When looking at the P wave, it should be upright, rounded, and each of them in Lead II all looking (morphologically) the same. The P wave is the discharge of energy (or depolarisation) from the SA node (Figure 15.2) in the wall of the right atrium initiates stimulation of the inter atrial pathways throughout the right and left atrium, which in turn causes atrial contraction (seen on the ECG as a P wave) and starts the electrical stimulation path that travels through the atrioventricular (AV) node through the septum and terminates with **Purkinje fibre** depolarisation (causing ventricular contraction) with ventricular output, followed shortly by repolarisation of cardiac muscle and nerve tissue. Ensuring the electrical limits of the normal P wave shape (upright, rounded, and

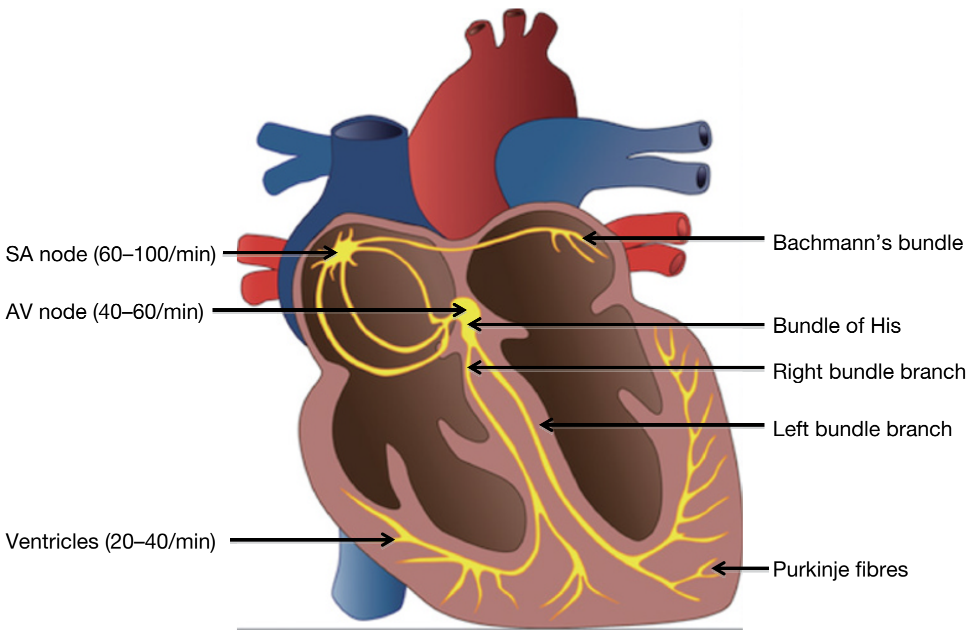

Figure 15.2 Electrical conduction system of the heart (min = minute). Source: Image courtesy of Bastian Lee.

mostly symmetrical) reassures us that normal atrial electrical activity is happening and that the **pacemaker** origin is 'sinus'. Any alterations from normal potentially mean the pacemaker origin is somewhere else within the atrial pathways or atrial tissue. This could be as subtle as P waves changing shape (instead of upright, rounded, and mostly symmetrical), or displaying irregular rhythms due to multiple sites firing in order to compensate for the poorly discharging SA node (Houghton and Gray 2008). Once we have determined the details of the P wave, we can continue to examine the rest of the ECG.

QRS complex

Once the atria have contracted, the impulse is caught at the junction between the atria and the ventricles, known as the interatrial septum, where a specialised collection of cells is gathered, known as the AV node. The AV node gathers the impulse received from the atrium and passes it down the electrical conduction pathway in order to send it forward to stimulate ventricular contraction. Once the stimulus leave the AV node, it passes it down to the next part of the conduction pathway, known as the bundle of His (Houghton and Gray 2008). The bundle of His passes into the **interventricular septum** and divides into the left and right bundle branches. These bundle branches then pass downwards, into the interventricular septum, where the left bundle branch further divides into the anterior and posterior **fascicles**. From there, the electrical signal passes from the **Purkinje fibres** into cardiac myocytes, and the electrical discharge depolarizes myocardial tissue as represented by the 'QRS' complex. Once the myocardium has fully depolarised, the ECG returns to the base line or **isoelectric line**.

T wave

The T wave represents ventricular repolarisation, which is needed in order to return the ventricles to a state where they are able to discharge again. This element of the ECG is not normally measured, but the T wave should be upright, maybe slightly rounded, and asymmetrical – meaning it should be slightly slanted on the upstroke and shortened or sharper on the downstroke.

PR interval

Electrical discharge from the SA node should measure between 120 ms and 200 ms (0.12–0.20 seconds), or three to five small squares. This is a normal PR interval. If there is any delay, thereby making the PR interval greater than 200 ms, you should consider the pathology. Given that the AV node captures and passes on the electrical wave to the bundle of His, you could assume that the AV node is damaged somehow. Disruption of the AV node will interrupt the flow of signal, giving a delay in passing the signal through; this disruption is known as AV block. The causes of AV pathology can be numerous, and range from **ischaemia**, injury, or **infarction** to medicinal and drug interaction (such as digoxin, most **beta blockers**, and some **calcium-channel blockers**). Whatever the reason, if there is a delay in AV conduction, consider AV block.

Practice insight

The key to successful ECG interpretation is practice, practice, practice. Be sure to discuss the ECG findings with your crewmate and other staff members, and follow this up with plenty of research and reading. Know the time limits for each section of the QRS – if anything is out of the ordinary, consider it to be abnormal and worthy of further investigation.

Atrioventricular heart blocks

There are three main types of AV block, progressing and worsening in severity (Houghton and Gray 2008).

First-degree AV block

This is technically not a block but a conduction delay, as there is always a QRS after the P wave – it is just delayed. A delay in the PR interval of greater than 200 ms should be investigated further.

Second-degree AV block

This *is* a block, because some of the P wave activity does not innervate the bundle of His and, therefore, there is no QRS.

Type 1 (Known as wenckebach phenomenon or mobitz type 1)

Here the PR interval increases in time and the distance between the P wave and the QR wave progressively becomes longer and longer until, eventually, a QRS beat is dropped, and the P wave fails to pass through the AV node to the bundle of His. Once this happens, the process is reset, and continues the same cycle.

Type 2 (Known as mobitz type 2)

The PR interval, unlike in Type 1, is constant; however, occasionally the P wave is not followed by a QRS complex, failing in its conduction to the bundle of His. This rhythm can be difficult to detect, therefore a long rhythm strip may be needed in order to evaluate it.

Third-degree AV block

This is where there is no associative conduction between the atria and the ventricles. In this condition, both atria and ventricles fire independently, and bear no resemblance to each other. This condition should be easier to identify than a second-degree rhythm as, although the P waves and QRS complexes are autonomous, they are usually regular. Therefore, if you were to identify the P waves on the rhythm strip, they would be regular, as would the QRS complexes; however, as they work independently of each other, they appear to be irregular.

Heart blocks and the QRS width

In time, discharge from AV capture to Purkinje systole should take no longer than 110 ms (0.11 seconds), or less than three small graph squares – this represents normal ventricular discharge. If the ventricular discharge time is longer, it will widen the QRS complex, indicating the presence of a potential pathology. Thus, it is important to measure the width of the QRS complex. Remember, the QRS complex represents cardiac conduction: if cardiac conduction is disrupted, so is muscle contraction and cardiac output, which may mean cerebral hypoxia and almost certain disruption of other key systems.

The QRS becomes wider as the normal conduction pathway is disrupted for some reason. Accordingly, the only way in which the electrical signal can discharge the ventricles is abnormally, i.e. through cellular depolarisation, as opposed to conduction pathway depolarisation.

Now that we have analysed a 'normal' rhythm, we should turn our attention to analysing a 'normal' 12-lead ECG rhythm. A five-point plan is helpful in establishing the normal parameters of a 12-lead ECG.

Performing and reviewing a 12-lead ECG

A 12-lead ECG is a way of viewing the heart from many different viewpoints. It is important to note that 'lead' in this sense does not denote physical wire (the number of wires and electrodes involved in ECG equipment is in fact 10), but instead denotes a 'view' or 'perspective'. Thus, in a 12-lead ECG, we have 12 different 'views' of the heart, thereby increasing diagnostic vision and capability. The 12-lead ECG is made up of 6 precordial leads (or 'chest' leads) and 4 limb leads. When reviewing the 12-lead ECG, be sure to analyse each aspect of the ECG waveform, as outlined in Figure 15.3.

P wave

Ensuring that there is an upright, rounded, and symmetrical P wave is vital. This gives assurance that the heart is depolarising normally through the SA node and the rhythm is 'sinus' in origin. Ensure that the PR interval is between 120 and 200 ms in length, and that the P wave is regular and precedes the QRS complex.

QRS complex

Check that the QRS complex is 'tight' and within its normal limits (less than three small squares or <0.12 seconds). Confirm that the QRS complex follows the P wave, and that the interval is regular and within normal limits. Scan for abnormalities, such as 'notches' and 'wide and bizarre' QRS complex patterns.

aVR negative

The aVR section refers to the augmented vector right electrode, residing on the right wrist. This view should be mostly negative, as all electrical discharge waves are travelling away from this view; therefore, if the heart is depolarising normally, the waveform should be negative. If we see any positive waveform in this view, we should presume abnormality/pathology.

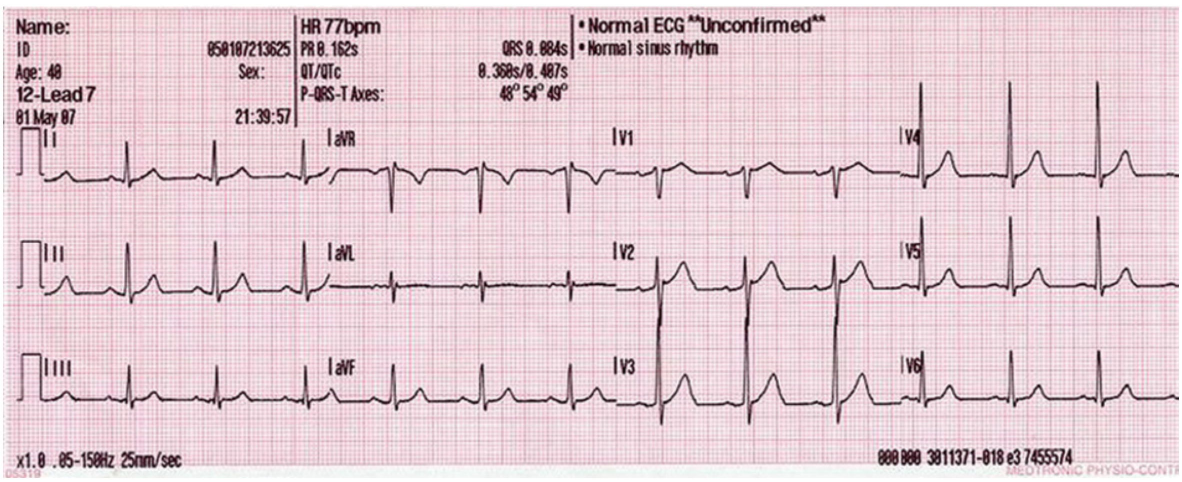

Figure 15.3 12-lead ECG. Source: Image courtesy of Nathan Puckeridge. https://commons.wikimedia.org/wiki/File:12_lead_generated_sinus_rhythm.JPG

R wave progress

In the precordial leads we should see, essentially from V2–V6, the R waves grow in size. This shows normal depolarisation of the ventricles as the electrical wave moves down the AV bundle and left and right bundle branches. Of course, the electrodes are not moving position; instead, the position of each electrode through V2–V6 becomes more direct, leaving V4–V6 effectively 'looking down the barrel of the gun'.

ST segment elevation

This is the most important element of the 12-lead analysis. In this section, analysis of the ST element shows that, with 'flat', isoelectric ST segments, there is likely to be no ischaemia or injury to the myocardium. ST depression or elevation indicates potential myocardial ischaemia (although this is not definitive).

Generally, in order to demonstrate 'serious' myocardial damage, if the ST elevation is equal to, or greater than, 2 mm (some say 1 mm or greater, whilst others say 2 mm or greater – be guided by local recommendations), in two or more leads (V2–V6), it indicates a significant cardiac event. It is important to note that if the ST depression or elevation does not equal 2 mm and the patient's condition suggests a cardiac event, it should still be considered an important finding and referred to an appropriate medical practitioner.

Practice insight

When conducting a 12-lead-ECG, it can sometimes be difficult to place the leads on the patient due to clothing or positioning. Ideally the patient should be in a private environment such as an ambulance or their own home and should be lying comfortably. This is not always possible. Ask your crewmate to assist when necessary by holding clothes or preparing the patient.

Acute coronary syndromes and the ECG

Correctly identifying an acute coronary syndrome (ACS) through ECG interpretation is a fundamental skill. ECG changes are sometimes clear with this condition and sometimes not. There are three types of acute coronary syndrome:

- Unstable angina pectoris (UAP).
- ST-elevation myocardial infarction (STEMI)
- Non-ST-elevation myocardial infarction (NSTEMI)

All three types are classified as an ACS: conditions that cannot be absolutely determined or differentiated in the acute phase of the condition without a blood test (troponin protein test; Swanton 2003).

The signs and symptoms of an ACS are those of myocardial ischaemia/injury: retrosternal pain (sometimes disguised/reduced by progressive diabetic neuropathy, which is important to consider), sometimes referring into the jaw/arm, as well as diaphoresis, nausea and vomiting, and shortness of breath. There are, of course, atypical presentations, which should always be considered when evaluating the patient.

When considering the patient's ECG, it is generally only the STEMI patient that can be semi-reliably diagnosed through the use of an ECG; the UAP and NSTEMI patient's ECG can produce many ECG variants. Generally, the differentiation between UAP and NSTEMI is that of injury and infarction, and the presence of troponin in the blood test. If the blood supply is interrupted (generally sub-endocardially, as this is the area of the heart that is most precarious due to how blood vessels oxygenate the myocardium), but the interruption does not result in prolonged injury or infarction (and therefore no troponin has been released), the event can be considered UAP. If, however, due to the partial occlusion and resultant drop in oxygenation of the myocardium, an area of the myocardium is damaged (thereby releasing troponin), it can be considered a myocardial infarction. From that point, it will be determined if the episode has resulted in a full-thickness or partial-thickness injury – STEMI or NSTEMI.

A full-thickness injury (otherwise known as a **transmural** injury) will have affected the whole of the myocardium, **subendocardially** to **epicardially**. The extent of this damage will present itself as a full-thickness infarct, and it will not only show ST elevation in the early stages, it may go on to produce pathological Q waves (>0.03 seconds wide between PR segment and beginning of R wave, or depth one-third that of the R wave) if the patient survives the episode. This is significant, as death of the full wall of the myocardium may result in congestive cardiac failure and cardiogenic shock. The patient may be acutely unwell, displaying multisystem shock and, potentially, multi-organ failure. Patients suffering STEMI are time critical and need early intervention to prevent rapid deterioration.

A partial-thickness injury (otherwise known as a **nontransmural** injury) will not have affected the whole of the myocardium, thus it may not present so acutely and dramatically, but this does not mean that the condition is not as serious. If the cardiac event progresses from UAP to NSTEMI (i.e. there is a degree of injury and infarction together with positive cardiac markers in the blood test), the ECG changes will vary, from ST depression to T wave inversion (due to the ischaemic nature of the presentation) – there may even be a mixture of both. The presence of these ECG changes, together with evidence of the release of troponin, means that the patient has suffered an NSTEMI.

It is important to remember that at this juncture we must treat the specific presentation of the patient and not become fixated with the ECG. The patient is the best barometer of what is happening: if they are experiencing pain, we must manage it; if they are becoming short of breath, we must deal with it. Ignoring the patient, and interpreting the ECG in isolation, is dangerous and must be avoided at all costs.

Practice insight

Troponin is a specific protein found in skeletal and cardiac muscle and can be detected in blood after an ischaemic injury. However, it can take some time for cardiac-specific troponins to be high enough to be detected. Recently, researchers have found another protein called cardiac myosin-binding protein (which has much higher quantities than troponin), which is able to be detected much sooner than cardiac troponins for the diagnosis of a myocardial infarction (Kaier et al. 2017).

Idioventricular rhythm

Widely recognised as any rhythm originating from within the ventricle, an idioventricular rhythm usually presents as bradycardic, with a 'wide and bizarre' QRS complex that exceeds the normal QRS limits (<120 ms). The conduction is delayed and distorted due to the fact that the affected ventricle relies on the functioning ventricle to depolarise it *indirectly*, **myocyte** to myocyte, rather than through the conduction pathways, which results in a wide QRS complex. There are idioventricular rhythms that are a little quicker than the ventricular intrinsic rate known as AIVRs, or accelerated idioventricular rhythms. These are rhythms that have several uncontrolled foci that accelerate the output of the ventricles.

Whatever the presentation of an idioventricular rhythm, it represents aberrant conduction and should be treated with the utmost caution and vigilance.

Bundle branch blocks

One abnormality clearly visible on the 12-lead ECG is bundle branch block (either left or right), manifested by a high degree of aberrant conduction. Bundle branch block, essentially, is the loss of the conduction pathway somewhere in the bundle branch (or, at times, the fascicle of the left bundle branch). In terms of severity, left bundle branch block (LBBB) is far more severe than right bundle branch block (RBBB), and is associated with much higher mortality and **morbidity**.

Left bundle branch block

Interruption of the left bundle branch deprives the ventricle of its intrinsic conducting pathway. As the left bundle branch (including the fascicle) is unable to conduct, it relies on the right bundle branch to cellularly conduct the signal from myocyte to myocyte (Houghton and Gray 2008), stimulating contraction and *usually* showing as a wide QRS, large S wave in V1–V3, sloping ST segment in Lead I and V6, and a rounded R wave and S wave in Lead I and V6. Given that the left ventricle provides the output to the body, interruption of this conduction pathway may prove hugely problematic for the body. In terms of the ECG, the QRS complex is wider than is considered to be normal, giving rise to concern. The widening of the QRS complex represents cellular conduction rather than via the conduction pathway, which takes longer.

Right bundle branch block

For RBBB, the right ventricle is not stimulated by activation impulses travelling down the right bundle branch. Instead, the left bundle branch stimulates the right ventricle to contract through myocyte stimulation (Houghton and Gray 2008), as the left ventricle is still left to right.

The cellular conduction spreads from left to right, producing aberrant conduction waves on the ECG. Usually, there is a notching in the R wave in the lateral leads (L1 and aVR), a slurred S wave in L1 and V6, and wide 'rabbit-ear' QRS in V1–V3. RBBB usually has a pathological cause, although it can be seen in healthy individuals. Compared with LBBB, RBBB does not represent such a high mortality rate.

Incomplete bundle branch block

Usually caused by the same pathology, a partial blockage in one of the bundle branches can cause an incomplete bundle branch block. More difficult to recognise than a complete bundle branch block, the delay causes abnormal shapes and complexes without exceeding the 120 ms boundary in an idioventricular presentation.

Conclusion

Throughout this chapter we have discussed and examined different ECG presentations, and the associated pathology. We have introduced a structure for 'reading' ECGs, so as to know when an abnormality is present. Being able to recognise a 'normal' ECG and decipher it through logical progression is a fundamental skill. It is, however, appropriate to remember that attached to the 10 electrodes is a patient: often frightened, in pain, vulnerable, and utterly reliant on the care provided to them. Focusing on translating and interpreting an ECG is important, but does not exceed the importance of attentive patient care.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. What does the P wave represent?
2. What does the QRS complex represent?
3. What does the T wave represent?
4. What is a dysrhythmia?
5. List three dysrhythmias.
6. What is a left bundle branch block?

Activity 15.1

Answer the following questions:

1. What is the correct paper speed of an ECG?
2. How many squares does this paper speed represent?
3. Name one method for calculating the rate of an ECG.

Activity 15.2

What three conditions comprise an acute coronary syndrome?

Activity 15.3

When the left bundle branch becomes blocked, why is this significant?

Glossary

Automaticity:	The ability of the cardiac cells to send an electrical signal independently of any stimulation.
Beta blockers:	A class of drugs that target beta cells, thus reducing the sympathetic response which, in turn, can help reduce hypertension and cardiac arrhythmias.
Bradycardic:	A slow cardiac output, determined as 60 beats per minute or below.
Calcium-channel blockers:	A class of drugs that reduces the movement of calcium through calcium channels, thereby reducing hypertension and heart rate.
Cardiac conduction:	The pathway of electrical movement through the heart.
Cardiac output:	The volume of blood ejected from the heart over one minute: stroke volume (SV) × beats per minute (BPM) = cardiac output (CO).

Cardiogenic shock:	Inadequate tissue perfusion to the cardiac muscle due to the heart's inability to function properly, thereby causing an inadequate pumping mechanism, resulting in multisystem shock and multi-organ failure.
Cerebral perfusion:	A net pressure gradient that allows adequate oxygenated blood to flow to the brain.
Depolarisation:	A move in a cell's membrane, allowing more positive or negative agents through it, thus allowing it to discharge, creating a cellular reaction.
Epicardial:	The outer layer of the heart.
Excitability:	The ability to excite a cardiac myocyte to cause a contraction.
Fascicle:	A cluster, collection, or bundle.
Infarction:	Death of tissue (otherwise known as necrosis), which can be due to ischaemia or injury.
Interventricular septum:	The wall separating the ventricles.
Ischaemia:	An interruption of oxygen and glucose to the tissues, usually characterised by reduced blood flow to an area of the body.
Isoelectric line:	The baseline of the ECG.
Morbidity:	The degree to which the condition the patient suffers from affects them.
Myocyte:	Tubular muscle cells that are found in cardiac, skeletal, and smooth muscle masses.
Nontransmural:	Not reaching the full thickness of the myocardium.
Pacemaker:	A cluster of highly specialised cells located in the right atria, responsible for starting the cardiac contractions.
Purkinje fibres:	A group of myocytes that are responsible for conducting cardiac impulses across a large area of myocardium, thereby creating and propagating synchronous contractions of the myocardium.
Repolarisation:	A move, following depolarisation, where the membrane potential returns to a resting phase, thereby allowing the cell to depolarise again.
Subendocardial:	Positioned below the endocardial layer of the heart.
Tachycardic:	A fast cardiac output, determined as 100 beats per minute or above.
Transmural:	Pertaining to full thickness.

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16

Assessing the cardiac system

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Contents

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Companion website: www.wileyfundamentalseries.com/paramedic

Learning outcomes

On completion of this chapter the reader will be able to:

- Locate and describe the general anatomy of the heart, to include normal blood flow and heart perfusion.
- Describe the components of a clinical assessment required to perform an appropriate evaluation of the cardiac patient.
- Recognise the presentation of commonly occurring cardiac conditions.
- Discuss the general patient management strategies for cardiac conditions.

Case study

An emergency call has been received for an ambulance crew to attend a case where a 45-year-old male is complaining of chest pain. On arrival, they are shown to a male who says he has central chest pain that has been getting worse throughout the day. On further questioning, he states that the pain increases when he tries to lie down or bend over. It doesn't appear to radiate to any other parts of his body. He states he has also been unwell for at least a week with fevers and chills. He takes no medication and has no allergies.

Introduction

The paramedic will regularly attend to patients who present with cardiac symptoms, therefore it is important that they develop skills in diagnosing cardiac conditions and recognising how these can cause dramatic changes in other major systems. This chapter will give an overview of some of the most common cardiac conditions a paramedic will encounter and introduce key processes for assessing the cardiac system.

Cardiac anatomy and physiology

The heart (Figure 16.1) is a powerful muscle situated in the centre of the chest between the lungs and above the diaphragm. It has left and right pumps that work in series, delivering blood to the lungs and the body. It is covered in a serous sack called the pericardium that allows free movement during each beat and during breathing (Martini et al. 2017; McKinley et al. 2016).

The size of an average fist, the heart weighs approximately 250–300 g and circulates up to 9000 l of blood per day. The heart wall consists of three layers: the epicardium (outer serous membrane), the myocardium (muscular layer), and the endocardium (the innermost smooth layer). The muscular wall of the heart is supplied with blood by the left and right coronary arteries (Figure 16.2), and deoxygenated blood is returned through a similar vein system that unites at the coronary sinus, a large vein at the back of the heart leading to the right atrium (Martini et al. 2017).

The right-side pumping mechanism (the right atrium and ventricle chambers) forces blood returning from the body (systemic system) through the heart and into the lungs (pulmonary system). This happens at relatively low pressure, whereas on the left side of the heart, the left atrium and ventricle pump oxygenated blood that has returned from the lungs around the body and to the tissues at high pressure. These four chambers are separated by the tricuspid valve and the mitral valve, which separate the right atrium and ventricle, and the left atrium and ventricle (Kumar and Clark 2017).

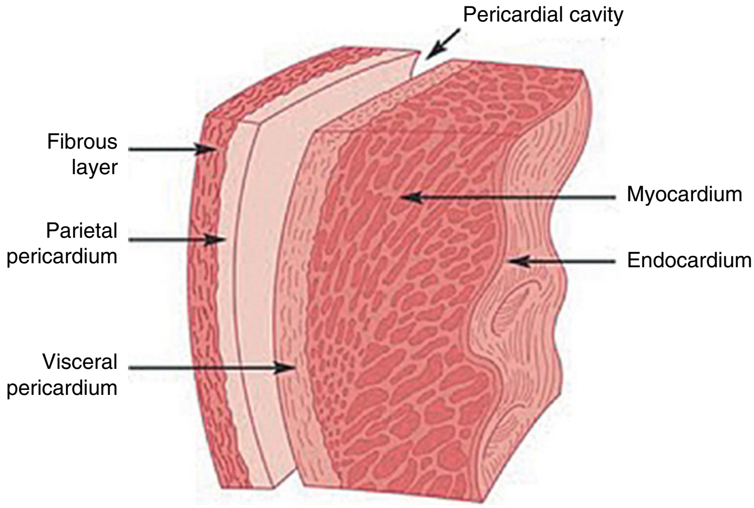

Figure 16.1 Layers of the heart.

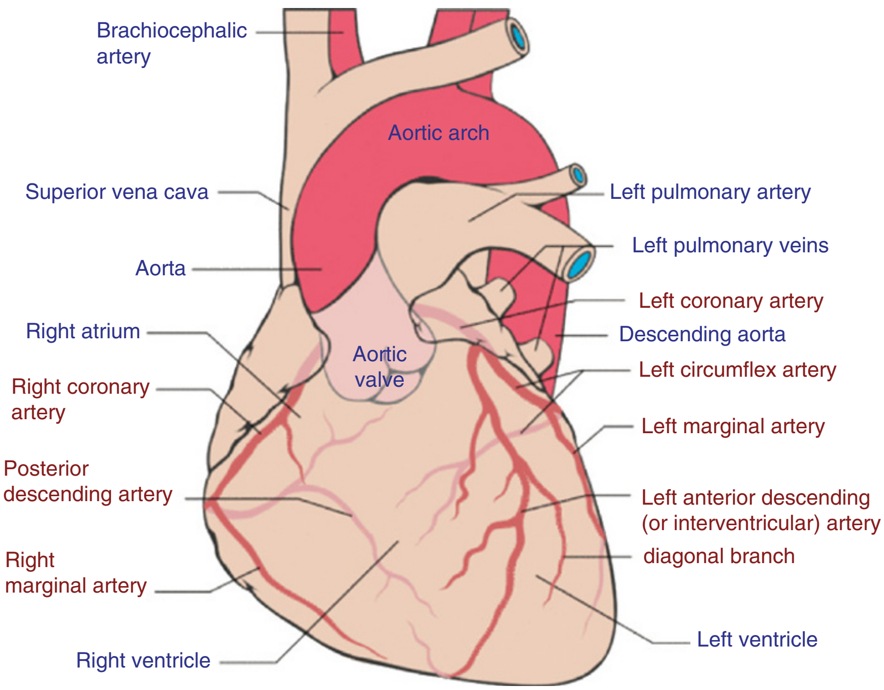

Figure 16.2 Coronary arteries of the heart.

During the beating of the heart the valves are either open, allowing blood flow, or closed, preventing back flow. The valves need to have guide wires (**chordae tendineae**) and anchor points (papillary muscles) so they do not fail and prolapse, causing a back flow of blood (Kumar and Clark 2017).

The complete cardiac cycle (Figure 16.3) consists of a diastolic phase, where the atria and ventricles are relaxed, and a systolic phase involving atrial and ventricular contraction. During the longer diastolic phase both the tricuspid and mitral valves are open so as to allow blood returning to the heart to fill the right ventricle and

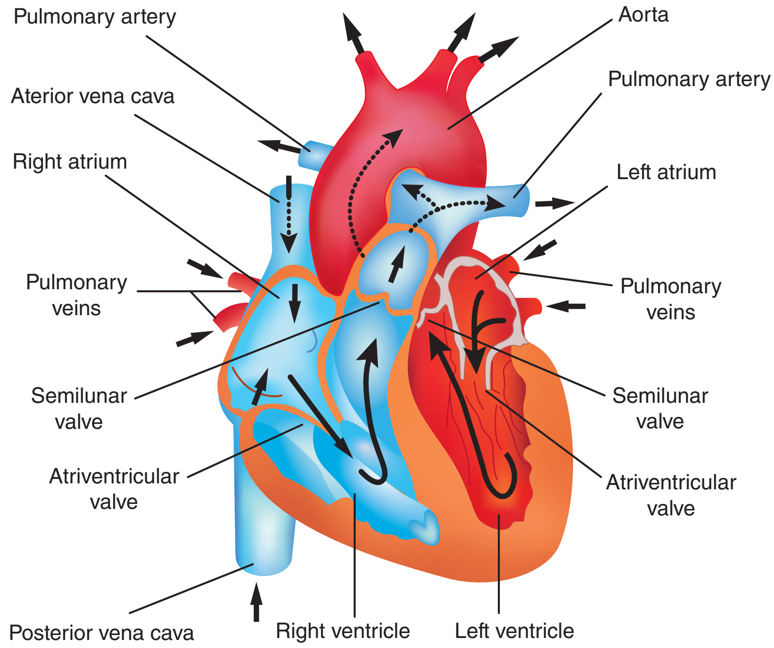

Figure 16.3 Blood flow through the heart.

oxygenated blood from the lungs to fill the left. The atria then contract, forcing blood into both ventricles; this signals the beginning of the ventricular contraction (systole) and the closing of the tricuspid and mitral valves. As the ventricles contract, the pulmonary and aortic valves open, forcing deoxygenated blood into the pulmonary circulation and oxygenated blood around the system (McKinley et al. 2016).

Common cardiac conditions

Coronary heart disease (CHD) is the single greatest cause of death in the UK (de Silva 2013), with a wide variety of cardiac conditions and cardiovascular diseases covered by the umbrella term 'heart disease'. These include:

- Ischaemic heart disease (IHD)
- Heart failure
- Atrial fibrillation (AFib)
- Chronic cor pulmonale
- Valvular heart disease

As paramedics will routinely attend patients with all of these conditions, the following sections will describe each in more detail, before introducing the methods of assessment that will assist in diagnosis.

Ischaemic heart disease

IHD, or myocardial ischaemia, is characterised by ischaemia (reduced blood supply) to the heart muscle, usually due to coronary artery disease. Its risk increases with age, smoking, hypercholesterolaemia, diabetes, and **hypertension** (Meckler et al. 2016). IHD is the leading single cause of death under 75 years in Europe in both men and women (Wilkins et al. 2017), although presentation in women is on average 7–10 years later (Crea et al. 2015).

Symptoms of stable IHD include angina and decreased exercise tolerance; those of unstable IHD include chest pain at rest or rapidly worsening angina. Diagnosis of IHD is by electrocardiogram (ECG), blood tests (cardiac markers), cardiac stress testing, or coronary angiogram. Depending on symptoms and risk, treatment may involve medication, percutaneous coronary intervention (angioplasty), or coronary artery bypass surgery (Meckler et al. 2016).

Heart failure

Heart failure occurs when the heart is unable to pump efficiently or fast enough to eject blood from its chambers. There are many causes of heart failure, including myocardial infarction (MI), cardiomyopathy, and chronic hypertension (Kumar and Clark 2017). The result of the insufficiency is a back-up of blood in the systemic circulation, the pulmonary circulation, or both (Meckler et al. 2016).

Practice insight

Patients who are extremely hypoxic due to heart failure are likely to lack capacity to make a decision regarding treatment, and may even be combative when you go to treat them. Be prepared for this and ensure that you undertake the necessary steps to be able to treat the patient who lacks capacity, such as completing the required documentation (your ambulance service will allow you to complete the paperwork after the event has been managed).

Left-sided heart failure

An increase in end-diastolic volume and workload due to conditions such as MI, cardiomyopathy, or chronic hypertension can enlarge the left ventricle. The muscular wall becomes hypertrophic (increased cell size; Meckler et al. 2016), causing reduced oxygen supply to the ventricle. At this stage, a patient may experience increased heart rate, decreased cardiac output, and arrhythmias (Kumar and Clark 2017).

Left ventricular failure

Reduced left ventricle function permits blood to pool in the left side of the heart. As this worsens, the volume of blood eventually encroaches into the pulmonary veins and capillaries. As this pressure increases due to the engorgement of the pulmonary circulation, sodium and water are forced into the interstitial space and pulmonary oedema then develops. This causes the patient to experience difficulty in breathing, often with crackles heard on listening to the lungs, confusion, dizziness, decreased peripheral pulses, cyanosis, and a third heart sound (S3; Bickley et al. 2017; Kumar and Clark 2017).

The treatment of acute left ventricular failure (LVF) with cardiogenic pulmonary oedema includes high-flow oxygen to treat the difficulty in breathing, followed by glyceryl trinitrate to reduce pressure in the lungs and occasionally intravenous furosemide to try to remove the excess fluid. The use of continuous positive airway pressure (CPAP) is also indicated, wherever available (Association of Ambulance Chief Executives AACE and Joint Royal Colleges Ambulance Liaison Committee 2017). CPAP will help to keep the patient's airway open to allow for better oxygen exchange.

The treatment of chronic LVF is commonly drug therapy using beta blockers and angiotensin-converting enzyme (ACE) inhibitors to interfere with neurohormonal pathways that are activated by cardiac dysfunction, and improve left ventricular function (Meckler et al. 2016). For patients without adequate improvement from drug therapy, biventricular pacing may be considered, involving insertion of wires into the coronary veins. Both interventions result in improved quality of life, better exercise tolerance, and decreased mortality (Meckler et al. 2016).

Right-sided heart failure

The most common cause of right-sided heart failure is actually left-sided heart failure. But other conditions, such as certain lung diseases, can cause the right ventricle to fail even when there is no problem with the left ventricle (Meckler et al. 2016).

When the left ventricle fails to pump blood forward, there is an increase in stress placed on the right ventricle to pump against a greater pulmonary resistance, and increased left ventricular pressure, hypertrophy (which is when the muscle grows bigger) occurs. This can cause an issue with the electricity in the heart, which may increase conduction time and generate arrhythmias as the heart deviates from its normal electrical axis. The failing right side of the heart allows blood to accumulate in the atrium and ventricle, resulting in increased pressure and congestion in the vena cava and systemic circulation (Comerford and Hodgson 2013).

When the right side of the heart becomes unable to compensate for increased hypertrophy and/or dilatation occurs, there is a resulting increase in central venous pressure, jugular vein dissention, hepatomegaly, and splenomegaly (enlarged liver and spleen). Finally, raised capillary pressure forces fluid from the capillaries into the interstitial space, causing peripheral oedema, commonly in the lower extremities and abdomen (Comerford and Hodgson 2013).

Atrial fibrillation

AFib is the most common dysrhythmia treated in clinical practice and the most common dysrhythmia for which patients are hospitalised (Morady and Zipes 2019). It can be defined as an atrial tachycardia with varied ventricular response, characterised by uncoordinated atrial movement and reduction in the effectiveness of the pumping mechanism (Aehlert 2018). This dysrhythmia can be observed on an ECG by an absence of P waves and an irregular ventricular response.

As AFib can present asymptomatically, it is important for the clinician to gain a full history of the events that preceded call-out and to fully assess the patient so that life-changing conditions are not overlooked. Symptoms can include palpitations, dyspnoea, chest pain, syncope, and dizziness, but approximately 15% of patients describe their worst symptom as fatigue and 25% have no symptoms at all (Morady and Zipes 2019).

Although some patients may be totally asymptomatic, others can be greatly affected. The adverse effects of AFib can differ between patients: some may have haemodynamic changes associated with rapid pulse rate or irregularity; others may have complications such as **cerebro-vascular accidents** (CVAs) and **transient ischaemic attacks** (TIAs) due to the **thromboembolic** complications of the disease (Andrade et al. 2014).

Although many patients with AFib will have some form of cardiovascular disease, AFib can occur in patients without any detectable heart disease or related symptoms (Aehlert 2018). Examples of conditions that are both cardiac and noncardiac are shown in Table 16.1.

The predominant form of AFib determines how it should be categorised. AFib that terminates spontaneously within seven days is termed paroxysmal, and AFib present continuously for more than seven days is called persistent. AFib that persists for longer than one year is termed longstanding persistent, whereas longstanding AFib refractory to cardioversion is termed permanent. However, 'permanent AFib' is not necessarily permanent in the literal sense, because it may be successfully eliminated by surgical or catheter ablation (Morady and Zipes 2019).

When AFib occurs suddenly, it can cause a reduction of cardiac output of up to 10–20%, regardless of ventricular rate. Risk of heart failure and cardiac ischaemia increases if there is an event causing a ventricular tachycardia (Aehlert 2018). Therefore, an AFib patient with acute symptoms such as described here must be treated as a medical emergency.

AFib is also associated with greater risk of stroke and thromboembolism, and increased incidence of stroke by age 80. This is due partly to intra-atrial blood stasis (standstill of blood in the atria due to fibrillation) and increases the incidence of clot formation (thrombogenesis), leading to stroke and other thromboembolic disorders (January et al. 2014).

Paramedic management of AFib focuses on symptom and ECG rhythm recognition, and symptom management. Rate control and rhythm control are the two primary treatment strategies used to manage the symptoms.

Table 16.1 Causes of atrial fibrillation.

Cardiac	Noncardiac
Ischaemic heart disease	Acute infections, especially pneumonia
Rheumatic heart disease	Electrolyte depletion
Hypertension	Lung carcinoma
Sick sinus syndrome	Other intrathoracic pathology (e.g. pleural effusion)
Pre-excitation syndromes (e.g. Wolff–Parkinson–White)	Pulmonary embolism
Cardiomyopathy or heart muscle disease	Thyrotoxicosis
Pericardial disease	Post-surgery
Atrial septal defect	Electrolyte balance
Atrial myxoma	Excessive alcohol or caffeine consumption
	Emotional or physical stress

With rate control, the patient remains in AFib, but the heart rate is slowed to reduce acute symptoms, or prevent signs of heart failure developing. With rhythm control, the patient may be cardioverted or medications used that may revert the patient to a sinus rhythm (Aehlert 2018).

Chronic cor pulmonale

Cor pulmonale is right-sided heart ventricular failure and pulmonary heart disease brought about by pulmonary arterial hypertension (Weitzenblum 2003). There are a number of causes of cor pulmonale, some acute, such as a thrombus or emboli in the respiratory circulation (pulmonary embolism), some related to congenital abnormalities, and others due to infectious diseases affecting the respiratory system, such as the human immunodeficiency virus (HIV; Weitzenblum 2003). It is important to choose the correct care pathway for the critically unwell patient and consider the acute nature of a patient's dyspnoea.

A hypoxic episode will increase pulmonary vascular resistance and pulmonary arterial pressure; this is due to hypoxic pulmonary vasoconstriction (i.e. a low oxygen state in the blood causing the vessels in the lungs to squeeze tighter and increase the circulating pressure), thus causing pulmonary hypertension (Weitzenblum 2003).

It is difficult to diagnose cor pulmonale in the out-of-hospital setting, as a number of symptoms present only in the late stages of the condition. One of the most noticeable signs of right-sided heart failure is peripheral (ankle) oedema (though it should be noted this is not specific to this condition). In severe pulmonary hypertension, the pulmonary component of the second heard sound may be **accentuated** (Weitzenblum 2003).

The treatment of right-sided heart failure involves diuretics such as furosemide and nitrates. Long-term oxygen therapy can also improve prognosis and **digitalis** can be used in cases of associated left-sided heart failure and/or arrhythmia. Specific treatment of pulmonary hypertension consists of vasodilators such as sildenafil and home oxygen therapy (Weitzenblum 2003).

Valvular heart disease

Valvular heart disease covers a variety of complications that deal with the valves of the heart. Primarily the two we are interested in are both problems that are caused by stenosis, a narrowing or constriction of the diameter of a bodily passage or orifice ('Stenosis 2019'). This narrowing can occur in many places, especially at the aorta and the mitral valve (Meckler et al. 2016).

Aortic stenosis

Aortic stenosis is a structural abnormality of the aortic valve that prevents the left ventricle from emptying (Czarny and Resar 2014; Meckler et al. 2016). A ventricle that is unable to finish emptying will attempt to grow bigger and stronger over time to overcome the pressure required (it hypertrophies). Rheumatic heart disease is a major cause of aortic valve disease worldwide. Bicuspid aortic valves and congenital heart disease are causes as well, especially in younger patients. The prevalence of aortic stenosis is about 3% of patients over 74 years old (Meckler et al. 2016).

With most causes of aortic stenosis, symptoms of the disease will typically occur over a gradual period of time in which the patient will develop symptoms (Czarny and Resar 2014). The classic triad of aortic stenosis is dyspnoea, chest pain, and syncope (Meckler et al. 2016). However, many patients with severe stenosis can be asymptomatic.

The downward spiral of symptoms will progress, usually starting with dyspnoea (also occasionally with coughing blood – haemoptysis), followed by chest pain, then syncope. Once symptoms start, mortality increases as arrhythmias and finally signs of heart failure result (Kumar and Clark 2017).

When listening to the heart, a harsh systolic ejection murmur can be heard over the right upper sternal border, radiating to the neck, and may be preceded by an ejection click as a result of sudden opening of the deformed but mobile valve (Bickley et al. 2017).

Mitral stenosis

Like aortic stenosis, mitral stenosis is often caused by rheumatic disease (Meckler et al. 2016) and is more common in children and women (de Silva 2013). With rheumatic fever, the disease creates inflammation of the mitral valve that leads to thickening of the leaflet edges and fusion and scarring of the cusps. Subsequent ongoing scarring leads to valve deformity and an inability of the valve to do its job, which is closing under pressure (Thomas and Bonow 2019). If this condition is left untreated, chronically elevated left atrial pressure can lead eventually to right ventricular failure caused by increased pulmonary capillary pressure, pulmonary oedema, and pulmonary hypertension (Meckler et al. 2016).

Treatment is aimed at symptom management for mild cases of mitral stenosis, diuretics for heart failure, and anti-coagulation for patients in AFib. In worsening cases or if there are signs of pulmonary hypertension, procedures can be performed to improve or replace the valve (Thomas and Bonow 2019).

Patient assessment

Once you have completed the primary survey and established the patient is not time critical, you may begin the secondary survey, which includes the patient interview (history taking), a clinical examination, and a full set of vital signs.

The process outlined in this chapter is based on a medical model approach, which is a systematic process consisting of a comprehensive history and a structured clinical examination. Before commencing the assessment, ensure you have identified and managed any immediate threats to life. Patients found to be time critical during the primary survey would require a limited, focused exam. The medical model approach should only be utilised for patients determined not to be time critical.

The cardiac system is interlinked with other body systems and cardiac conditions may sometimes only be detected through abnormal presentations in other systems. For this reason, it is often necessary to undertake an integrated clinical examination. The two most common integrated examinations are the cardio-respiratory and cardio-abdominal examination.

History taking

Effective history taking is an essential part of patient assessment: 80–90% of diagnoses can be made from the history alone. A suggested structure for obtaining the history is listed here, mnemonics are outlined in Table 16.2, and suggested questions detailed in Table 16.3.

Presenting complaint and history of presenting complaint

The presenting complaint refers to the reason the patient sought help in the first place. The chief complaint for cardiac conditions may often not appear to be cardiac in origin until further investigations are conducted. Some examples of the most common complaints that would warrant a full cardiovascular examination are chest pain or discomfort, dyspnoea, cough, syncope, palpitation, fatigue, and loss of consciousness.

When dealing with patients across the lifespan, you may need to consider different triggers. Chief complaints in paediatrics that would suggest the potential for cardiac disease are quite different to those of adult patients. For example, some red flag presentations would be cyanosis, periods of apnoea, tiredness during feeding, and breathing changes during feeding. It is important to have an awareness of these and to maintain a high index of suspicion when called by concerned parents.

The same is true for geriatric patients, where it can be notoriously difficult to diagnose serious illness due to atypical presentations such as fatigue and orthostatic hypotension. Keep an open mind and maintain a high index of suspicion when presented with 'vague' symptoms.

Practice insight

It is important when examining patients who are not independently mobile to look for oedema in the sacral area as well as in the lower limbs. In patients whose lower limbs are not dependent, sometimes the only indicator will be found in the sacral region.

Table 16.2 Mnemonics for history taking relating to symptomology.

OPQRST-ASPN	SOCRATES
Onset	**S**ite
Provocation or **P**alliation	**O**nset
Quality	**C**haracteristics
Region and **R**adiation	**R**adiation
Severity	**A**ssociated symptoms
Time	**T**iming
Associated **S**ymptoms[a]	**E**xacerbates/**A**lleviates
Pertinent **N**egatives	**S**everity

[a] Associated signs and symptoms related to cardiac conditions: diaphoresis (perspiration), restlessness or anxiety, feeling of 'impending doom', nausea and/or vomiting, palpitations, fatigue, oedema (peripheral and sacral).

Table 16.3 Questions for cardiac patients.

History type	Lines of enquiry/questions to ask
History of presenting complaint	How did the chest pain/shortness of breath begin?
	How severe is the pain/breathlessness? Does it affect functionality (walking upstairs/to the bathroom, washing/dressing)?
	What were you doing when it started?
	Are there any relieving or aggravating factors?
	Were you eating during onset?
	Did the pain start at rest or on exertion?
	Is the onset acute, subacute, or chronic?
	Any recent illness/infection?
	Have you taken any medication to attempt to resolve these symptoms and how effective was it?
Previous medical history	Any history of myocardial infarction, angina, coronary artery disease, congestive heart failure?
	Any cardiac surgery?
	Any history of rheumatic fever?
	Congenital abnormalities or dysrhythmias?
	Any history of stroke, diabetes, hypertension, deep vein thrombosis or pulmonary embolism, peripheral vascular disease, high cholesterol, asthma, chronic obstructive pulmonary disease, renal or gastric disease?
	Any previous hospital admissions? Similar episodes or recent investigations?
Medication history	Do you take any medications on a regular basis? Note dosage and compliance
	Length of time on current medication regime? Date of last medication review?
	Do you take any 'over-the-counter' medication?
	Any history of recreational drugs?
	Any use of herbal remedies?
Social history	Any history of smoking? Number and years?
	Alcohol consumption?
	Any history of recreational drug use?
	Patient's occupation? Retired or still employed?
	Any anxiety-related symptoms or history of depression?
	Travel history?

(*Continued*)

Table 16.3 (*Continued*)

History type	Lines of enquiry/questions to ask
	Attitude to health and physical activity?
	Any social support needed/in place for activities of daily living?
Family history	Health of siblings?
	Cause and age at death – parents and siblings?
	Family history of sudden adult death?
	Congenital heart defects?
	Family history of risk factors?
Review of systems: cardiovascular	Any pain or pressure in chest, arm, or neck?
	Are you short of breath? On exertion or at rest?
	Have you been woken up at night by severe breathlessness?
	Can you lie flat at night without feeling breathless (orthopnoea)?
	Any swelling in ankles (peripheral oedema)?
	Have you noticed any palpitations or an irregular heart beat?
	Do you ever get pain in calves on walking?
	Do you ever get cold or blue extremities?
	Any specific risk factors? Rheumatic fever, myocardial infarction, diabetes?

Past/previous medical history

It is important to investigate the patient's previous medical history, including previous illnesses and surgical history, including any minor dental work. Remember to enquire about childhood illnesses too, as this may provide important information about risk factors. For example, rheumatic fever, which is still found in some population groups, is a risk factor for valvular heart problems. It is also useful to explore how well managed current conditions are and whether the patient has recently undergone a review of their condition, or there has been any deterioration of previous managed conditions (Douglas et al. 2013; Talley and O'Connor 2017).

Drug history

Drug history should be explored during the history taking and should include questions around compliance and concordance, and whether or not the patient is taking any additional 'over-the-counter' medication, herbal remedies, or recreational drugs. Establish whether the patient has had a recent review of their medication and whether they have recently started or stopped taking any medication. It is good to develop a working knowledge of the commonly prescribed medications for cardiac conditions, especially as the patient may not always be able to communicate this information to you during an acute presentation (Talley and O'Connor 2017).

Allergies

Questions around allergies relate to medication, food, and other factors (insect bites, animals). Further questions should be asked around any identified allergies to determine what the exact nature of the response was and whether the patient suffered a minor allergic reaction or an anaphylactic reaction.

Social history

Social history incorporates a wide range of information, from day-to-day activities to occupation, travel history, physical activity, nutrition, alcohol and tobacco consumption, and sexual history (if appropriate). The responses to these questions may provide important clues to the presence of risk factors for specific conditions, as well as providing you with a good overview of the patient's general health status (Douglas et al. 2013). For example, smoking, excess alcohol consumption, and poor nutrition are contributing factors to coronary artery disease and peripheral vascular disease (Bledsoe et al. 2013).

Family history

Family history is important, as many cardiac disorders have a genetic component. For example, a positive history of coronary artery disease, hypertension, and diabetes would all be pertinent findings when assessing a cardiac patient (Bledsoe et al. 2013).

Clinical examination

Clinical examination of the cardiovascular system starts with an end-of-bed assessment to provide a general impression of the patient. This takes into account factors such as the patient's gender, weight, and body shape (any evidence of obesity, wasting, or other features of note), as well as a consideration of environmental clues. Whilst the chief anatomical area for cardiovascular examination focuses on the chest, it is important to undertake a systematic examination starting from the patient's hands and nails, moving up to their arms, neck, and face, including examination of the eyes and mouth (Talley and O'Connor 2017). A more detailed examination of the chest would follow utilising the IPPA (Inspection, Palpation, Percussion, and Auscultation) structure (Douglas et al. 2013).

The paramedic must be able to perform a range of physical assessments when assessing the cardiovascular system, ranging from basic checks such as assessing the pulse, through to the more complex, such as listening to heart sounds. The recommended structure for conducting the physical examination is as follows.

Hand assessment

Much information about the patient's level of perfusion can be obtained through a brief examination of the hands. Examine for tremor (can be medication induced) and a carbon dioxide retention flap (asterixis). Check also for clubbing, cyanosis, and any other abnormalities present in the nails, such as splinter haemorrhages. You should also take note of the temperature and texture of the skin (warm and dry or cool and clammy).

Finger clubbing

Finger clubbing is an indicator of potential cardiovascular disease and can suggest hypoxia. Normally the nail beds should be firm on palpation, but in early clubbing they may feel springy. To assess the level of clubbing, ask the patient to place the first phalanges of the forefingers together. A normal result would display a small diamond shape between the two nails; in late clubbing the convex nail bases can touch without leaving a space and therefore no diamond. Patients with this condition could have serious respiratory and cardiac diseases, such as heart failure or emphysema (Comerford and Hodgson 2013).

Assessing the pulse

When assessing arterial pulses, the middle and index finger are used to apply pressure at specific sites; these can help to assess the condition of the patent or the circulation of the limb. Commonly palpated pulse sites include:

- Carotid pulse
- Brachial pulse
- Femoral pulse
- Pedal pulse
- Radial pulse

Practice insight

One method for palpating the pulse expects a pulse to be palpated for 15 seconds and then that figure multiplied by 4 (for example, 20 beats noted in 15 seconds × 4 = 80 beats per minute); however, it is essential to palpate for a full 60 seconds in a patient who has an irregular pulse and who is not time critical.

The carotid pulse can be palpated medial to the trachea and below the angle of the jaw; it is important never to palpate both carotid arteries simultaneously, as this may compromise circulation to the brain.

The brachial pulse can be found when palpating the arm medial to the biceps tendon. This pulse site is commonly used for blood pressure measurement. By applying pressure to the medial and ventral side of the wrist, just below the base of the thumb, the radial pulse can be felt.

To palpate the femoral pulse, firm pressure should be used at a point inferior to the inguinal ligament. The dorsalis pedis (Figure 16.4) can be palpated by placing two fingers on the medial dorsum of the foot whilst the patient points their toes downwards. This pulse can be difficult to locate and may be absent or abnormally sited in some healthy patients (Comerford and Hodgson 2013).

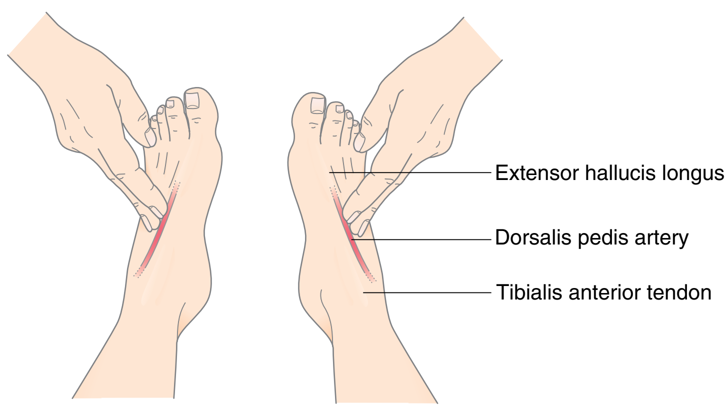

Figure 16.4 Locating the dorsalis pedis pulse.

The radial pulse is located at the wrist. Described as a peripheral pulse, it is the most commonly palpated pulse by the paramedic and helps determine cardiovascular efficiency due to its presence and strength. When assessing a pulse, take note of:

- Presence/absence
- Rate
- Regularity
- Strength

Other features to note in the cardiac patient are whether there are any signs of radio-radial delay, radio-femoral delay, collapsing pulse, pulse alternans, or pulsus paradoxus.

Pulsus paradoxus

During normal respiratory and cardiac function, there is slight variation of pulse volume due to continually changing **intrathoracic pressure**; this can be measured using blood pressure and respiration. To assess pulsus paradoxus, measure the systolic pressure, as already detailed, during inspiration and expiration. If a systolic decrease of >15 mmHg is present with inspiration, then it is pathological and could be attributed to cardiac tamponade (Douglas et al. 2013).

Head and neck assessment

Inspect the eyes to exclude any pallor of the conjunctiva, which may suggest anaemia, and inspect around the eyes for any signs of xanthelasma (small fatty deposits) or corneal arcus (white rings around the iris of the eye), which may indicate elevated levels of cholesterol (Talley and O'Connor 2017). Check also for any signs of pallor or cyanosis in the face and mouth, and for any evidence of poor dentition, which may be a risk factor for other conditions such as infective endocarditis (Douglas et al. 2013). Check the neck for any signs of increased jugular venous pressure suggestive of right ventricular failure, acute pulmonary embolism, chronic obstructive pulmonary disease (COPD), or cor pulmonale (Douglas et al. 2013).

Chest examination

Following the IPPA format, examination of the chest starts with inspection of the thorax. Remember that both the anterior and posterior thorax should be examined.

Inspection

Inspect the thorax, observing for pallor, mottling, or diaphoresis. Take this opportunity to assess for bilateral and symmetrical movement of the chest and to observe any signs of respiratory distress (accessory muscle use, cyanosis). Note the presence of mid-sternal scars suggesting cardiac artery bypass graft or signs of a pacemaker. When inspecting the posterior thorax, check for sacral oedema, as in less mobile patients it may not be found in the peripheries.

Palpation

The chest should be palpated for any tenderness or crepitus. The apex beat should also be palpated, as anatomical displacement is suggestive of pulmonary disease. It may be possible to feel palpable murmurs (thrills), which indicate turbulent blood flow. Identification of palpable murmurs is suggestive of significant underlying pathology (Talley and O'Connor 2017).

Percussion

Percussion is less useful as a diagnostic tool in the cardiovascular assessment, but percussion would normally be undertaken routinely with respiratory assessment and patients would often require an integrated cardio-respiratory assessment, as many presentations are difficult to isolate as either cardiac or respiratory without more detailed investigations.

Auscultation: Heart sounds

Specific events in the cardiac cycle can be heard at different locations across the chest (Figure 16.5). The bell and diaphragm of the stethoscope accentuate sounds of different pitches and should be used at all locations to provide a comprehensive assessment; leaning the patient forward with breath held can assist auscultation. The closure of heart valves causes the classic 'lub-dub' sound heard in a normal assessment. It is important to include routine auscultation of heart sounds in every assessment so that additional sounds such as murmurs can be identified (Douglas et al. 2013).

As with all assessments, distinguishing normal findings from abnormal ones can be difficult without continued practice. Normal heart sounds should be as follows:

- *First heart sound* ('lub' sound on auscultation). This is caused by the closure of the mitral and tricuspid valves at the onset of ventricular systole. It is best heard at the apex location and can be documented as S1 (Douglas et al. 2013).
- *Second heart sound* ('dub' sound on auscultation). This is caused by the closure of the aortic and pulmonary valves at the end of ventricular systole. It is louder and more high pitched than the first sound, is best heard at the left sternal edge, and can be documented as S2. In healthy patients a split S2 (lub-d/dub) can be heard at the end of inspiration, due to the left ventricle emptying before the right, causing the valves to actuate at different times to suit the actions of the heart. A prolonged or wide splitting of the second sound would be categorised as abnormal and could suggest some cardiac abnormality. For example, a split that widens during inspiration could indicate right bundle branch block and a split that widens during expiration could indicate left bundle branch block (Douglas et al. 2013).

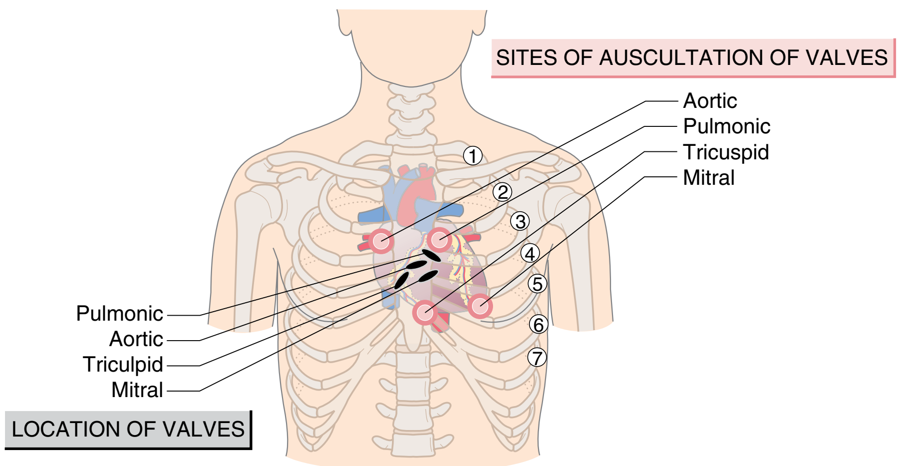

Figure 16.5 Locations for auscultating heart sounds.

- *Third heart sound*. This occurs during early **diastole** and can be present in healthy young people and during pregnancy, but should be considered abnormal in any patient over 35. It is associated with abnormally increased filling pressures in the atria and can be heard at the apex using the bell; the sound should present as 'lub-da-dub' and can be documented as S3 (Fang and O'Gara 2019).
- *Fourth heart sound*. This occurs immediately before the first heart sound; it is always pathological. The fourth sound is caused by a forceful atrial contraction against a noncompliant ventricle and, as with the third sound, it is best heard at the apex using the bell of the stethoscope. The sound should present as 'da-lub-dub' and can be documented as S4. Both third and fourth heart sounds cause a triple rhythm, known as a gallop (Douglas et al. 2013; Fang and O'Gara 2019).

Murmurs

The **turbulent flow** of blood through an abnormal valve, across a septal defect, due to an outflow obstruction or by increasing the volume or velocity of flow through a normal valve, can all cause murmurs. Murmurs can occur in healthy and diseased hearts; innocent murmurs could be caused by the increased stroke volume of an athlete or by pregnancy, or in more serious medical conditions such as valve prolapses or stenosis. The timing of a murmur can be important in the recognition of its pathology. For example, aortic stenosis causes a systolic murmur. By palpating a carotid pulse during auscultation, a clinician can ascertain the point in the cardiac cycle at which the murmur is occurring (i.e. systole, from the first sound, during the carotid beat finishing at the second sound; diastole, from the second to the first sound; Douglas et al. 2013)

Blood pressure measurement

The blood pressure is the pressure exerted on the artery walls by circulating blood and can be measured using a sphygmomanometer and a stethoscope. The maximum pressure that occurs during left ventricular contraction is known as the systolic pressure, whilst the residual pressure maintained in the aorta following contraction of the left ventricle is the diastolic pressure. These two figures are measured in millimetres of mercury (mmHg), are recorded as systolic above diastolic, and provide a guide to the haemodynamic condition of a patient. A normal blood pressure can be defined as 100–120/70–80 mmHg (Comerford and Hodgson 2013), but variations in stress, excitement, and environment can all affect this reading (Douglas et al. 2013).

Practice insight

During the vehicle daily inspection, be sure to check for the presence of a working manual blood pressure cuff. It is easy to overlook this essential piece of ambulance equipment.

Mean arterial pressure

Mean arterial pressure (MAP) is an important assessment tool, as it gives an accurate measure of the perfusion pressure in the systemic circulation. It is defined as the average arterial pressure throughout the cardiac cycle (Douglas et al. 2013). At present it is common practice to use a brachial blood pressure as an estimated measurement of the entire body's circulation, rather than having a more specific measurement of organ perfusion. To perfuse the kidneys and the brain, an approximate MAP of 60 is required (American Academy of Orthopaedic Surgeons 2007).

A patient with a brachial blood pressure of 80/50 and a pulse rate of 120 would have a MAP of 64. The MAP can be calculated using the following equation:

$$\mathrm{MAP} = \left[\left(2 \times \text{diastolic} \right) + \text{systolic} \right] / 3$$

MAP equals 2 times the diastolic pressure plus the systolic pressure, divided by 3 times the systolic blood pressure.

Assuming a blood pressure of 120/80:

MAP = 160 (this number is the diastolic × 2) + 120 (systolic) / 3 (so 200/3) = 67 (rounded from 66.6)

End-tidal carbon dioxide monitoring (Capnography)

Cellular aerobic metabolism produces carbon dioxide (CO_2) as an end product. It defuses from the cells and is transported to the lungs in blood via the venous circulation, and as a result of cardiac contraction. Capnography or end-tidal carbon dioxide ($ETCO_2$) monitoring is a noninvasive technique that allows the clinician to monitor and evaluate the efficiency of the respiratory and circulatory system. Normal $ETCO_2$ values are 35–45 mmHg or 4.6–5.9 kPa. A change from this normal value can be evaluated according to a patient's condition and treatment can be altered accordingly (Douglas et al. 2013).

In the prehospital setting, $ETCO_2$ measurement devices are routinely used to confirm the correct position of the endo-tracheal tube during intubation. They are also used in the conscious patient via a nasal cannula, when presented with a patient who has a respiratory disease such as COPD.

Conclusion

Paramedics must possess the necessary skills and knowledge to be able to recognise and manage a wide range of cardiac presentations. This chapter has provided an overview of commonly occurring cardiac illnesses that the paramedic is likely to come across during their routine, daily practices, as well as identifying key aspects of patient assessment.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. Where is the heart situated?
2. What is the MAP?
3. What is stenosis?
4. What does capnography measure?
5. Define the pulse.
6. What is heart failure?

Activity 16.1

Reflect on the case study of the 45-year-old male you were presented with at the beginning of the chapter, how do you think he should be managed?

Activity 16.2

1. Draw a diagram of the flow of blood through the heart.
2. Using your diagram, explain to a friend how valve problems can cause pressure to build up and heart enlargement.

Activity 16.3

Using the descriptions in the chapter, follow the processes mentioned to feel (palpate) for your own pulse. Take a note of its strength, rate, and rhythm.

Glossary

Accentuated:	Stressed or emphasised.
Cerebro-vascular accident (CVA):	The common term for a stroke.
Chordae tendineae:	Heart strings (tendons) that connect the papillary muscles to the mitral valve in the heart.
Diastole:	The pressure within the aorta during a period of relaxation following systole.
Digitalis:	A drug derived from the foxglove, of which an example is digoxin.
Hypertension:	High blood pressure.
Intrathoracic pressure:	Also called intrapleural pressure; the pressure within the thoracic cavity.
Thromboembolic:	The blocking of a blood vessel by a clot.
Transient ischaemic attack (TIA):	Also termed a mini-stroke. Symptoms of a stroke occur, but are fully resolved within a 24-hour period.
Turbulent flow:	A flow regime characterised by chaotic movements and property changes.

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17

Assessing the nervous system

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Contents

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Learning outcomes

On completion of this chapter the reader will be able to:

- Understand the normal functioning of the nervous system and the impact of pathophysiological changes, disease, or illness.
- Recognise the assessment needs of a patient with potential neurological impairment.
- Identify how to carry out specific neurological assessments in order to inform differential diagnoses and management.
- Consider the importance of a cranial nerve assessment.
- Consider the importance of a peripheral nerve assessment.

Case study

You have been called to a local nursing home where there are reports of an elderly female who has become unresponsive. On arrival the patient's eyes are open, and you notice that she has excess saliva in her upper airway and is leaning to her left side. You also notice that the patient has been incontinent of urine and does not respond to verbal or physical stimulus. You manage the patient's airway with gentle suctioning and she is conveyed to the ambulance, where she is made comfortable and taken to the hyper-acute stroke unit (HASU).

Introduction

Neurological conditions affect approximately 10 million people across the UK and account for 20% of acute hospital admissions. An estimated 350 000 people across the UK need help with daily living because of a neurological condition and 850 000 people care for someone with a neurological condition (Department of Health 2005).

Paramedics will regularly attend patients with acute and chronic neurological diseases. These are often complex, with life-threatening symptoms that need rapid diagnosis and management to prevent deterioration or damage. This chapter will describe the function of the nervous system and how pathophysiological changes, disease, and illness can affect it. It will stress the importance of history taking and the value of neurological examination techniques you might employ to inform differential diagnoses and patient management.

Nervous system: Structure and function

The human nervous system comprises a network of nerves and cells that carry impulses between the brain, spinal cord, and various parts of the body. The purpose of the nervous system is to detect changes in the external and internal environments and initiate appropriate responses in muscles, organs, and glands. The nervous system can be damaged by inherited or developmental abnormalities, disease processes, and traumatic injury. Conditions include:

- Structural disorders of the brain and spinal cord (central nervous system).
- Structural disorders of the nerves in the face, trunk, and limbs (peripheral nervous system).
- Disorders involving muscles.

- Common conditions which are not necessarily caused by structural disease, such as headache.
- Other conditions such as epilepsy, fainting, and dizziness.

Assessment and examination of the nervous system require knowledge of anatomy and physiology. Therefore, an understanding of **neuroanatomy** and its correlation with function and dysfunction is essential in order for you to diagnose and treat a patient with neurological problems. The section offers a brief overview of the nervous system; further reading on this complex topic is recommended.

The nervous system controls the body's **motor**, sensory, **autonomic**, cognitive, and behavioural functions, and is divided into the central nervous system and the peripheral nervous system (CNS and PNS, respectively). The CNS comprises the cells that lie within the brain, brain stem, and spinal cord. The PNS comprises the nerves that lie outside these structures, including 31 pairs of spinal nerves, 12 pairs of cranial nerves (CN), all of their branches, and the autonomic nervous system (ANS), which subdivides into the sympathetic and parasympathetic nervous systems and plays an important role in controlling the endocrine and homeostatic systems of the body. Within the nervous system there are millions of neurones whose electrical excitability enables nerve impulse conduction.

The neurone is a specialised conductor cell that receives and transmits electrochemical nerve impulses. A neurone has a cell body and long arms that conduct impulses from part of the body to another part. The three main components of a neurone: cell body, dendrites, and axon. From the cell body there are several branch-like, thick extensions; these are **dendrites**. This is typical of a motor neurone, which will have multiple thick dendrites; a sensory neurone will have one single long dendrite. The function of the dendrite is to carry a nerve impulse into the cell body. The axon is a long, thin process that carries impulses away from the cell body to another neurone or tissue.

Each neurone is covered with a layer of lipid, or **myelin sheath**, which acts as an electrical insulator, alters the conducting properties of the axon, and allows for rapid action potential transmission without loss of signal. The specific loss of neurones is seen in a number of neurological disorders and diseases, including Alzheimer's, Parkinson's, and motor neurone diseases, and is usually neurodegenerative in nature.

Central nervous system

The CNS has two major parts: the brain and the spinal cord (Figure 17.1). The brain comprises three parts – the **cerebrum**, the brain stem, and the cerebellum – and is surrounded by three protective layers called the meninges and bathed in cerebral spinal fluid (CSF).

Cerebrum

The cerebrum has an outer layer of nerve cell bodies, the cerebral cortex, which is responsible for the highest functions of the CNS such as thought, memory, reasoning, and voluntary movement. The cerebrum can be further divided into two hemispheres, left and right, and each of these into four lobes, each with their own primary functions, shown in Figure 17.1 and detailed in Table 17.1.

Damage to any of these areas produces a corresponding loss of function, including motor weakness, paralysis, loss of sensation, or impaired ability to process language. Damage occurs when the highly specialised neurological cells are deprived of blood supply, for example when a cerebral artery becomes occluded following a thrombotic stroke, vascular bleeding, or loss of oxygen due to hypoxia after brain injury.

Cerebellum

The cerebellum is located under the occipital lobe and contains branches of the major and sensory pathways. It controls motor coordination of voluntary movement, posture, balance, and motor tone. It is not involved with initiating movement, but facilitates smooth, coordinated muscle movement, balance, and proprioception (awareness of our body in space). Diseases affecting the cerebellum include multiple sclerosis and can lead to cerebellar syndrome, causing nystagmus (incoordination of eye movement), dysarthria (difficulty with speech), intension tremors of the upper limbs, and ataxia (abnormal gait).

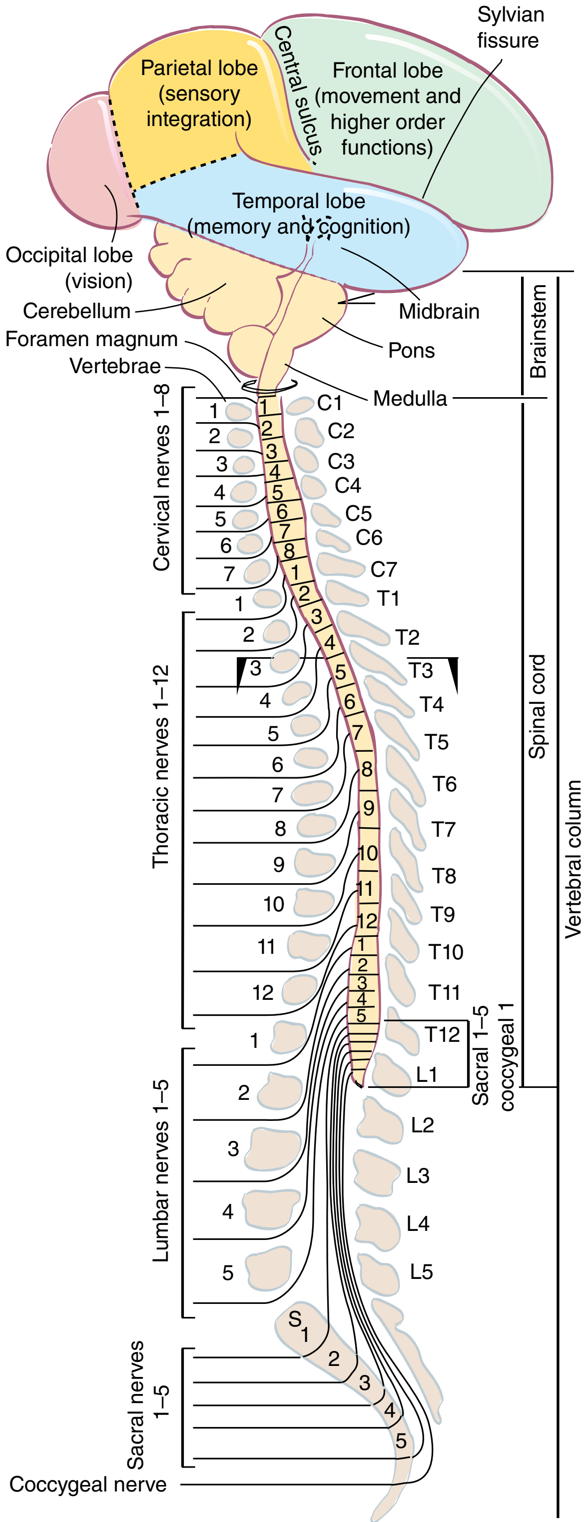

Figure 17.1 The organisation of the brain and spinal cord. Source: Barker et al. (2012, p. 12). Reproduced by permission of John Wiley & Sons.

Table 17.1 Functions of the lobes of the cerebrum.

Lobe	Function
Frontal	Personality, behaviours, function, emotions, and intellectual function. Broca's area controls the ability to speak. Primary motor cortex initiates voluntary movement.
Parietal	Primary centre for sensation providing analysis of deep and cutaneous touch, pressure, position, and vibration.
Occipital	Primary visual receptor centre.
Temporal	Primary auditory reception centre with functions of hearing, taste, and smell. Wernicke's area associated with language comprehension.

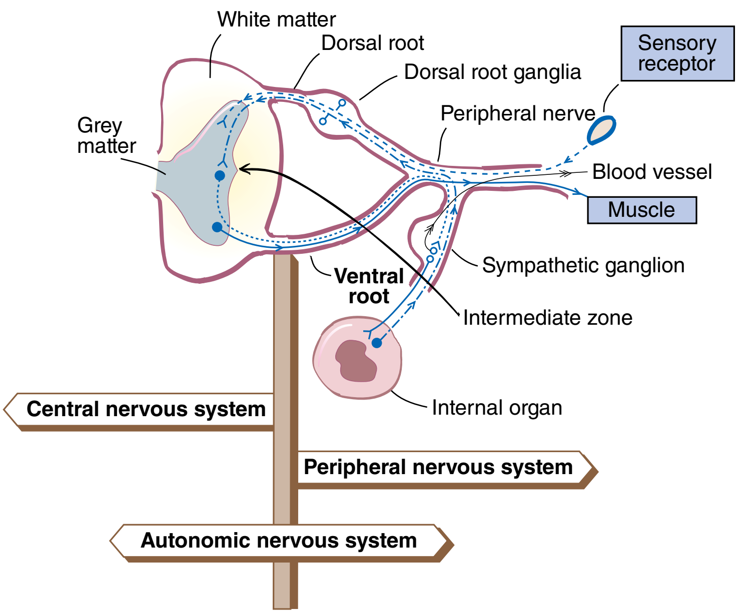

Figure 17.2 Cross-section of the spinal cord. Source: Barker et al. (2012, p. 12). Reproduced by permission of John Wiley & Sons.

Brain stem

The brain stem can be subdivided into three parts: midbrain, pons, and medulla (Figure 17.1), all of which have ascending and descending sensory and motor tracts passing through them to link the brain and spinal cord. The brain stem controls vital functions such as the respiratory and cardiovascular systems, swallowing, and coughing. The brain stem also contains CNs III–XII.

Spinal cord

The spinal cord is continuous with the medulla and occupies the spinal canal within the vertebral column. It provides a series of segmented pathways enabling messages to travel between peripheral areas of the body and brain. The spinal cord is divided into five sections: cervical, thoracic, lumbar, sacral, and coccyx (Figure 17.1). Sensory and motor nerve pathways enter and exit the cord through spinal and peripheral nerves (Figure 17.2).

Peripheral nervous system

The PNS contains the 31 pairs of spinal and peripheral nerves and the 12 pairs of CNs. There are 8 cervical, 12 thoracic, 5 lumbar, 5 sacral, and 1 coccyx pair of spinal nerves, which are labelled according to where they exit the spinal cord, e.g. C1, L2, S1. Each nerve has an anterior root containing motor fibres and a posterior root containing sensory fibres. Peripheral sensory nerves transmit stimuli from sensory receptors in the skin, muscles, and sensory organs to the spinal cord. For the purpose of assessing sensory function, we refer to different areas of the body as dermatomes, with each dermatome representing a sensory nerve impulse to a particular spinal root (Figure 17.3).

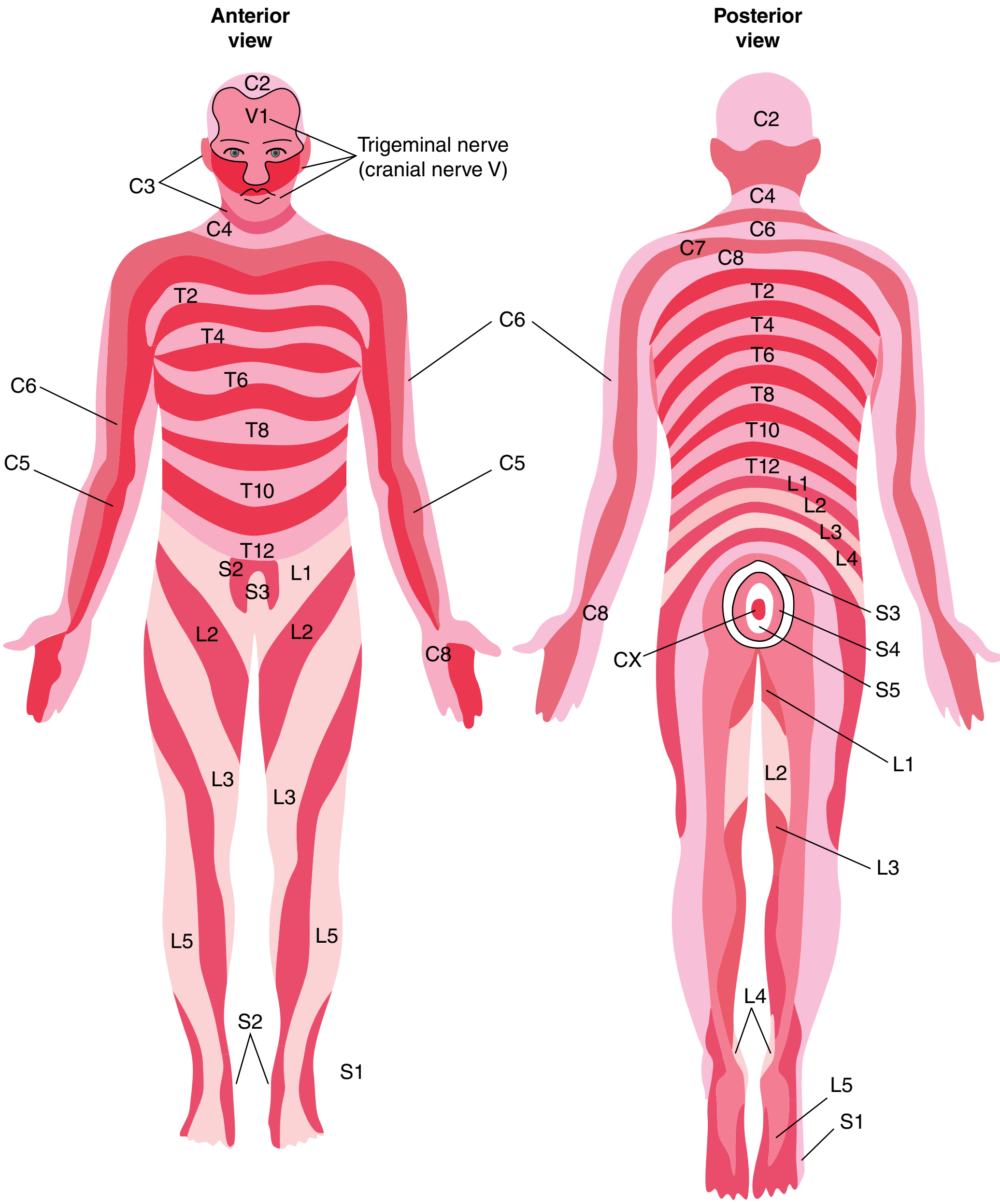

Figure 17.3 Dermatomes of the body.

Table 17.2 The 12 cranial nerves.

Name	Number	Function	Impulse
Olfactory	I	Sense of smell	Sensory
Optic	II	Vision	Sensory
Oculomotor	III	Eye movement, opening eye lid, and pupillary constriction	Motor
Trochlear	IV	Downward and inward movement of the eye	Motor
Trigeminal	V	Chewing, corneal reflex, and face sensation	Sensory and motor
Abducens	VI	Lateral movements of the eye	Motor
Facial	VII	Facial movements and expressions including smiling, closing of the eyes, taste, production of saliva, and tears	Sensory and motor
Acoustic	VIII	Hearing and balance	Sensory
Glossopharyngeal	IX	Swallowing, taste, and salivating	Sensory and motor
Vagus	X	Swallowing, gag reflex, talking, sensations of throat and larynx, activities of the abdomen and thoracic viscera (heart rate and peristalsis)	Sensory and motor
Spinal accessory	XI	Movement of the shoulders and head, rotation and development of the sternomastoid and trapezius muscle	Motor
Hypoglossal	X	Movement of the tongue	Motor

Source: Adapted from Jarvis (2012). Reproduced with permission of Elsevier.

The 12 pairs of CNs are assigned a Roman numeral and a name, which relates to their function. CNs I and II emerge from within the cranium and, as already mentioned, III–XII from within the brain stem. Some CNs are either just sensory or motor, a few are both, and others are specialised to producing the senses (smell, vision, hearing, and taste). Table 17.2 provides a summary of each of the CNs, including their name, number, function, and type of impulse.

Upper and lower motor neurones

Abnormalities in the upper motor neurones will display differently from those in the lower motor neurones (Table 17.3). Upper motor neurones lie in the motor strip of the cerebral cortex and synapse with motor nuclei in the brain stem for the CNs and spinal cord for the peripheral nerves. Lower motor neurones are peripheral neurones that run from the spinal cord into the peripheral nerves, terminating at the neuromuscular junction to initiate action.

History and physical examination

Symptoms of neurological problems vary according to the part of the nervous system affected. The symptom may be specific and sudden (e.g. headache, double vision) or gradual (e.g. forgetfulness, limb weakness, or numbness). When disease processes affect the structure of neural tissue, significant changes are often found during

Table 17.3 Effects of motor neurone disease muscle tone, reflex, and strength.

	Tone	Reflex	Strength
Upper motor neurone disease	Increased	Increased or brisk	Reduced or absent strength
Lower motor neurone disease	Reduced	Decreased or absent	Reduced or absent strength

clinical examination. Disorders of neural function (e.g. epilepsy) may produce no abnormal signs during clinical examination, and diagnosis is reliant on history taking to establish:

- Time and locality
- Precipitating factors
- Associated principles
- Past, family, and social history

Physical examination/assessment of the neurological system

This section will focus on aspects of neurological assessment that you are most likely to use. Here is important to remember that the nervous system can be affected not only by neurological disorders, but by a number of disease processes. Thus, throughout your examination you need to review findings constantly to help establish whether the abnormality lies in the CNS or the PNS or stems from another cause.

General inspection

General inspection starts with initial observation of the patient, noting **posture** and body position in movement and at rest, evidence of paralysis, weakness, or **involuntary movements**, and **lucidity**. Observations of blood pressure, pulse, respiratory rate, and blood glucose level are also important.

Practice insight

When assessing any patient, especially when making direct observations and if you are unsure of the presence of an abnormality, don't be afraid to ask your crewmate for a second opinion. Also ask the patient and their relatives to confirm whether or not something is normal for them.

Conscious level

Start by speaking to the patient to assess their conscious level. Damage or diseases in the cerebral cortex or reticular activating system can alter a patient's mental function (awareness) or wakefulness (arousal). Causes include:

- Direct destruction of the anatomical structures of consciousness by disease.
- Poisons and toxins (e.g. glue, gases, alcohol, drugs).
- Metabolic and endocrine disorders (e.g. cardiac arrest, hypoglycaemia, liver failure, renal failure, hypo- and hyperthermia).

In an emergency you will initially use an ABCDE approach (Airway, Breathing, Circulation, Disability, Exposure) and assess conscious level using AVPU (Alert, responds to Vocal stimuli, responds to Painful stimuli, or Unresponsive to all stimuli). If you have any doubt about the patient's level of consciousness or the history suggests a risk of deterioration to conscious level, you should use the internationally recognised tool, the Glasgow coma scale (GCS). The GCS was developed by Teasdale and Jennett (1974; NICE 2007) and assesses arousal and cognition by noting a patient's ability to perform three activities: eye opening, motor response, and verbal response. In 2014 the GCS was reviewed and updated by Teasdale to promote its more consistent application and thus a structured approach to assessment (Teasdale et al. 2014). The GCS is presented in graphic scale format (Table 17.4), allowing trends to be easily noted.

When assessing a patient's GCS you need to score their ability to respond to verbal, motor, and **sensory stimuli**, the maximum score being 15 and the minimum 3. When reporting the score it is essential that you break this down into the three components you are assessing: eye opening, verbal response and motor response, e.g. E = 4, M = 6, V = 5, Total 15/15. A reduced score in one or more components suggests neurological concern; a GCS of 8 or less indicates a severe neurological condition and intubating the patient should be considered (NICE 2007; Teasdale et al. 2014).

Eye opening looks at the arousal mechanisms and control of the eyes in the brain stem. When assessing eye opening, the patient scores 4 if their eyes open spontaneously; this indicates that the arousal mechanisms in the brain stem are active, but does not necessarily mean the patient is aware. If they open their eyes to sound they score 3; if they open them following peripheral stimuli/pressure (e.g. by you applying pressure to the side of the finger) they score 2. They score 1 if their eyes do not open to sound or pressure.

Verbal response assesses two elements of cerebral functioning: comprehension and transmission of sensory input, and the ability to reply. An orientated response shows a high degree of integration within the nervous

Table 17.4 Glasgow coma scale (GCS).

Eye opening	Spontaneously	4
	To sound	3
	To pressure	2
	None	1
Best motor response	Obeys commands	6
	Localising	5
	Normal flexion	4
	Abnormal flexion	3
	Extension	2
	None	1
Verbal response	Orientated	5
	Confused	4
	Words	3
	Sounds	2
	None	1

Source: Adapted from Teasdale and Jennett (1974) and Teasdale et al. (2014).

system: a patient who can tell you their name, the date and time, and where they are and why they are there will score 5. If they are unable to answer any of these questions, they should be considered as being confused and will score 4. This group of patients can often appear orientated when first talking to them, therefore it is essential that you ask all patients all three questions. A patient who utters only occasional words in response to your interventions (e.g. putting in a Venflon catheter) will score 3. A patient who makes incomprehensible sounds such as groans and grunts – in response to stimuli rather than spontaneously – will score 2. No verbal response at all will score 1.

Best motor response assesses a patient's ability to interpret and perform simple instructions. Normally it is the response of an upper limb that is recorded, as these are more reliable than lower limb responses that could be the result of spinal reflexes. If the patient is able to obey commands (e.g. lift left arm, stick tongue out), they will score 6. It is important not to demonstrate what you would like them to do, as this allows the patient to copy you rather than interpret your command. If the patient does not obey commands, motor activity needs to be assessed by applying a central painful stimulus (pressure on the supraorbital nerve or trapezius pinch) and observing their response. The stimulus must be applied in a standard way and maintained until a maximum response is obtained. If applying pressure to the supraorbital nerve is inappropriate (e.g. if the patient has eye swelling or orbital fractures), the next recommended central stimulus is a trapezius pinch.

Grading of limb strength

When grading muscle strength you need to ensure that you put appropriate resistance on for the age and gender of the patient. Table 17.5 describes how you would grade your finding.

Coordination

When assessing a patient's coordination, assess gait, balance, and coordination. Disorders of the cerebellar, sensory, and motor systems will affect the patient's coordination. Table 17.6 provides a summary of what this aspect of the assessment involves, and possible alternative findings, with suggested pathology.

Table 17.5 Limb strength grading.

Grade	Findings	Description
0	No muscular contraction detected	No response to painful stimuli
1	Flicker or trace of contraction	
2	Active movement, but cannot overcome gravity	
3	Active movement against gravity, but not resistance	Severe weakness
4	Active movement with evident weakness against resistance	
5	Active movement against resistance without fatigue – normal power and strength	Normal power
	Flexion	Abnormal flexion response to painful stimuli
	Extension	Extension response to painful stimuli

Table 17.6 Coordination assessment.

Assessment	Alternative finding and related pathology
Gait – should be smooth, rhythmic, and effortless, opposing arm swing is coordinated, and turns are smooth. To test gait further, ask the patient to walk in tandem (heel to toe). This will decrease the base of support and will accentuate any coordination problems. The patient should be able to walk straight and stay balanced.	Ataxic gait lacks coordination with reeling and instability, with the following potential causes: • Cerebellar ataxia: unilateral or bilateral cerebellar lesion. • Sensory ataxia: loss of position sense/propreoception due to lesions in dorsal columns, thalamus, parietal lobes. • Vestibular ataxia: associated with vertigo, nausea. • Exogenous substances: alcohol, recreational drugs (e.g. ketamine, PCP [phencyclidine]), anti-epileptic drugs. Inability to tandem walk is particular sensitive to upper motor neurone lesions such as multiple sclerosis, or acute cerebellar dysfunction, e.g. intoxication.
Romberg test – ask the patient to stand with their feet together and arms by their side. Once (if) balance is gained, ask them to close their eyes for 20 seconds. Normally a person can maintain their posture; they may sway a little, however they can right themselves (stand close in case they are unable to).	Patient may sway, or widen their base or feet to prevent themselves from falling. A positive Romberg sign is loss of balance that occurs when the patient shuts their eyes as they are unable to use their vision to stabilise themselves, which had been compensating for a sensory loss. Causes include cerebellar ataxia, loss of proprioception, or loss of vestibular function.
Pronator drift and arm tap – ask the patient to stand with their feet heel-width apart (or sitting or lying if need be), and extend their arms with palms upwards. Ask them to close their eyes and maintain this position for 30 seconds. Normally a person can maintain this position without pronation of the hands or downward drift of the arm. Tap the arms briskly and ask the patient to return them to their original position.	Pronator drift is when one forearm pronates. This is caused by corticospinal tract lesion, which originates in the contralateral hemisphere. Following arm tap, a sideways or upward drift suggests loss of position sense, whereas under- or overshooting of arms suggests cerebellar disease.

Practice insight

Assessing a patient's gait and balance is as simple as asking them to take a couple of steps. When doing this ensure that you and your crewmate are ready to support them in case they fall. This is best achieved by having one crew member on each side of the patient, in order to distribute any weight between two persons.

Reflexes

Reflexes are involuntary actions that permit a quick reaction to potentially harmful or damaging situations. There are four types of reflex: deep tendon, e.g. knee jerk; superficial, e.g. corneal reflex; visceral, e.g. pupil reaction; and pathological, e.g. Babinski. This section will describe how to assess and grade deep-tendon reflexes.

Deep-tendon reflexes have five components, and damage or disease to any component will cause either absent, diminished, or hyperactive reflexes. The five components are an intact sensory nerve, a functioning synapse in the cord, an intact motor nerve fibre, the neuromuscular joint, and a competent muscle. When assessing deep-tendon reflexes by tapping, the specific tendon stretches the muscle spindles in the muscle, which in turn activates the sensory nerve. The sensory nerve fibres carry the message from the receptors to the spinal cord, which synapse in the cord with the motor neurone. Motor fibres leave the cord and travel to the muscle, stimulating a sudden contraction. You should test the following deep-tendon reflexes, remembering to compare side to side and noting any differences in symmetry: biceps (C5/6), triceps (C7/8), brachioradialis (C5/6), knee (L2, 3, 4), Achilles (L5, S1, S2), and clonus. Table 17.7 describes how you grade reflexes and some possible pathology of increased reflexes (hyper-reflexia or clonus) and decreased reflexes (hyporeflexia or absent).

Assessment of cranial nerves

Not all CNs will be tested routinely and paramedics will concentrate on a few; however, as always your assessment should be guided by the patient history and symptoms. As a paramedic, CNs that you will assess on a regular basis will include CNs II, III, IV, VI, VII, IX, and X. Table 17.8 describes how to assess each CN, abnormal findings, and possible pathology.

Detecting increases in intracranial pressure

Many patients with a neurological disorder will display signs and symptoms of raised intracranial pressure (ICP) – the pressure inside the cranium and the brain, the normal pressure of which is 0–10 mmHg. CSF and blood occupying the space inside the cranium contribute to ICP and an increase in either causes a raised ICP. A number of conditions can cause raised ICP, including conditions that increase brain volume, e.g. space-occupying lesions (haematomas, abscesses, tumours, aneurysms), oedema (traumatic brain injury, stroke), increased blood flow (e.g. obstruction of venous outflow), hyperaemia, hypercapnia, cerebral artery vasodilation, increase in CSF (e.g. increased production of CSF), decreased absorption of CSF (e.g. communicating hydrocephalus, following subarachnoid haemorrhage), or obstruction of flow of CSF (e.g. non-communicating hydrocephalus; Hickey 2009).

Practice Insight

Raised ICP can be recognised by identifying Cushing's triad: raised blood pressure, decreased pulse rate, and altered respirations.

Table 17.7 Reflex grading.

Grade	Description	Related pathology
4+	Very brisk, hyperactive with clonus	Indicative of upper motor neurone (UMN) disease/lesion, e.g. following traumatic brain injury, meningitis
3+	Brisker than average	May be normal for that patient or may indicate UMN disease as above
2+	Average, normal	
1+	Diminished	May be normal for that patient, a sign of incomplete relaxation by the patient, or indicative of lower motor neurone (LMN) disease/lesion, e.g. peripheral nerve damage or damage to the nerve roots such as spinal cord injury
0	Absent	LMN disease/lesion

Table 17.8 Focused assessment of the cranial nerves (CNs).

CN	Clinical test	Abnormal finding	Possible pathology
I	Introduce a familiar odour under the patient's nostril (get them to block the other off first). Ask them if they can smell anything and if they can identify the smell.	Anosmia – decreased or loss of sense of smell	Upper respiratory infection (temporary), tobacco or cocaine use, fracture, frontal lobe lesion, tumour of olfactory bulb or tract
II	Test visual acuity and visual field by confrontation. Assess pupillary reaction to light, and general eye inspection.	Defect or absent central, peripheral vision Absent light reflex, palpilloedema, retinal lesions	Congenital blindness, refractive error, acquired vision loss from a range of diseases, e.g. stroke, diabetes, tumour, trauma to globe or orbit Raised intracranial pressure (ICP), glaucoma, diabetes
III	Ensure that the patient holds their head still. Ask them to focus on a pen that you introduce in front of their face. Smoothly move the pen through the usual range of ocular movements and ask the patient to follow the pen. Observe patient's eyes for smooth movement. Examine pupils for equality and reaction to light. A reaction in both pupils should be noted.	Failure to move eye up, in and down Dilated pupil, ptosis, eye turns out and down Absent light reflex	Paralysis of CN III from internal carotid aneurysm, tumour, inflammatory lesions, raised ICP Ptosis from myasthenia gravis, oculomotor nerve palsy, Horner syndrome Blindness, drug influence, raised ICP, central nervous system (CNS) injury, circulatory arrest, CNS syphilis
IV	See test for CN III. CN IV controls eye movement towards the inferior aspect of the nose.	Failure to turn eye down or out	Fracture of orbit, brain-stem tumour
V	Palpate the temporal and masseter muscles whilst the patient is clenching their teeth. Feel for strength of muscle contraction and equal power bilaterally. With their eyes shut, ask the patient to identify: • The location of light touch across their forehead, cheek, and chin • Dull vs sharp touch over the forehead, cheek, and chin (Each sensory branch of CN V should be touched in a random order)	No blink reflex Weakness of masseter or temporalis muscles Absent/reduced touch and pain, paraesthesias	Trauma, tumour, pressure from aneurysm, inflammation Unilateral weakness with CN V lesion, bilateral weakness with upper motor neurone (UMN) or lower motor neurone (LMN) disorders
VI	See test for CN III. CN VI controls lateral eye movement.	Failure to move laterally, diplopia on lateral gaze	Brain-stem tumour or trauma, fracture of orbit

(*Continued*)

Table 17.8 (*Continued*)

CN	Clinical test	Abnormal finding	Possible pathology
VII	Observe the patient's face for symmetry through a range of facial expressions (raising eyebrows, frowning, showing teeth, smiling, puffing out cheeks). Also test their ability to hold their eyes shut against resistance.	Absent or asymmetric facial movements Loss of taste	Bell's palsy (LMN lesion) causes paralysis of entire half of face UMN (e.g. stroke, tumour, inflammatory) causes paralysis of lower half of face, leaving forehead intact
VIII	Balance can be tested using a Romberg test. Ask the patient to stand with their eyes closed for 20–30 seconds. Observe for any loss of balance, whilst ensuring patient safety. Test hearing using a whisper test. If the patient is unable to identify the spoken word, test hearing with a Weber test (lateralisation) and a Rinne test (air to bone conduction).	Decrease or loss of hearing	Inflammation, occluded ear canal, tumour, drug toxicity
IX	Listen to patient's voice for abnormal sound (hoarse or nasal). Ask the patient to swallow, whilst observing for any difficulty. The gag reflex should only be tested if abnormality has been found on other tests for CN IX and X.	Hoarse or nasal voice	As for X
X	Ask patient to say 'Ah' and observe for equal bilateral rising of the soft palate and the maintenance of the uvula in the midline.	Uvula deviates to side	Brain-stem tumour, neck injury, CN X lesion Vocal cord weakness, soft palate weakness Unilateral or bilateral CN X lesion
XI	Test the stenocleidomastoid (turning the head) and trapezius (shrugging the shoulders) against resistance. Feel for equal strength bilaterally.	Absent or weak movement of the sternomastoid or trapezius muscles	Neck injury, muscle damage
XII	Listen to patient's voice for abnormal sounds. Ask the patient to poke their tongue out and move it laterally. Observe for midline position and symmetry of movement.	Tongue deviates to one side Slow rate of movement Tongue wasting	LMN lesion or bilateral UMN lesion

Source: Adapted from Jarvis (2012). Reproduced by permission of Elsevier.

The sooner raised ICP is recognised and treated, the more the chances of secondary brain injury are reduced and patient outcome improved. Table 17.9 provides a summary of potential, early, and late signs of raised ICP. If you encounter any of these during your assessment, raised ICP should be suspected and treated as an emergency.

Table 17.9 Signs of raised intracranial pressure (ICP).

	Possible early signs of ICP	Late signs of ICP
Consciousness level	Requires increased stimulation Slight loss of orientation Anxiety and restlessness Patient suddenly falls silent	Nonresponsive
Pupils	Changes in size on side of lesion One constricts and then dilates Both react in sluggish manner Are of unequal size	Fixed and dilated
Muscle weakness	Is evident and onset may be sudden Positive pronator drift	Extreme weakness
Vital signs	Periodic increases in blood pressure	Increased systolic pressure, severe bradycardia, irregular respirations (Cushing's triad)

Source: Adapted from Rushforth (2009). Reproduced with permission of LWW.

Conclusion

This chapter has provided an introduction to the complex anatomy and physiology of the nervous system, stressing the importance of accurate history taking, observation of symptoms, and physical assessment of the patient. These tools will provide you with differential diagnoses and inform your decision-making and management of the patient.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. True or false, the first cranial nerve is the optic nerve?
2. How many pairs of cranial nerves are there?
3. How many pairs of peripheral nerves are there?
4. What are the components of the Glasgow coma scale?

Activity 17.1

Using a fellow student or close friend/family, practise assessing the cranial nerves in order. This will help you to become familiar with this assessment.

Activity 17.2

Draw a triangle and label each side to represent Cushing's triad, identifying the correct changes in blood pressure, heart rate, and respiration pattern.

Glossary

Autonomic function:	The part of the nervous system that regulates involuntary action of the intestines, heart, and glands, and that is divided into the sympathetic nervous system and the parasympathetic nervous system.
Cerebrum:	The two large hemispheres of the brain.
Dendrites:	Branch-like endings of a nerve cell.
Involuntary movements:	Uncontrollable movements of the body.
Lucidity:	Quality of thought and expression.
Motor function:	Ability of movement of the limbs.
Myelin sheath:	A fatty substance that coats the nerve, which provides protection and aids electrical conduction.
Neuroanatomy:	Anatomy of the nervous system.
Posture:	The relationship between the muscles and bones of the body.
Sensory stimuli:	Stimulation of the senses such as sight, smell, touch, and sound.

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18

Assessing the abdomen

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Learning outcomes

On completion of this chapter the reader you will be able to:

- Describe the anatomical borders of the abdomen.
- Recognise the difference between visceral and parietal pain.
- Define the acute abdomen.
- Consider the many causes of abdominal pain.
- Describe the components of a clinical assessment required to perform an appropriate evaluation of the abdomen.

Case study

An emergency call has been received for a 25-year-old male complaining of severe abdominal pain. He is vomiting and curled up in a ball on the floor. His mum explains that the pain came on suddenly and has got progressively worse over the last few hours. He has a mild fever but no other associated symptoms.

Introduction

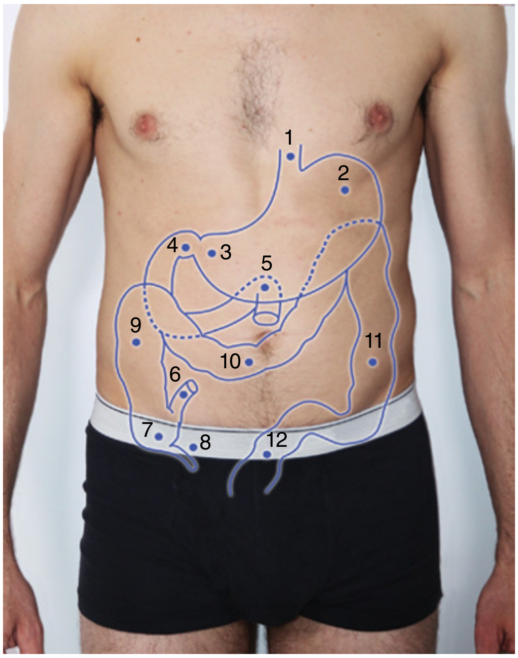
Acute abdominal pain represents one of the top three symptoms prompting patient presentation to emergency departments (ED), accounting for up to 7% of ED cases. It is the main presenting complaint in patients over 65 years, where it accounts for 13% of ED visits (Association of Ambulance Chief Executives AACE and Joint Royal Colleges Ambulance Liaison Committee 2016). Causes of abdominal symptoms include appendicitis, cholecystitis/biliary colic, gastritis, urinary/renal colic, intestinal obstruction (including constipation), gastroenteritis, pancreatitis, diverticulitis, peptic ulcer perforation, mesenteric adenitis (especially in children), and gynaecological pain in women (Manterola et al. 2011; Abdullah and Firmansyah 2012).

A systematic and thorough clinical examination of the abdominal system should thus be part of every paramedic's repertoire. This chapter will review the anatomy of the abdomen, and will outline a thorough and detailed approach to abdominal examination and assessment.

Abdominal anatomy and physiology

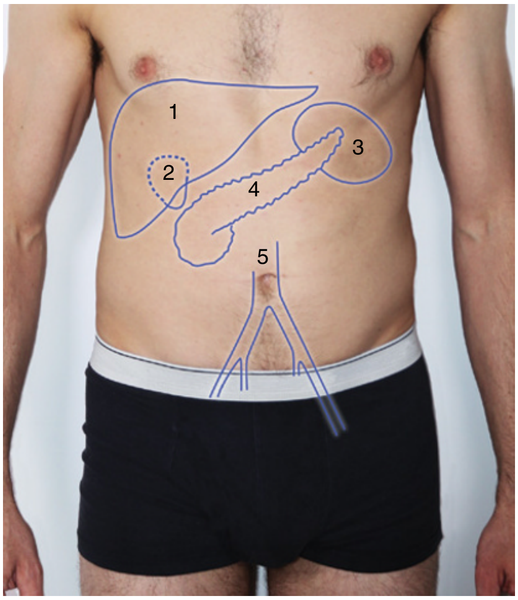
The abdominal cavity represents the largest bodily cavity and is filled by the abdominal viscera and the following major organ systems:

- *Gastrointestinal (or alimentary) system*, comprising distal oesophagus, stomach, duodenum, ileum, caecum, appendix, ascending/transverse/descending colon, and sigmoid colon (Figure 18.1).
- *Hepatobiliary and pancreatic system*, comprising liver, gall bladder, pancreas, and related ducts (Figure 18.2)
- *Spleen and lymphatics*.
- *Urinary system*, comprising kidneys, ureters, and urinary bladder (Figure 18.3).



1. Oesophagus
2. Stomach
3. Pyloric antrum
4. Duodenum
5. Duodeno-jejunal flexure
6. Terminal ileum
7. Caecum
8. Appendix
9. Ascending colon
10. Transverse colon
11. Descending colon
12. Sigmoid colon

Figure 18.1 Gastrointestinal system. Source: M. Magain, Melbourne, Australia, 2014. Reproduced with permission of M. Magain.



1. Liver
2. Gallbladder
3. Spleen
4. Pancreas
5. Aorta (dividing into left and right femoral arteries at the aortic bifurcation)

Figure 18.2 Hepatobiliary and pancreatic system. Source: M. Magain, Melbourne, Australia, 2014. Reproduced with permission of M. Magain.

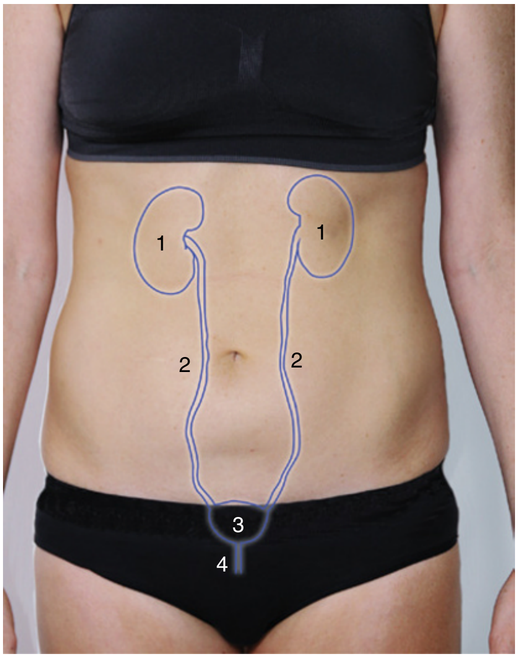


Figure 18.3 Urinary system. Source: M. Magain, Melbourne, Australia, 2014. Reproduced with permission of M. Magain.

An abdominal **viscus** may be hollow or solid. Hollow organs include those of the gastrointestinal tract (oesophagus, stomach, small and large intestines, appendix), gallbladder and bile ducts, pancreatic duct, fallopian tubes, ureters, and urinary bladder. Solid organs include the liver, pancreas, spleen, kidneys, adrenals, uterus, and ovaries.

It is helpful to have some understanding of the early development of the abdomen and its contents, as it assists in explaining how certain pain syndromes come to present in the way they do. In embryonic development, the primitive *gut tube*, through sequences of folding and division, gives rise to the **peritoneum**, a tough layer of tissue similar to that of lung pleura and pericardium, which is similarly made up of a parietal and visceral layer. These layers are separated by a thin film of fluid in the peritoneal cavity, which lubricates, stores fat, allows for selective diffusion of water and solutes, and assists in infection control (Kumar and Clark 2017; Martini et al. 2017). As the name suggests, the visceral layer envelopes the visceral organs, and is formed by a complex series of outpouchings off the posterior abdominal wall. Imagine, if you will, suspending a taut piece of clingfilm, then placing on it a tube. Gradually allow the clingfilm to become slack, until it eventually adheres to itself, with the tube enveloped within it at the bottom. The suspended, self-adhered section from which this tube now hangs would be referred to in the gut as a **mesentery** – two suspensory folds of peritoneum reflected off the posterior abdominal wall. This complex embryological process (see Schoenwolf and Larsen 2009) leads to a division of organs that are suspended intraperitoneal organs, and to those that are retroperitoneal or secondarily retroperitoneal (Table 18.1), and thus are essentially adherent to the posterior abdominal wall.

The peritoneum allows for free movement of most of the abdominal viscera. With the enveloping of each organ in visceral pleura and their suspension from their mesentery (or adherence to the posterior abdominal wall) comes their associated blood supply and, importantly to this chapter, their nerve supply. When we refer to types of pain, keep in mind the underlying anatomy, and hopefully *why* a patient experiences a particular sensation will become more evident.

Table 18.1 Distribution of the abdominal organs.

Intraperitoneal	Retroperitoneal	Secondarily retroperitoneal
Abdominal oesophagus	Thoracic oesophagus	Pancreas
Stomach	Rectum and anus	Duodenum
Spleen		Ascending colon
Liver (with gallbladder)		Descending colon
Jejunum		
Ileum		
Caecum and appendix		
Sigmoid colon		

Genitourinary causes of abdominal pain

It is important to always consider that (especially younger) patients presenting with abdominal pain may have symptoms originating from reproductive organs and referring to other parts of the abdomen.

Females

Always consider gynaecological causes of pain in females (especially of childbearing age), which may include pain relating to menstrual periods, endometriosis, ruptured ovarian cysts, pelvic inflammatory disease, ovarian torsion, or ruptured ectopic pregnancy (see Brown and Cadogan 2011, section XII). As discussed later in the chapter, targeted history gathering may be required, depending on the level of suspicion and given presentation.

Most gynaecological conditions will present with lower abdominal pain. Some may also include vaginal discharge or blood loss.

Some gynaecological presentations, such as ruptured ectopic pregnancy with haemodynamic instability, can be life threatening. It may be difficult to differentiate between, say, a right-sided ectopic pregnancy and appendicitis, thus careful consideration of all differential diagnoses should be the practice of an astute paramedic.

Males

It is important to remember that abdominal pain in (especially young) males may well be referred from the reproductive organs. It may be necessary to specifically enquire about (and where appropriate, examine for) testicular pain, as some patients may not volunteer such information on general questioning. Dividing conditions by age is often useful:

- In males under 25 years (and especially aged 12–14 years), acute testicular torsion should always be considered (Meckler et al. 2016). There is usually acute onset of testicular and lower abdominal pain, and often associated nausea and vomiting, and one testis may sit high (and very painfully) in the scrotum. The testis becomes nonviable after approximately six hours of torsion.
- Acute epididymo-orchitis, with pain beginning gradually in the testis and sometimes referring to the abdomen, may be a cause in the sexually active male.

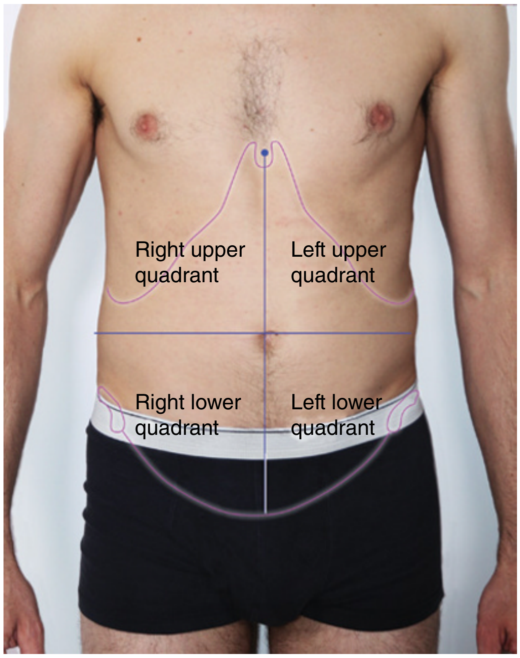


Figure 18.4 The four abdominal quadrants. Source: M. Magain, Melbourne, Australia, 2014. Reproduced with permission of M. Magain.

- In those further advanced in age, one should always consider acute urinary retention as a result of prostate pathology, urethral stricture, pelvic tumours, or even constipation. Although the distended urinary bladder is often palpable, elderly patients may present only with delirium or restlessness, so this condition can be easily missed.

The abdomen can be divided into quadrants (Figure 18.4) by passing a dividing median line vertically though the umbilicus, and a second line at right angles to this line transversely, with each segment named accordingly. This will assist with describing findings and locating landmarks.

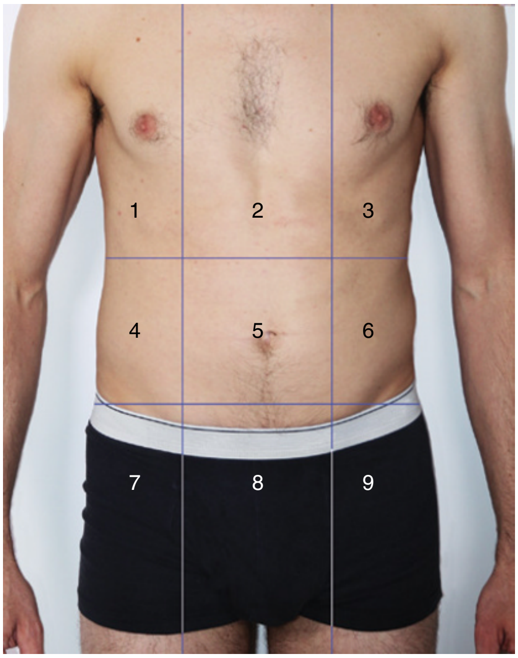
One can also divide the abdomen into nine regions (Figure 18.5). When we overlay a diagram of organ locations (Figures 18.1–18.3 and 18.6), we begin to build up a picture of how surface anatomy relates to underlying structures.

The nature of abdominal pain

There are three pathways by which a patient may experience abdominal pain: visceral, somatic, and referred.

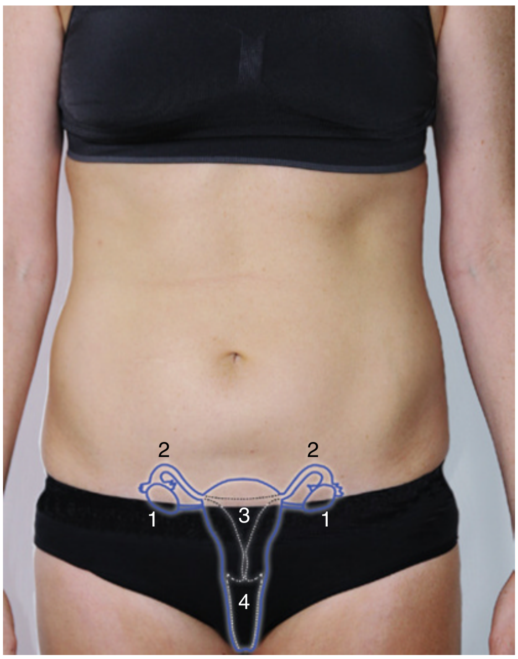
Visceral pain tends to be elicited by stretching and distension, and is mediated by afferent C fibres (a type of autonomic nerve fibre) located in the walls of hollow viscera and in the capsules of solid organs. Each organ is supplied by a pair of nerve bundles (see Netter 2006, pp. 318–328), and they can be divided into the cardiopulmonary, thoracic, lumbar, sacral, and pelvic branches (corresponding to where they join the spinal canal).

The visceral structures, encased by the peritoneum and suspended from their mesenteries, tend to be associated with different sensory levels in the spine (Figure 18.7). Given that they possess bilateral paired nervous innovations, increased luminal distension (say, in the bowel due to obstruction), forceful smooth-muscle contractions ('colic'), or capsular stretching (such as acute hepatitis) is most often poorly localised, centralised to the midline, and referred to other regions, also supplied by that same division of the **splanchnic system**. When



1. Right hypochondrium
2. Epigastrium
3. Left hypochondrium
4. Right lumbar
5. Umbilical
6. Left lumbar
7. Right iliac (inguinal)
8. Hypogastrium (pubic)
9. Left iliac (inguinal)

Figure 18.5 The nine abdominal regions. Source: M. Magain, Melbourne, Australia, 2014. Reproduced with permission of M. Magain.



1. Ovaries
2. Fallopian tubes
3. Uterus
4. Vagina

Figure 18.6 Location of the ovaries. Source: M. Magain, Melbourne, Australia, 2014. Reproduced with permission of M. Magain.

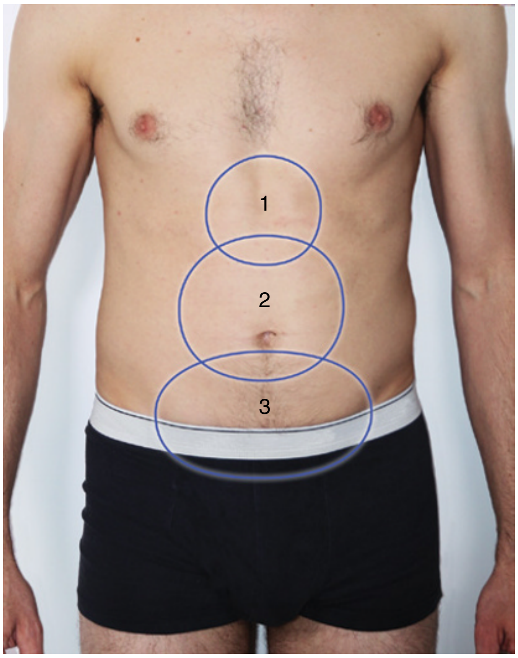


Figure 18.7 Visceral structures. Source: M. Magain, Melbourne, Australia, 2014. Reproduced with permission of M. Magain.

the paramedic takes a history, they may find that discomfort began as a vague, centralised ache (visceral pain). As the pathology progresses, this pain may become parietal in nature, leading to signs of peritonism that ought to ring alarm bells for the paramedic.

Practice insight

Here is a handy way to remember the direction of nerve fibres: Afferent fibres Arrive at the central nervous system. Efferent fibres Exit the central nervous system.

Parietal pain is mediated by a different set of nerve fibres, called C and A delta nerve fibres, which form part of the somatic nervous system, responsible for detecting sensory modalities such as touch, temperature, and pain. These fibres are responsible for the transmission of rapid, localised, sharp, and more acute signals, and the somatic afferent fibres are directed to only one side of the nervous system (in contrast to visceral pain sensations). Thus, any irritation of the parietal peritoneum by the likes of blood, pus, bile, urine, gastrointestinal contents, or inflammatory mediators released in response to a pathological insult will be transmitted as a localised, sharp, stabbing pain. This is what doctors often refer to as 'peritonitic', and it implies a condition that may well need surgical intervention.

Referred pain denotes the perception of sensation at a site distant from the pain stimulus (Kumar and Clark 2017; Martini et al. 2017). This is due to the complex convergence of afferent fibres from wide areas in the abdomen into small areas of the spinal cord. This explains why, for example, diaphragmatic irritation (by an inflamed gallbladder, for instance) is often perceived in the ipsilateral (that is, the right side) shoulder, because the phrenic nerve serves both of these areas (Figure 18.8).

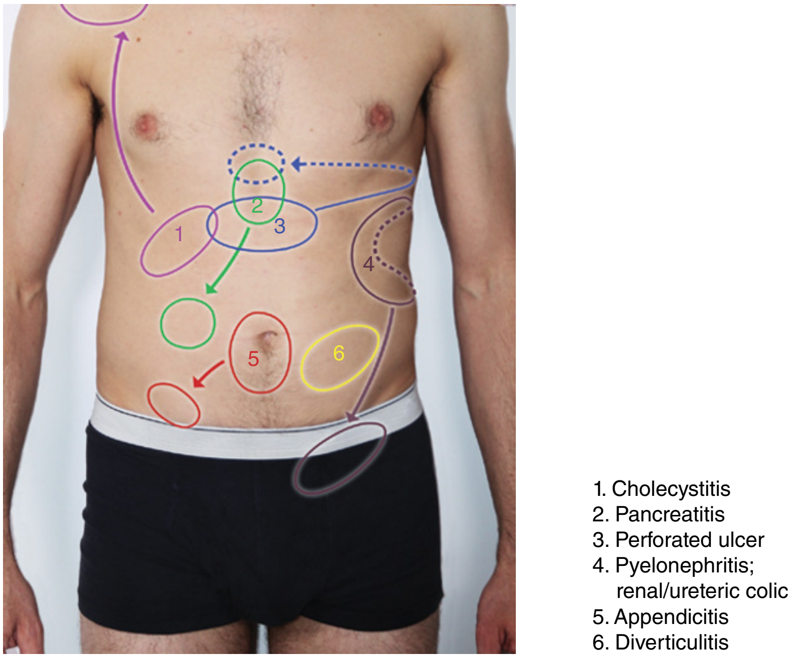


Figure 18.8 Referred pain. Source: M. Magain, Melbourne, Australia, 2014. Reproduced with permission of M. Magain.

Practice insight

Remember that although abdominal pain can refer to other areas of the body, so too can pain in other areas refer to the abdomen. Cardiac pain may be reported as abdominal pain, so always consider 'abdominal pain' that may be referring from the chest.

The acute abdomen

The 'acute abdomen' refers to any nontraumatic sudden, severe abdominal pain of unclear aetiology for which an urgent operation may be necessary. It is of utmost importance to start with the ABCs (Airway, Breathing, Circulation): signs of reduced circulating blood volume and hypoperfusion may be reflected by tachycardia, hypotension, tachypnoea, diaphoresis, and pallor. Shock may be due to bleeding, to substantial fluid losses (as seen in pancreatitis), or to sepsis.

A higher level of suspicion should be reserved for the elderly, the immunocompromised, children, and women of childbearing age. Acute cholecystitis, appendicitis, bowel obstruction, cancer, and acute vascular conditions (leading to gut **ischaemia** or bleeding) are the most common causes of the acute surgical abdomen in the elderly, whilst appendicitis accounts for a third of all cases in children (Meckler et al. 2016).

Rapid onset of severe pain will tend to suggest perforated viscus or aneurysmal rupture (not forgetting myocardial infarction). Gradually building pain may reflect worsening appendicitis, bowel obstruction, or a genitourinary or gynaecological issue.

Important abdominal pathologies

Appendicitis

The greatest incidence of acute appendicitis occurs around the ages of 10–19, though the likelihood of perforation and complications increases in those greater than 65 years (Omari et al. 2014).

- *Cause*: inflammation, distension, and potential rupture as the (assumed) result of entrapped bacteria.
- *Presentation*: starts as poorly localised central or epigastric abdominal pain, usually periumbilical, which shifts to the right iliac fossa.
- *Associated symptoms*: low-grade fever, anorexia, nausea, vomiting, and either diarrhoea or constipation.
- *Examination*: localised right iliac fossa tenderness on palpation.
- *Specific signs and symptoms*:
  - McBurney's sign – point tenderness over a place two-thirds of the distance along a line taken from the anterior superior iliac spine to the umbilicus.
  - Rovsing's sign – assessing for any tenderness in the right illiac fossa arising from palpation of the opposite, left illiac fossa.
  - Psoas sign – the ileopsoas is a retroperitoneal hip flexor muscle, lying under the appendix at the edge of the peritoneum. Flexion of the right hip may cause right iliac fossa irritation when the appendix is inflamed.
  - Obturator sign – likewise, flexion and internal rotation of the right hip may cause spasm, and resultant right iliac fossa pain, as the obturator muscle (in part responsible for this movement) sits close to the appendix.

Intestinal obstruction

- *Causes*: adhesions (especially due to prior surgeries), incarcerated hernia, volvulus (twisting), intussusception (telescoping), carcinomas, diverticulitis, mesenteric infarction (as may be seen in the setting of emboli secondary to atrial fibrillation), Crohn's disease, or neurological disorders affecting peristalsis.
- *Presentation*: in high obstruction, there tends to be early vomiting, colicky ('wave-like') pain, and distension. In low obstruction, there is constipation and inability to pass flatus, resulting in distension.
- *Associated symptoms*: nausea, vomiting (sometime faeculent in the case of small bowel obstruction), and possible shock.
- *Specific signs and symptoms*: always consider hernia entrapment, especially in the inguinal regions or beneath scars from previous surgeries. Always ask about stools (specifically looking for evidence of altered bowel habits and/or bleeding).

Diverticulitis

- *Cause*: diverticula are dead-end pouches most commonly within the descending colon wall. The process is termed diverticulosis. The reason sudden inflammation occurs remains uncertain (Peery et al. 2012).
- *Presentation*: lower abdominal pain radiating to the left iliac fossa, often with guarding on palpation.
- *Associated symptoms*: bloody diarrhoea, fever.
- *Specific signs and symptoms*: sometimes presents with profuse frank rectal blood loss.

Biliary colic, acute cholecystitis, and pancreatitis

We can group these under the one banner, because although they represent different processes, they may nonetheless be related to inflammation of, or blockages within, the biliary tree.

Gallstones form within the gallbladder (which stores bile made by the liver) in 5–25% of the population and this number is higher in Western populations (Gurusamy and Davidson 2014). Whilst often asymptomatic, gallstones are well known to potentially lead to presentations of biliary colic, acute or chronic cholecystitis, as well as potentially life-threatening pancreatitis, obstructive jaundice, or gallbladder cancer (Stringer et al. 2013). Let us break them down into each entity.

Biliary colic

- *Cause*: interruption of normal bile flow by stones or sludge, causing the muscular distended gallbladder to repeatedly try to squeeze bile past the blockade.
- *Presentation*: episodic right upper quadrant colicky (wave-like and intermittent) pain.
- *Associated symptoms*: may be jaundiced if there is blockade of the common bile duct (most visible as scleral icterus – the yellowing of the white parts of the eyes), combined with dark urine (due to high levels of bilirubin). There may be nausea and vomiting.
- *Specific signs and symptoms*: may describe right scapula and shoulder tip discomfort. Pain tends to be poorly localised. Episodes may occur after fatty meals and pain tends to subside over a number of hours. Episodes may become more intense and frequent over time.

Acute cholecystitis

- *Cause*: ongoing prevention of bile outflow, leading to distension, irritation, inflammation, infection, and potentially perforation of the gallbladder.
- *Presentation*: constant, severe right upper quadrant pain which refers to the right scapula and shoulder.
- *Associated symptoms*: anorexia, nausea, vomiting, fever, and occasional jaundice.
- *Specific signs and symptoms*: Murphy's sign – painful splinting of respiration (patient suddenly stops breathing) at deep inspiration, whilst the examiner is placing gentle pressure over the gallbladder region, due to severe sharp right upper quadrant pain. There will be localised tenderness and involuntary guarding.

Acute pancreatitis

- *Cause*: most easily remembered by the mnemonic (alluding to alcoholism as a leading cause) IGETSMASHED – Idiopathic, Gallstones, Ethanol, Trauma, Steroids, Mumps (and a variety of other infections), Autoimmune, Scorpion sting (of all things), Hyperthermia/Hyperlipidaemia/Hyperparathyroidism, ERCP (endoscopic retrograde cholangio-pancreatography – a procedure used to clear biliary obstructions), Drugs.
- *Presentation*: sudden, severe mid-epigastric abdominal pain that tends to radiate to the back and sometimes chest. It is normally associated with guarding.
- *Associated symptoms*: repeated vomiting, dehydration, fever, shock if severe.
- *Specific signs and symptoms*: may derive some relief from sitting forward. May have absent bowel sounds on auscultation, and may describe offensive or fatty stools (due to poor digestion).

Ruptured abdominal aortic aneurysm

- *Cause*: weakening of the vessel wall through a variety of postulated causes (Chaikof et al. 2009).
- *Presentation*: sudden onset of left abdominal pain, often tearing or knifelike, and radiating through to the back.
- *Associated symptoms*: syncope, collapse, or unexplained shock.
- *Specific signs and symptoms*: classic triad of abdominal pain, hypotension, and pulsatile, tender abdominal mass. Note that, given this condition is life threatening, it must always be considered, especially in vulnerable groups, such as previously known abdominal aortic aneurysm or men over 45 years of age (Brown and Cadogan 2011).

Patient assessment

Once you have completed the primary survey and established the patient is not time critical, you may begin the secondary survey, which includes the patient interview (history taking), a clinical examination, and a full set of vital signs.

The process outlined in this chapter is based on a medical model approach, which is a systematic process consisting of a comprehensive history and a structured clinical examination. Before commencing the assessment, ensure you have identified and managed any immediate threats to life. Patients found to be time critical during the primary survey would require a limited, focused exam. The medical model approach should only be utilised for patients determined not to be time critical.

The abdominal system is interlinked with other body systems and abdominal conditions may sometimes only be detected through abnormal presentations in other systems. For this reason, it is often necessary to undertake an integrated clinical examination. The two most common integrated examinations are the cardio-respiratory and cardio-abdominal examinations.

History taking

Accurate diagnosis of an abdominal complaint will be almost impossible without a history. History taking may occur prior to examination and treatment of the patient or concurrently with other activities. A suggested structure for obtaining the history is listed here and questions are listed in Table 18.2.

Presenting complaint and history of presenting complaint

The presenting complaint refers to the main reason the patient sought help in the first place. The chief complaint for abdominal conditions may often not present typically, and it may take further investigations to exclude the involvement of other systems. Some of the most common signs and symptoms associated with abdominal complaints are listed in Table 18.3.

Other factors that can help to generate a more definitive list of *differential diagnoses* are related to a more detailed exploration of the type and duration of the pain. Helpful mnemonics are explained in Table 18.4.

Practice insight

- Particular care should be taken in higher-risk populations, such as pregnant or childbearing-age females, elderly, or immunocompromised patients.

Past/previous medical history

It is important to gain a comprehensive *surgical* history in addition to the usual *medical* history. Prior abdominal surgeries can predispose to **adhesions** leading to strictures and obstructions, or to fistula formation. It may be necessary to ask specifically about previous conditions, such as ulcers, gallstones or renal stones, diverticulitis, hernias, or appendicitis. In particular:

- It is often necessary to ask females discreetly about past pregnancies, terminations, and potential for current pregnancy.
- Also ask about menstrual periods, endometriosis, ovarian cysts, and pelvic inflammatory disease.
- In males, it may be important to ask about testicular pain or prostate issues.

Table 18.2 Questions for abdominal patients.

Type of history	Lines of enquiry (questions to ask)
History of presenting complaint	When did it begin?
	How severe is it? Does it affect functionality (walking upstairs/to the bathroom, washing/dressing)?
	What were you doing when it started?
	Are there any relieving or aggravating factors?
	Were you eating during onset?
	Are there any associated symptoms?
	Is the onset acute, subacute, or chronic?
	Any recent illness/infection?
	Have you taken any medication to attempt to resolve these symptoms and how effective was it?
Previous medical history	Any history of previous abdominal problems?
	Any abdominal surgery?
	Any cardiac history?
	Any history of renal calculi or urinary tract infection?
	Any history of diabetes, hypertension, gout, hepatitis, peptic ulcers, colitis, bowel cancer?
	Any previous hospital admissions? Similar episodes or recent investigations?
Medication history	Do you take any medications on a regular basis? Note dosage and compliance
	Length of time on current medication regime? Date of last medication review?
	Do you take any 'over-the-counter' medication?
	Any history of recreational drugs?
	Any use of herbal remedies?
Social history	Any history of smoking? Number and years?
	Alcohol consumption?
	Any history of recreational drug use?
	Patient's occupation? Retired or still employed?
	Any anxiety-related symptoms or history of depression?

(*Continued*)

Table 18.2 (*Continued*)

Type of history	Lines of enquiry (questions to ask)
	Travel history?
	Nutrition and diet?
	Attitude to health and physical activity?
	Any social support needed/in place for activities of daily living?
Family history	Health of siblings?
	Cause and age at death – parents and siblings?
	Family history of hypertension or diabetes?
	Family history of renal disease?
	Family history of polycystic kidney disease?
Review of systems: gastrointestinal	Any history of indigestion or heartburn?
	Any difficulty swallowing (dysphagia)?
	Any abdominal pain or discomfort? Any bloating or swelling of the abdomen?
	Any signs of jaundice?
	Have you noticed any sudden/unexplained weight gain or weight loss?
	Sore tongue or mouth ulcers?
	Any change in bowel motions or abnormal colour?
	Have you vomited blood (haematemesis) or had black bowel motions (melaena)?
	Any change in frequency or effort of urination? Any blood in urine?

Drug history

Drug history should be explored during the history taking and this should include questions around compliance and concordance, and whether or not the patient is taking any additional 'over-the-counter' medication, herbal remedies, or recreational drugs. Establish whether the patient has had any recent review of their medication and whether they have recently started or stopped taking any medication. It is good to develop a working knowledge of the commonly prescribed medications for abdominal conditions, especially as the patient may not always be able to communicate this information to you during an acute presentation (Talley and O'Connor 2017).

Practice insight

Note medications that may mask symptoms (analgesia) or exacerbate (nonsteroidal anti-inflammatory drugs or **NSAIDs** and bleeding; opiates and constipation) abdominal presentations.

Table 18.3 Signs and symptoms of abdominal pathology.

Pain
Fever
Nausea and/or vomiting
Reflux/heartburn
Loss of appetite; early postprandial satiation
Unintentional weight loss
Bloating and/or distension
Altered bowel habitus (diarrhoea, constipation, or both; dark or pale stools, mucous)
Dysuria/haematuria
Bleeding (haematemesis, malaena, frank rectal blood loss, vaginal bleeding)
Jaundice

Table 18.4 Mnemonics for taking a symptom/pain history.

OPQRST-ASPN	SOCRATES
Onset	**S**ite
Provocation or **P**alliation	**O**nset
Quality	**C**haracteristics
Region and **R**adiation	**R**adiation
Severity	**A**ssociated symptoms
Time	**T**iming
Associated **S**ymptoms	**E**xacerbating factors
Pertinent **N**egatives	**S**everity

Allergies

Questions around allergies relate to medication, food, and other factors (insect bites, animals). Further questions should be asked around any identified allergies to determine what the exact nature of the response was and whether the patient suffered a minor allergic reaction or an anaphylactic reaction.

Social history

Social history incorporates a wide range of information, from day-to-day activities to occupation, travel history, physical activity, nutrition, and alcohol and tobacco consumption. The responses to these questions may provide important clues to the presence of risk factors for specific conditions, as well as providing you with a good overview of the patient's general health status (Douglas et al. 2013). Additional social history questions in need of further investigation in the abdominal patient are those around pregnancy (or potential pregnancy), sexual history (if appropriate), and the ongoing use of analgesics. Potential occupational, sexual, or travel exposure to potential pathogens, such as hepatitis-causing viruses, should be specifically addressed.

Family history

Always consider abdominal disorders that may have a genetic component, such as cancers in family members (e.g. bowel, ovarian), autoimmune diseases (see Cojocaru et al. 2011), or inflammatory bowel disease (Crohn's disease, ulcerative colitis).

Practice insight

Remember, a *symptom* is something the patient feels, and is able to describe. A *sign* is something you uncover on examination. The two are commonly confused.

Clinical examination

Clinical examination of the abdominal system starts with an end-of-bed assessment to provide a general impression of the patient. This takes into account factors such as the patient's gender, weight, and body shape (any evidence of obesity, wasting, or other features of note), as well as a consideration of environmental clues. Whilst the chief anatomical area for abdominal examination focuses on the abdomen, it is important to undertake a systematic examination starting from the patient's hands and nails, moving up to their arms, neck, and face, including examination of the eyes and mouth (Talley and O'Connor 2017). A more detailed examination of the abdomen would follow utilising the IAPP (Inspection, Auscultation, Palpation, and Percussion) structure (Douglas et al. 2013).

Patients should be observed for the following behaviours:

- *Restlessness* is often noted with presentations of acute cholecystitis or renal colic.
- *Reluctance to move*, where a foetal position may be maintained, can be seen in the setting of peritonitis.
- *Shallow breathing* may be notable when abdominal pain is exacerbated by deep inspiration, or, for example, when the diaphragm itself is irritated by peritonitis or a markedly inflamed gallbladder impinging on it.

Hand assessment

Much information about the patient's level of perfusion can be obtained through a brief examination of the hands. Examine for palmar erythema (reddened palms) and a hepatic flap (asterixis) caused by liver failure. Check also for finger clubbing, cyanosis, and any other abnormalities present in the nails, such as leukonychia (white nails due to kidney disease). You should also take note of the temperature and texture of skin (warm and dry or cool and clammy).

The radial pulse is located at the wrist. Described as a peripheral pulse, it is the most commonly palpated pulse by the paramedic and helps determine cardiovascular efficiency due to its presence and strength. When assessing a pulse, take note of:

- Presence/absence
- Rate
- Regularity
- Strength

Head and neck assessment

Inspect the eyes to exclude any pallor of the conjunctiva, which may suggest anaemia, or any signs of jaundice. Check also for any signs of pallor or cyanosis in the face and mouth, and for any evidence of poor dentition, halitosis, or mouth ulcers (Douglas et al. 2013; Talley and O'Connor 2017). Check the neck for any signs of increased jugular venous pressure.

Abdominal examination

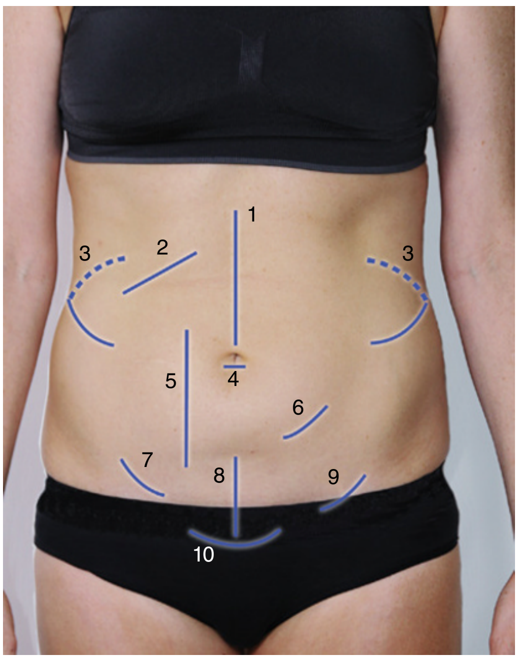
Following the IAPP format, examination of the abdomen starts with inspection of the thorax and abdomen.

Inspection

The abdomen should ideally be examined with the patient supine, hands by their sides, though clearly this may not always be achievable. This helps facilitate abdominal muscle relaxation (lifting the patient's knees may also help). The abdomen should be fully exposed (preserving privacy and dignity), and the patient kept as warm and comfortable as possible.

Inspect the abdomen, observing for previous surgical scars. Recent scars tend to appear pink, old scars white. Small scars around the umbilicus may indicate previous laparoscopic surgeries; lower **Pfannenstiel incision** scars ('bikini-line' scars) may indicate caesarean section or gynaecological surgeries in female patients (Figure 18.9)

Irregularities in shape possibly suggest hernia or enlargement of an underlying organ. Also inspect for skin irregularities, such as rashes, prominent veins (possibly suggesting hepatic portal congestion or impedance to inferior vena cava flow from thrombosis or tumour), spider naevi (suggestive of liver cirrhosis), or stretch marks, which may reflect **ascites**. Pulsatile masses could be indicative of an abdominal aortic aneurysm.



1. Upper midline
2. Right subcostal
3. Nephrectomy
4. Umbilical port (laproscope)
5. Right paramedian
6. Renal transplant
7. Appendicectomy
8. Lower midline
9. Inguinal
10. Suprapubic (Pfannenstiel)

Figure 18.9 Surgical scar locations. Source: M. Magain, Melbourne, Australia, 2014. Reproduced with permission of M. Magain.

Auscultation

During auscultation you will primarily listen for bowel sounds, which should be audible in all abdominal regions in healthy individuals. One tends to report bowel sounds as either 'present' or 'absent', where an absence of sound suggests bowel paralysis (paralytic ileus). One might also note high-pitched 'tinkling' sounds when an obstruction is present.

Palpation

Palpating the abdomen should be carried out methodically, with the fingers together and pressure distributed across the anterior surfaces of all the examiner's fingers; in the case of examining for a palpable liver or spleen, pressure should be distributed along the thumb side (lateral aspect) of the examiner's hand and fingers. Always ask where the patient is most tender, as this is the area that ought to be examined last. If the paramedic is haphazard in this respect, patient trust may be lost and the patient may resist further palpation.

Begin with light pressure in the quadrant farthest from the main source of pain. Feel for lumps, masses, or signs of peritonism, moving systematically. Always consider what structures lie beneath your hand during palpation, and regularly watch the patient's facial expressions for suggestions of discomfort. Proceed to deep palpation, following the same pattern and leaving the most tender regions until last.

Practice insight

Signs of peritonism may include:

- *Guarding* – the voluntary or involuntary tensing of the abdominal wall muscles over an inflamed abdominal region to guard the underlying structures against the pain of palpation. Involuntary guarding suggests peritonitis.
- *Rigidity* – constant involuntary contraction of abdominal muscles.
- *Rebound tenderness* – sudden release of a slowly compressed abdominal wall causing a rapid stab of sharp pain.

The liver may, on occasion, require specific attention. To palpate for a liver, align your hand with the patient's right costal margin, beginning at the umbilicus (or even the right iliac **fossa** if liver enlargement is suspected), asking the patient to breathe in and out slowly. Use the lateral edge of the hand to press down on expiration; you may sometimes feel the edge of the liver under your hand. Repeat this process, moving about 1–2 cm at a time towards the costal margin on the right (that is, the base of the ribs). Many disorders may cause liver enlargement and/or tenderness, including hepatitis (acute viral, toxic, or alcoholic), right-heart failure (where the liver becomes congested with blood), cancers (which are causing the liver capsule to stretch, or which may have started to bleed or infiltrate other vital areas), or perhaps biliary obstruction with cholangitis (infection of the common bile duct).

Percussion

Percussion may be applied to gauge the size of organs, or the location of fluid. It will also tend to elicit pain if peritonitis is present. In general, hollow and mostly air-filled organs, such as the intestines, will produce a more resonant percussion note, whereas fluid (such as blood or ascites) will sound dull. Percussion involves placing your hand flat on the region to be examined, and then briskly tapping the middle finger of this hand with the tip of the middle finger of your other hand.

Practice insight

There are five 'Fs' of abdominal distension to consider: Fat (obesity), Fluid (ascites or severe bleeding), Foetus (pregnancy), Flatus (gaseous distension from causes such as bowel obstruction), and 'Filthy' big tumour (Talley and O'Connor 2017).

Conclusion

Paramedics will commonly assess patients with abdominal pain. Rapid identification and treatment of abdominal disorders, along with timely transport to the most appropriate medical facility, are vital to ensure optimal patient outcomes. This chapter provides a thorough overview of abdominal assessment and common abdominal pathologies.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. Show two ways in which the abdomen can be divided by an overlying grid to help describe signs and symptoms of abdominal pain. Identify the underlying structures in each of these divisions.
2. What is the difference between visceral and parietal pain?
3. What is an acute abdomen? What symptoms, signs, and details in the history of the presenting complaint might assist the paramedic to decide that a patient with abdominal pain is time critical?
4. What additional diagnoses need to be considered in the young female presenting with abdominal pain?
5. Provide a working diagnosis and two possible differential diagnoses for the case study given at the start of the chapter.

Activity 18.1

Draw the abdomen with an overlying grid showing four quadrants or nine regions, and include as many anatomical structures as you can (it may help to use different colours for each major organ system). Try repeating this activity over time to improve your anatomical knowledge.

Activity 18.2

Have a fellow student imagine an abdominal condition without your knowledge of its nature. Take a history, focusing down on what you feel the problem may be. Can accurate diagnoses in medicine be made through careful history taking alone?

Activity 18.3

Undertake an abdominal examination of a patient (real or simulated). Practise being systematic, and do not forget to monitor your patient's facial expressions for clues regarding discomfort or pain.

Activity 18.4

Review the anatomy of the biliary tree, including the liver and its hepatic ducts, the gallbladder, the cystic duct, the pancreatic duct, the common bile duct, and the manner in which this system drains into the duodenum (see Netter 2006, pp. 294–296).

Glossary

Adhesions: Past abdominal surgery can cause tissue to adhere to adjoining structures and result in the formation of bands of scar tissue. This can lead to strictures (narrowings in a hollow tube), fistulae (abnormal connection between structures), or obstruction.

Ascites: An accumulation of fluid in the peritoneal cavity, most commonly as the result of severe liver disease.

Fossa: A hollow or depression. Thus, the iliac fossa is an area overlying the ileum (the large wing-shaped sections of the pelvis), either on the left or the right.

Ischaemia: Restriction of blood supply, leading to a lack of nutrients and oxygen needed to sustain normal cellular metabolism.

Mesentery: Two sheets of peritoneum, containing vessels and nerves, which reflect off the posterior abdominal wall to suspend the jejunum and ileum. This term can also be extended to include any double fold of peritoneum which surrounds an abdominal structure.

Nonsteroidal anti-inflammatory drug (NSAID): A class of commonly used anti-inflammatory medications (such as aspirin or ibuprofen), which often produce gastrointestinal side effects (such as gastric erosion and bleeding), especially with continued or high-dose use.

Peritoneum: A lining of the abdominal cavity, comprising serous membrane, forming the parietal (outer) layer, which lines the abdominal and pelvic cavities, and the visceral (inner) layer, which envelops abdominal organs.

Pfannenstiel incision: A low, slightly curved, abdominal incision made to gain access to the pelvic organs. Commonly used for caesarean section deliveries or hernia repair.

Splanchnic system: Paired nerve fibres that supply both autonomic efferent and sensory afferent signals to and from (respectively) the abdominal viscera.

Viscus (pleural = viscera): Any internal organ, whether solid or hollow (usually in reference to abdominal and pelvic organs).

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19

Respiratory assessment

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Contents

Fundamentals of Paramedic Practice: A Systems Approach, Second Edition. Edited by Sam Willis and Roger Dalrymple.

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Learning outcomes

On completion of this chapter the reader will be able to:

- Discuss the function and general anatomy of the respiratory system.
- Describe pulmonary ventilation and the mechanism of breathing.
- Recognise the presentation of commonly occurring causes of breathing difficulty in the out-of-hospital setting.
- Describe and discuss the focused history-taking information that is required as part of a comprehensive respiratory assessment.
- Discuss the relevant clinical skills required and process for undertaking a comprehensive respiratory assessment.

Case study

You have an emergency call to attend a 20-year-old male patient having difficulty in breathing at a residential address. On arrival you are presented with a male patient, who is sitting on a chair leaning forward with a salbutamol inhaler in his hand. The patient is alert and maintaining his own airway. The breathing pattern is shallow and regular, with an approximate rate of 20 breaths per minute. The patient cannot speak in full sentences, but can communicate using two- to three-word replies. There appears to be increased effort of breathing and a subtle wheeze is audible throughout expiration. His friends who called for the ambulance are all looking concerned.

Introduction

Breathing problems or shortness of breath (SOB) is a common reported presenting complaint. Respiratory conditions accounted for 676 079 presentations to Accident and Emergency in 2015–2016 (Baker 2017). Consequently a comprehensive and systematic respiratory assessment is frequently practised by contemporary paramedics in delivering high-quality out-of-hospital patient care. This chapter will outline the significant respiratory anatomical landmarks and physiological processes a paramedic should be aware of prior to undertaking respiratory assessment. We will consider how this assessment should involve focused history taking and in-depth clinical examination.

The first priority in any out-of-hospital patient environment is risk assessment of the threat of danger to practitioners. Once dangers have been considered and, where necessary, eliminated, a quick scan of the environment may provide additional information regarding the patient's previous medical history, especially health and social status. Significant observations may include presence of mobility aids, use of respiratory inhalers, home oxygen tubing, presence of sputum pots, living environment, and presence of previously completed patient report forms or clinical care pathways.

Practice insight

The scene survey starts the moment you arrive. For example, if you are attending a private address, take a mental note of the garden and external surroundings. This might give an indication of how the owner of the property gets out of the house in order to be able to maintain the garden, therefore reflecting their mobility status.

Table 19.1 Components of the general impression.

Appearance	Age Sex AVPU (Alert, Verbal, Pain, Unresponsive) How interactive is the patient? Generalised overview of general health (body mass index, signs of cachexia, tone, any sign of muscle wasting) Emotional state
Work of **B**reathing	Is the patient breathing? What is the approximate rate? Depth and pattern of breathing (shallow, regular, deep sighing)? Does the patient look breathless (i.e. forward tripod position)? Is there any supplemental oxygen? Pursed lip breathing Any respiratory sounds (stridor, wheeze, strenuous breathing) Generalised signs of increased effort (accessory muscle use)
Circulation to skin	Pallor? Is the patient cyanosed? Is the patient flushed, ashen, pale?

Once a brief scan of the environment has been completed, the practitioner should turn attention to the patient, as significant information regarding the severity of respiratory distress can be immediately identified using components and information collected by taking a 'snapshot' of the patient (Table 19.1).

It is essential for practitioners to obtain appropriate informed consent to ensure that their practice remains professional and legal. Once consent has been obtained, clinicians should conduct a structured primary survey following the steps provided by the Airway, Breathing, Circulation, Disability (ABCD) protocol. The primary survey should be a dynamic process in which the assessment of ABCD should be regularly repeated.

During the primary survey, determine whether a patient is 'primary-survey positive' or 'primary-survey negative'. A 'primary-survey positive' patient suggests that the practitioner has identified a significant abnormal finding or life threat, which requires further and immediate intervention as indicated. A 'primary-survey negative' patient exhibits no significant threats to ABCD, and therefore a more detailed history and detailed clinical assessment can be conducted.

Respiratory anatomy and physiology

During normal breathing, air enters the body through the nose (Figure 19.1). Inhaled air is passed from the external to the internal naris, whilst being warmed and humidified. As the air is inhaled, it is also spun and rolled around the nasal cavity, mainly through the presence of the superior, medial, and inferior nasal conchae or **turbinate bones**. The main role of these bones is to facilitate 'exertional filtration' and prevent foreign bodies from being inhaled into the respiratory tract.

The pharynx is a short muscular tube that starts at the internal nares and extends to the lower part of the larynx. It can be split into three anatomical areas: nasopharynx, oropharynx, and laryngopharynx. The nasopharynx provides the sole passageway for inhaled air and is anatomically located posterior to the nasal cavity. The oropharynx has a dual role in allowing air to pass distally into the respiratory tract and facilitating swallowing of food or **deglutition**. Finally, the laryngopharynx extends from the oropharynx to the opening of the oesophagus.

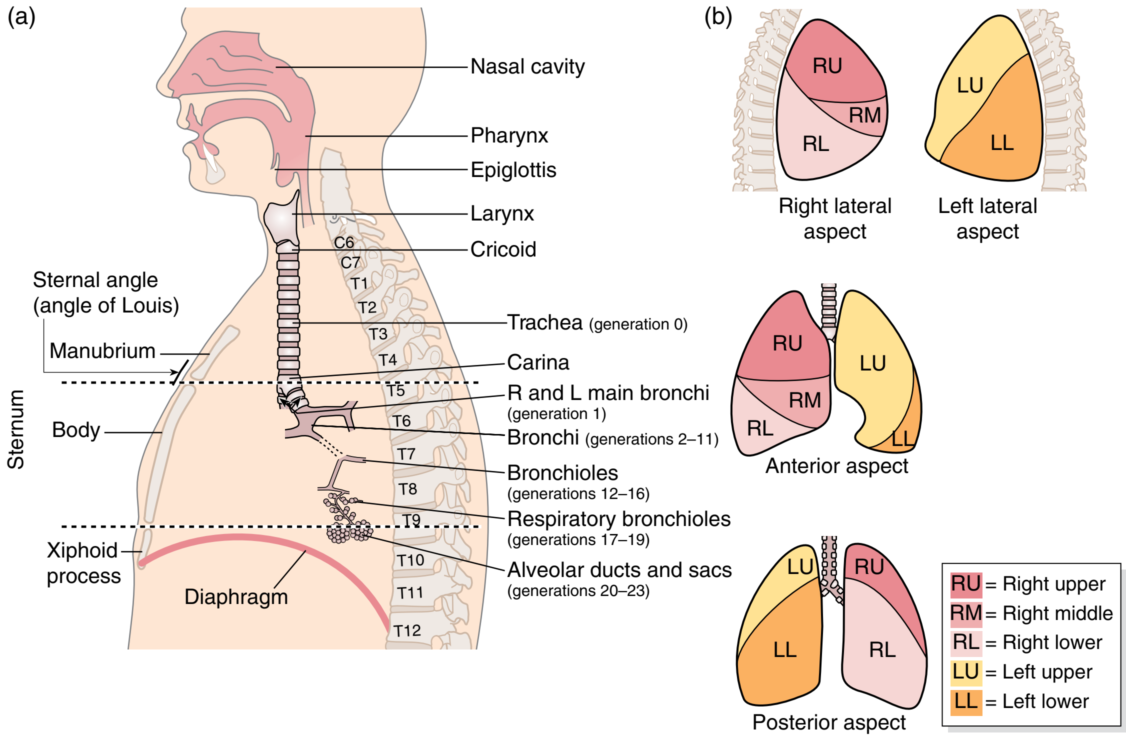

Figure 19.1 Anatomy of the respiratory system: (a) the airways and (b) the lung lobes. Source: Ward et al. (2010), p. 10. Reproduced with permission of John Wiley & Sons.

The larynx is a short vessel connecting the laryngopharynx to the trachea and houses significant anatomical structures associated with the respiratory system. First, the larynx contains the vocal cords, whilst the epiglottis, a leaf-shaped tissue, has a highly specific function of preventing food from entering the trachea. As swallowing occurs, the larynx rises, causing the epiglottis to move down. The glottis is the space between the vocal folds and is considered the anatomical dividing line between the proximal upper airway and distal lower airway.

The trachea is approximately 12 cm long in adults and anatomically located anterior to the oesophagus. Structurally it is made from 16–20 C-shaped arrangements of cartilage that are incomplete posteriorly. A key function of this cartilage is protection against the total collapse of the trachea, but also to allow a transient partial collapse whilst the partially digested foods dilate the oesophagus. The trachea bifurcates at the carina, which is heavily innervated by the autonomic nervous system, as irritation caused by the presence of foreign bodies instigates coughing reflexes to help clear the obstruction.

The right bronchus enters the lung at the **hilum** and subdivides into three lobular bronchi, providing airflow to the right lung's three lobes (upper, middle, and lower; Figure 19.1). Interestingly, the right bronchus is wider, shorter, and more vertical than the left bronchus, thus making it far more likely for paramedics to intubate the right bronchus during an endotracheal intubation attempt. Conversely, the left bronchus is longer and narrower, and splits into just two lobular bronchi, supplying the upper and lower lobes of the left lung. The lines that separate the separate lobes in the lungs are known as **fissures**.

These lobar bronchi in turn continue to divide into smaller and narrower segmental bronchi; after 11–12 further bifurcations, the bronchi are replaced by bronchioles, where rings of fibrous cartage are replaced by airways enclosed by smooth muscle, which determines the lumen size of these air-conducting passageways. The bronchioles divide into first terminal bronchioles then respiratory bronchioles, before the alveolar ducts and, most distally, the airways terminate in the form of numerous alveoli, which are the functional unit of the respiratory system. These pouch-like sacs are elastic and, along with alveolar ducts, serve as the respiratory zone where the **diffusion** of gases occurs. Surfactant is secreted by specialised cells in the alveolar walls that prevent the alveoli from collapsing during expiration, through reducing the surface tension on the internal surface and allowing the alveoli to expand.

Lungs and pleural membranes

Lungs are cone-shaped organs of respiration. In between the lungs lies the space housing the heart, great vessels, trachea, oesophagus, and bronchi, which is called the mediastinum. The apices of the lungs on the anterior aspect of the chest extend 1–2 cm superior to the clavicles, whereas the bases of the lungs reside approximately on the sixth rib in the mid-clavicular line and the eighth rib on the mid-axillary line. On the posterior aspect, apices can be detected at the T1 vertebrae anteriorly, whereas lung bases can be found at the level of T10 (expiration) and T12 (inspiration) due to inspiratory descent (Cox and Roper 2005).

The lungs are enclosed within smooth and moist membranes called the pleura. They consist of a closed bag of membranes containing first the visceral membrane, which attaches to the lung directly, whilst the parietal membrane attaches to the thoracic cavity. Within these membranes is a serous membrane that secretes fluid, allowing friction-free movement as the membranes move during the mechanism of breathing.

Mechanism of breathing

The diaphragm is the principal muscle responsible for normal breathing at rest. It is responsible for around 75% of pulmonary ventilation and is key in generating the difference in pressure gradient that is essential for ventilation to occur. During inspiration, the diaphragm contracts and flattens, which increases the size of the thoracic cavity. According to **Boyle's Law**, the increased volume will reduce the pressure of air within the thoracic cavity, thus creating a pressure difference between atmospheric air (outside the lungs) and intrathoracic air (inside the lungs). Due to this pressure gradient, air will move from higher to lower pressure, and consequently the lungs will fill with atmospheric air. Due to its dependence on muscular activity, inspiration is known as an active process. When an increased depth of ventilation is required, accessory muscles can assist with depth of inspiration.

Throughout expiration, the diaphragm and external intercostal muscles relax, which subsequently reduces the volume within the thoracic cavity. This increases the intrathoracic pressure above atmospheric pressure. Therefore, air simply moves out of the lungs down its concentration gradient. Expiration is aided by the elastic recoil of lung tissue and no energy is consumed. Thus, exhalation is known as a passive process.

Pathophysiology of respiratory conditions

Prior to respiratory assessment, it is essential for paramedics to have a basic understanding of some of the more common disease pathologies that cause breathing problems in the out-of-hospital setting (Table 19.2). This deeper level of understanding allows clinicians to detect potential clinically significant cues during subjective history taking.

Patient assessment

History taking

Taking the history is an essential part of patient assessment: 80–90% of diagnoses can be made from a history alone (Cox and Roper 2005). To assist in the attainment of a relevant subjective history, the medical model can be used to help structure a patient assessment consultation. The medical model includes presenting complaint, history of presenting complaint, previous medical history, current medications, allergies, and social history.

Table 19.2 Common disease pathologies causing breathing difficulty.

Condition	Definition	Signs and symptoms	Pathophysiology
Asthma	Common, reversible chronic inflammatory condition of the lower airways, associated with hypersensitivity.	Dyspnoea, cough, unable to speak in full sentences. Wheeze, tachypnoea, tachycardia, hyper-resonant, accessory muscle use.	Chronic inflammation of the bronchi which results in narrowing of the airways. Irritation causes smooth muscle to contract and produces respiratory compromise. Inflammatory processes also cause excessive mucus production and swelling.
Chronic obstructive pulmonary disorder (COPD)	An umbrella term for chronic lung diseases, most common of which are chronic bronchitis and emphysema. COPD is a progressive pulmonary disease characterised by airflow obstruction that is not fully reversible.	Progressive dyspnoea, wheezing, chest tightness, cough, purulent sputum, cyanosis.	Airway obstruction results from damage to the alveoli, alveolar ducts, and bronchioles due to chronic inflammation.
Heart failure	Not a specific disease, rather a syndrome characterised by clinical findings. It is the inability of the heart to provide adequate cardiac output to meet metabolic demands.	Dyspnoea especially on exertion, orthopnoea/ paroxysmal nocturnal dyspnoea. Cough producing frothy white or pink sputum. Peripheral oedema, tachycardia.	Reduced left ventricle function allows blood to pool in the left side of the heart. As this worsens the volume of blood eventually encroaches on the pulmonary veins and capillaries. As this pressure increases due to the engorgement of the pulmonary circulation, sodium and water are forced into the interstitial space and pulmonary oedema then develops. This causes the patient to experience difficulty in breathing and often crackles may be heard on auscultation of the lungs.
Pneumonia	A respiratory infection affecting the alveoli. It can affect either lungs, one lung, or individual lobes.	Dyspnoea, fever, cough, tachycardia.	Depends on cause. Infection spread by respiratory droplets, causing inflammation via immune response in the lungs. Fluid leaks into the alveoli, effecting gas exchange.
Pulmonary embolism	Obstruction of the pulmonary vessels.	Dyspnoea, pleuritic chest pain, cough, possible deep vein thrombosis, unilateral leg oedema, tachycardia, tachypnoea, fever.	Occlusion of the pulmonary artery, usually at multiple sites. Secondary effects include pulmonary infarction.

(*Continued*)

Table 19.2 (*Continued*)

Condition	Definition	Signs and symptoms	Pathophysiology
Pneumothorax	Presence of air in the plural space causing the lung to collapse. It can be caused by trauma or respiratory conditions, or can be spontaneous.	Dyspnoea, sudden-onset pleuritic chest pain.	Loss of the normal negative pressure in the pleural space that 'adheres' the visceral pleura (lungs) to the parietal pleura (ribs), causing the affected lung to collapse.

Presenting complaint and previous medical history

The presenting complaint refers to the key focus of why the patient, or a bystander, called for the ambulance service. Subjective information regarding the history of the breathing problem is clinically significant and replies from the patient can aid in the development of a working diagnosis. Example questions relating to breathing problems can be found in Table 19.3.

The patient's previous medical history is of course significant, and it is very important for the practitioner to place the current presenting complaint into the context of the patient's normal health, well-being, and quality of life. From a respiratory viewpoint, a patient with chronic obstructive pulmonary disorder (COPD) will always have an element of dyspnoea, which may be exacerbated through exertion, bacterial/viral infections, or stress.

Medication history

Identification of medication specifically prescribed for patients with respiratory disease can be a useful objective measure in terms of progression history of respiratory disease and pathology. It is helpful to develop your knowledge of the pharmacology and indications of some of the more commonly prescribed drugs for respiratory problems, especially where the patient cannot talk or communicate due to dyspnoea.

Allergies

An essential piece of subjective history relates to whether the patient has any known allergies to drugs, animals, or food. It is also important to establish the severity of the allergy, as clearly it can range from acute anaphylaxis to a more minor allergy.

Social history

This section considers the patient's day-to-day activities and personal capability. Lifestyle and environmental and social factors are all pertinent information to gather. All of these factors are summarised in Table 19.3.

Clinical examination

Respiratory assessment encompasses much more than asking nonspecific questions concerning the presenting complaint or merely listening to the patient's chest via a stethoscope. Instead, patient assessment demands a more focused and nongeneralised approach to subjective history taking, asking well-informed questions, to assist the practitioner to 'rule in' or 'rule out' provisional diagnoses. This will allow the paramedic to conduct a more attentive clinical examination, noting clinical signs from other body systems and other anatomical locations other than the chest in isolation.

Table 19.3 Questions for respiratory patients.

History of presenting complaint	How did the shortness of breath (SOB) begin?
	How severe is the breathlessness? How does it affect functionality (effect of hills, getting washed, walking to the bathroom)?
	How (what were you doing) and when it started?
	Are there any relieving or aggravating factors?
	Were you eating during onset?
	Did the SOB begin at night whilst you were lying flat?
	Did the SOB begin after being emotional?
	Is the SOB have a nocturnal concept associated with lying supine? How many pillows do you have normally? Any acute changes?
	Is the onset acute, subacute, or chronic?
	Is the SOB associated with a viral or bacterial infection?
	Have you taken any medication to attempt to resolve these symptoms and how effective was it?
	How does the SOB impact your daily life?
Previous medical history	Any history of night sweats?
	Any history of fever or the patient feeling unwell?
	Any unintentional weight loss?
	Any history of respiratory diseases (i.e. emphysema, chronic bronchitis, pleurisy, pneumonia)?
	Any family history of atopic and similar diseases (eczema, hay fever, cystic fibrosis, asthma)?
	Any surgical history that might be relevant (previous thoracotomies)?
	Any recent previous respiratory or diseases?
	Previous hospital correspondences: • Have you been in hospital in the last year with similar symptoms? Do you know your peak flow score? • Any previous admissions to a medical assessment unit? • Any previous intensive care unit admissions (have you ever been on a ventilator?)
Medication history	Do you take any medications on a regular basis?
	It is useful to note the dosage (mcg, mg, g).
	Do you take any 'over-the-counter' medication?
	How long have you been taking the medications?
	Are you concordant/compliant with the medication regime proposed?
	Do you take or have you ever taken steroid, antibiotic, or long-term oxygen therapy?
	Do you take immune-suppression dampeners (to reduce the immune response)?

(*Continued*)

Table 19.3 (*Continued*)

Social history	Any history of recreation drug use?
	Do you or have you ever smoked?
	Calculate the patient's pack years.
	Do you have any care plans in place? • Dependants • Carers (visits per day) • Meals-on-wheels service • Help with daily life (washing, cleaning, shopping etc.)
	Do you suffer from anxiety-related symptoms?
	Do you drink alcohol?
	What is your occupation? (Consider industrial lung disease.)
	Consideration of socioeconomic group is useful.
	Ask about recent travel.
	Ask about functionality (can you climb stairs without becoming too out of breath?)
Review of systems: respiratory	Do you have a productive cough? Acute (<3 wk) or chronic (>8 wk)? Character? Pattern?
	Sputum (colour, bloody, tenacity, quantity).
	Haemoptysis (source of haemorrhage, quantity).
	Wheezing (ask the patient what they mean by wheezing).
	Any chest pain reported? (Site, onset, character, radiation, type, aggravating/relieving, pain score.)

Patients with respiratory disease can range in severity from those requiring immediate resuscitation to those where respiratory assessment reveals no adverse findings. A systematic approach to any assessment starts with an assessment of the scene, followed by a primary survey, focused history, and, where appropriate, a more thorough 'hands-on' clinical examination.

A 'primary survey-negative' patient should have a comprehensive physical examination conducted. Whilst the chief anatomical area for respiratory examination focuses around the chest, it is important to consider other locations, such as hands, face, and neck, as these may reveal additional findings specific to the respiratory system. Ensure consent for physical examination is still valid, given that your respiratory assessment involves exposure of the chest and peripheral examination of hands, face, and neck.

Hand assessment

Assessment of the hands should be conducted first and can provide useful information relating to respiratory and cardiovascular aetiologies. Firstly, the tactile reassurance from the practitioner can be useful in that any cardiovascular compromise can be assessed through the presence of pallor, assessing the temperature, clamminess of the patient's skin, and capillary refill time. In addition, palpation of the radial pulse can offer further information regarding cardiovascular compromise where the pulse rate, character, rhythm, and pulse volume can be established.

Other significant peripheral signs associated with respiratory disease are finger clubbing and nicotine staining. Finger clubbing, a painless enlargement of connective tissue at the nail bed, can be associated with many respiratory diseases. The patient's fingers begin to develop a spoon-like appearance with the loss of nail-bed angle. The cause of finger clubbing is unclear, but can be associated with lung abscess, pulmonary fibrous, lung malignancy, asbestosis, and congenital heart defects. The best method of assessing for finger clubbing is by looking across the nail bed and by placing the fingers together to determine whether the space in between the fingers is narrowed.

Another clinically significant sign could be the presence of bilateral hand tremor. This can be often a sign of other significant co-morbidities (such as diabetes or Parkinson's disease), so a holistic assessment needs to be considered, but fine tremors can be associated with excessive selective β2-adrenoreceptor agonist use in the acute dyspnoeic patient. Correspondingly, a coarse tremor may be evident in patients who have a build-up of carbon dioxide in the blood, known as asterixis, common in COPD patients.

Head and neck assessment

Inspect the eyes and check the condition of the **conjunctiva**, which should have a pink and sticky appearance. In conditions such as anaemia, the conjunctiva can present as pale, which may necessitate further investigation and haematological investigation. A brief inspection of the nose may reveal nasal flaring if increased respiratory effort is present.

Next, check for the presence or absence of central cyanosis by examining the sublingual region of the mouth. The practitioner can smell for previous use of cigarettes on the patient's breath, as well as considering hydration status through the moistness of the mucous membranes or condition of the patient's tongue. The presence or absence of pursed lips should be noted, as it can also be indicative of increased respiratory distress.

The practitioner can palpate the lymph nodes around the neck for lymphadenopathy. The lymph nodes can become tender to palpation during viral and bacterial infection, so positive findings here assist practitioners with ruling provisional diagnoses in and out. Finally, note the working of accessory muscles around the neck and also inspect for the presence of distended neck veins, which can be more apparent in patients with heart failure.

Chest examination

A frequently used format for respiratory examination of the chest is Inspection, Palpation, Percussion, and Auscultation (IPPA). A common mistake made by clinicians in respiratory assessment is that they will examine the anterior chest, but overlook the sides or posterior of the chest. Good practice is thus to undertake IPPA of the anterior chest first and then repeat this format on the posterior chest.

Inspection

Clinical examination must start with complete and active visualisation of the patient's chest (Figure 19.2). Inspection of the chest is often first performed at a distance before closer inspection. In general, inspection of the chest can be split into two clear subcategories: (i) rate, pattern, and effort of breathing; and (ii) further inspection of chest.

Practice insight

In order to maintain patient dignity whilst exposing their chest, communicate your intentions to your crewmate and those on scene. Protect modesty by keeping the patient covered with a blanket or their own clothes when on scene, and keep the ambulance doors locked if in the back of the vehicle.

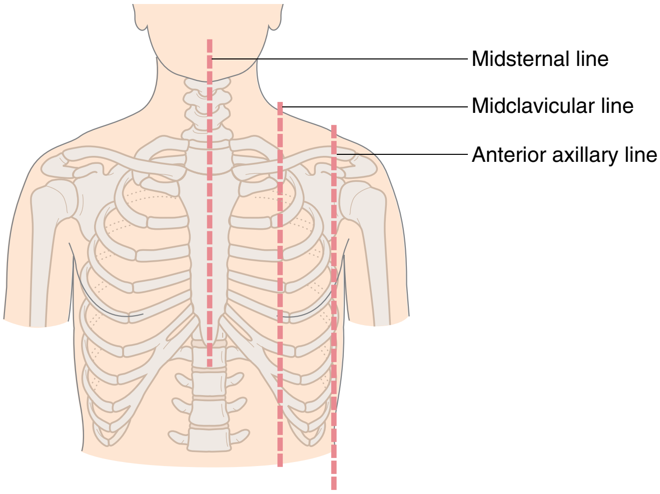

Figure 19.2 Anatomical landmarks of the anterior aspect of the chest.

Rate, pattern, and effort of breathing

Normal adult respirations typically range between 16 and 25 per minute (Cox and Roper 2005). Respiratory rate can be an important indicator of disease severity and normal breathing should be unlaboured and regular. In normal breathing it should also take twice as long to breathe out than in, demonstrating a ratio of 1 : 2 for inspiration and expiration.

Accurate assessment of a patient's respiratory rate can be challenging within the out-of-hospital setting. It is recommended that to calculate the most accurate respiratory rate you need to count the number of respirations across a whole minute. This may not always be appropriate or practicable, so respiratory rates are often counted over 30 or 15 seconds and then this figure is multiplied ×2 or ×4, respectively.

Eupnoea breathing should be even, coordinated, and regular. It is important to note that males often exhibit mainly diaphragmatic breathing, whereas the majority of movement of breathing in females occurs from the thorax. Signs of increased effort of breathing include inability to talk in full sentences and patients adopting the forward tripod position (leaning forward on a chair, often resting their hands on their knees), which facilitates pulmonary ventilation (Figure 19.3).

Signs of increased effort of breathing can often be displayed through intercostal recession and use of accessory muscles. Intercostal recession is a clinical sign of respiratory distress that occurs as a result of increasingly negative intrathoracic pressure causing recession or retraction of the chest. This is most commonly seen within the intercostal spaces. The degree of contractility and work of accessory muscles (trapezius, scalenus, sternoclomastoid, intercostal) should be noted, as they assist the chest with expansion, thus increasing minute volume.

Further detailed inspection of the thorax

Further inspection should include:

- Checking for bilateral and symmetrical movement of the chest, demonstrating a normal chest excursion.
- Checking for presence of scars (thoracotomy, pacemaker, lobectomy, coronary artery bypass graft, heart valve replacement).

Figure 19.3 Patient in tripod position.

- Checking for presence of central cyanosis.
- Checking the chest for trauma to the thorax, namely contusions, abrasions, puncture wounds, lacerations, swellings, burns.
- Inspecting the posterior aspects for sacral oedema, commonly associated with heart failure.
- Checking the pallor.
- Assessing the nutritional state of the patient.
- Determining whether the patient looks frail or there are signs of **cachexia**.

Palpation

Chest palpation can be broadly split into two: palpation of the thorax and assessment of lung compliance/chest expansion.

Palpation of thorax

Begin examination by light palpation across the thorax, which in normal circumstances should not elicit any pain to the patient. The chest cavity should feel warm and dry. The practitioner should lightly palpate over ribs for signs of tenderness or **crepitus**, especially following traumatic incidents such as falls or road traffic collisions. Palpation can also help exclude the presence of **surgical emphysema**, fracture or instability of the larynx, and suspected clavicular injury.

Assessment of chest expansion/Lung compliance

Healthy lungs should be stretchy and distensible. Lung compliance refers to the ease with which the lungs are stretched, as well as the equality and the depth (sometimes known as excursion) of respiration. When compliance is low, more effort is needed to inflate the lungs. Whilst practitioners cannot directly measure lung compliance, we can examine for bilateral thoracic wall compliance to detect excursion of breathing and thoracic compliance.

To assess chest compliance on the anterior aspect of the chest, the practitioner must place their hands directly on the thorax with thumbs extended along the costal margin pointing towards the xiphoid process. The clinician should ask the patient to breathe a maximum inspiration and as the thorax fills with air, the practitioner's thumbs should separate by 3–5 cm following deep inhalation in normal lung tissue. Chest compliance should also be examined on the posterior chest, using the tenth rib (just below the scapulae) as a landmark to perform the procedure.

Percussion

Percussion of the thorax is a clinical skill that is both felt and heard as the practitioner attempts to determine the resonance or hollowness of the chest. Striking of the chest requires considerable practice to achieve competence. Clinical examination findings from chest percussion in isolation have little clinical significance; these findings should be considered along with other information attained during patient assessment. Chest percussion can assist out-of-hospital practitioners in detecting different grades of resonance that can be sensitive to distinctive pathologies of the underlying lung tissue.

Normal percussion will penetrate approximately 5–7 cm into the chest and a normal chest can be described as 'drum-like' or normo-resonant to percussion. A more 'hollow-sounding' chest can be associated with an increased volume of air within the thoracic cavity, whereas a build-up of fluid within lung tissue can result in a duller resonance. Within the clinical examination context, these are termed hyper-resonant and hypo-resonant, respectively.

Method of percussion

The practitioner should place the middle finger of their nondominant hand firmly against the patient's chest in a hyper-flexed position within an intercostal space. It is very important to ensure that the practitioner's other fingers do not rest upon the chest, as this has a dampening effect on the resonance generated. The striking action from the middle finger of the practitioner's dominant hand should aim to strike the distal interphalangeal joint using a flick of the wrist in a constant, smooth motion. Finger-to-finger contact time should be kept to a minimum, and often clinicians will strike the nondominant hand a second time, which merely provides confirmation of resonance produced.

Auscultation

Auscultation via stethoscope is arguably the most important part of respiratory assessment, as it evaluates the turbulent airflow through the respiratory tract during inspiration and expiration. Airflow is assessed by quality of breath sounds created and the presence or absence of added sounds. The chief objective of prehospital auscultation is to identify differences in sounds produced from larger and smaller airways, as well as whether the air is passing through fluid-filled or narrowed airways, causing increased air turbulence.

Introduction to the stethoscope

The stethoscope is used to listen to the chest by amplifying sounds generated within the respiratory tract. Tubing on stethoscopes can vary in length and, depending on stethoscope manufacturer, stethoscopes may have a different tool that is placed onto the patient's chest, namely a bell or diaphragm. The bell of a stethoscope should be used for low-pitched sounds, whereas the diaphragm should be considered when sounds are higher in pitch. Where there is no option for a bell, the diaphragm should be used employing variable pressure on the skin.

Normal breath sounds

Normal lungs will produce four types of breath sound, depending on where on the thorax the practitioner listens: tracheal, bronchial, broncho-vesicular, and vesicular. Tracheal and bronchial sounds are described as harsh or sharp, whereas vesicular sounds are soft and low, with broncho-vesicular sounds being a mix. The key objective of auscultation is for the practitioner to differentiate between normal breath sounds and the presence or absence of added sounds, known as advantageous sounds.

Added or advantageous sounds

Advantageous sounds (Table 19.4) are additional sounds and are superimposed onto normal breath sounds. These sounds are always abnormal and linked to underlying pathology. These additional sounds, which can be detected using a stethoscope, should be noted for pitch, frequency, and phase of respiration. The most common forms of advantageous sounds are wheeze, stridor, and crackles.

Method of auscultation

Prior to auscultation, the clinician should ask the patient to cough to help clear the airways and to breathe more deeply and slowly than normal, through an open mouth to minimise additional air turbulence from the naso-pharynx. Whilst the clinician is listening to the anterior chest, it is recommended that the patient rests their hands on their knees; whilst the clinician is auscultating the posterior region, it is considered good practice to ask the patient to fold their arms and rest their hands on their opposite shoulders. This helps to separate the scapulae to facilitate auscultation.

Begin at the lung apices, superior to the clavicles, and work down inferiorly, comparing right and left sides (Figure 19.4). Across the thorax, press the diaphragm of the stethoscope firmly against the skin and listen for a full inspiration and full expiration in each anatomical location. It is important to move across the chest to enable immediate and direct comparison with the contralateral side.

Practice insight

It can sometimes be difficult to hear normal or abnormal breath sounds due to environmental noise. Therefore, whenever you are going to auscultate a patient's chest, let everyone on scene know and ask bystanders to remain quiet.

Table 19.4 Pathophysiology of advantageous sounds.

Wheeze	Typically described as a sharp whistling, occurring mostly on expiration, as inspiration causes the airways to dilate. The pathophysiology of wheeze is caused by smooth-muscle contraction around the bronchioles, leading to a reduction in lumen size and ability to conduct air distally into the respiratory tract. Wheezing is common in patients with asthma and exacerbation of chronic obstructive pulmonary disorder (COPD).
Stridor	High-pitched inspiratory sound of the upper airway caused by partial obstruction of the larynx or trachea. Stridor is common in foreign body inhalation, anaphylaxis, and life-threatening asthma.
Crackles	Sometimes termed 'creps' and thought to be the popping of alveoli due to the presence of pulmonary oedema. Can be coarse or fine, where 90% of crepitation are detected upon inspiration. Crepitations are difficult to explain, but can be suggested as sounding like rubbing hair between fingers next to your ear.

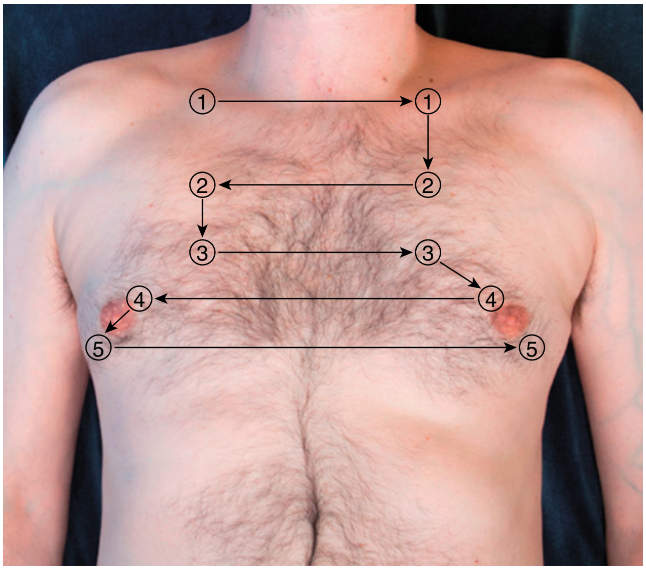

Figure 19.4 Positions on the thorax for percussion and auscultation.

End-tidal CO_2

End-tidal carbon dioxide ($ETCO_2$) monitoring is a vital assessment tool. It is a reliable indicator of effective heart compressions during cardiopulmonary resuscitation, and indicates return of spontaneous circulation. $ETCO_2$ monitoring is also a more reliable tool than monitoring oxygen saturation levels in many pulmonary pathologies, often distinguishing between respiratory conditions and very important for choosing appropriate therapy and management. $ETCO_2$ in patients with cardiac causes can be significantly different from that in patients with respiratory distress due to obstructive causes, allowing accurate diagnosis. This provides almost immediate information and detection of problems like hypercapnia, apnoea, respiratory depression, and hypoperfusion (NAEMT 2018).

Conclusion

As outlined in this chapter, respiratory assessment can be split into subjective history taking and objective clinical examination. Through the practice and application of clinical skills, trainee and existing paramedics alike can form credible provisional diagnoses and detect more subtle clues to clinical findings on physical examination.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. What are the functions of the respiratory system?
2. Define hypoxia.
3. How does smoking affect the respiratory system?

4. What is a primary survey?
5. What are the potential causes of shortness of breath?

Activity 19.1

List as many different causes of shortness of breath, dyspnoea, or breathing problems as you can.

Activity 19.2

Practise counting the respiratory rate on friends and family. Count their rate without them knowing. Take a note of the quality of the chest movement as well as the rate.

Activity 19.3

Get used to following a systematic approach to chest auscultation. Practise listening to a 'normal' chest on friends and family in order to establish what is normal, before listening to a patient's chest, who may have added sounds and other abnormal findings.

Glossary

Boyle's Law:	The pressure of a gas decreases as the volume of the gas increases.
Cachexia:	Weight loss and deterioration in physical condition.
Conjunctiva:	The membranes which line the inside of the eyelids.
Crepitus:	Grating, crackling, or popping sounds and sensations experienced under the skin and joints.
Deglutition:	The act of swallowing.
Diffusion:	A net movement of molecules or ions from high concentration to lower concentration until equilibrium is reached.
Eupnoea:	Normal-parameter breathing rate.
Fissures:	Any cleft or groove, normal or otherwise.
Hilum:	An area where blood vessels and nerves enter or leave an organ.
Surgical emphysema:	The presence of gas in subcutaneous soft tissues.
Turbinate bones:	Thin scroll-shaped bones within the nasal cavity that increase turbulent airflow, thus maximising the surface area in contact with cilia and mucous-covered layers of epithelium membrane.

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20

Paramedic assessment skills

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Contents

Fundamentals of Paramedic Practice: A Systems Approach, Second Edition. Edited by Sam Willis and Roger Dalrymple.

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Learning outcomes

On completion of this chapter the reader will be able to:

- Understand how to assess and implement care for a conscious patient.
- Understand how to approach and implement care for an unconscious patient.
- Identify the equipment required when managing both conscious and unconscious patients.
- Identify which skills require more than one paramedic to be performed safely when treating your patient(s).
- Understand the importance of routine skills maintenance and professional development.

Introduction

This chapter will focus on clinical assessment skills used by paramedics today to treat, manage, and provide ongoing care for patients. It will be split into two parts. Part 1 will focus on the conscious patient and Part 2 will focus on the unconscious patient, as the primary survey approach in each case is very different. Each part will be structured in a systematic manner for ease of reference and transferring over to more advanced skills later in your career development.

Part 1: The conscious patient

The majority of patients you will attend as a paramedic will be conscious. Consider the following questions when treating the conscious patient:

1. What do we need to do in order to assess them?
2. What do we need to look for?
3. What questions do we need to ask our patient?
4. What is the important information that will help to treat this patient?

The best way to approach all of these questions is to start with the question: 'Where should I start from?'

Anyone who has completed a first-aid course will have learnt the acronym DRSABC – Danger, Response, Send for help, Airway, Breathing, Circulation. This is exactly where we too will start from. However, we will add another three letters at the end and change the acronym to DRHABCDE, with H standing for catastrophic haemorrhage, the second D for Disability, and E for Exposure/Evacuation/Environment. We also drop the S, as you will be the help. If a second crew is required then they can be requested once the patient has been stabilised.

When we talk about haemorrhage we are talking about serious and potentially **catastrophic haemorrhage** which must be controlled first before managing the airway. If someone does not have sufficient blood in their body they are dead.

Disability refers to seeing whether your patient is talking and moving normally, or whether they present with a physical injury or illness.

Exposure/evacuation/environment refers to any need you might have to expose the patient to access their injuries. If the environment makes treating this patient difficult, then you would need to evacuate them to a more suitable location.

This acronym forms the basis for our conscious patient *primary survey*. This is your initial review of any patient you are going to commence treatment on. The acronym also forms the initial foundations of the **systematic approach** that you will use on all your patients. Let us now break down the areas you need to complete when utilising a primary survey for a conscious patient (Table 20.1).

So that is the primary survey. It does seem like a lot to do, however with practice and experience as a paramedic, you will complete your primary survey in the first one to two minutes of your initial patient encounter. With some patients and with experience, your primary survey may be done before you even start talking with

Table 20.1 Primary survey.

Danger	Look for danger to yourself, partner, patient, or others around you. You should never enter a scene if there is potential for you and/or your partner to be harmed.
Response	What is your patient's response? Do they even know you are present? To assess your patient, perform the AVPU scale assessment on them: • **A** – Is your patient *Alert***?** • **V** – Is your patient responding to *Verbal* **stimuli**? • **P** – Is your patient responding to *Pressure* stimuli?* • **U** – Is your patient *Unresponsive?* * When you apply a pressure stimulus, you should only use enough force to gain a response. You are not trying to hurt your patient; you are simply trying to get either a slight physical or vocal response, such as the patient pulling away or groaning/moaning.
Haemorrhage	Are there any signs of haemorrhage from the patient? If so, is the bleeding catastrophic – needing attention right now or your patient will die – or is it minor, which can wait until you complete your head-to-toe (HTT)/physical examination during your secondary survey? If there is catastrophic haemorrhage, how big is your patient: a large patient, a child, or a thin older adult? A catastrophic haemorrhage is a major medical emergency and must be managed immediately. Additionally, have a quick look at the extremities of your patient, to see if there are any obvious external injuries.
Airway	You need to check your patient's airway. Make sure it is clear with no chance or danger of airway obstruction. Can you hear any audible sounds as you approach your patient, like **stridor** or wheezing? You may also need to implement basic and advanced airway manoeuvres, which we will discuss further in Part 2.
Breathing	Check if your patient is breathing and if they have adequate ventilation for their presenting condition. Look at your patient as you walk up to them and see if you notice any rapid breathing, obvious signs of **accessory muscle** use, flaring nostrils, flushing of the face, or **cyanosis** (extremities or lips etc.). Also don't forget to obtain an initial respiration rate to help identify/flag any potential respiratory issues early.
Circulation	Does your patient have a pulse? If so, is that pulse adequate enough for their condition? If you are assessing a paediatric patient, is their capillary refill less than two seconds? Also don't forget to obtain an initial pulse rate to help identify any potential **perfusion**/cardiovascular issues early.
Disability	Is your patient talking and moving normally? If your patient is obviously alert, then you would move to **E**. What you are looking for here is: • Facial symmetry • Gross motor movement

Table 20.1 (*Continued*)

Expose/Evacuate	Here you need to scan the entire body area and environment in which your patient is located. You are looking for: • Has the patient been subjected to trauma? – Expose • Are the environmental conditions going to make your treatment dangerous or difficult? – Evacuate
	• What major/significant injuries do you see (e.g. stab wounds, obvious fractures, bullet wounds)? You need to treat these now, as, just like a major/catastrophic haemorrhage, these issues are a major medical emergency. • What minor injuries do you see? Make a mental note and then treat during your secondary survey.
Send for Help/ situational report (SITREP)	You may find yourself in a situation in which one paramedic crew is not enough. A SITREP is something all paramedics must do when they attend an incident, so that the Communication Centre knows what is going on and can provide further assistance if required.

them, as you'll be able see and confirm all the areas as you approach your patient. Let us now have a look at a case study and implement the primary survey in relation to this example.

Case study 1: Using the primary survey

You are dispatched to a 55-year-old male patient who is complaining of a potential broken hand after dropping on it a box that he was trying to move. As you walk up to the front door of the house, there are no signs of danger and it is safe to enter. When you reach the front door, the patient calls outs to you to come inside. You see a man sitting at the kitchen table clutching his right hand, breathing normally, but in obvious pain.

What would the primary survey reveal?

- **D** – The scene is safe and there is no danger.
- **R** – The patient calls out to you to come inside as you appear at his front door. He is alert (**A** on the AVPU Scale).
- **H** – There are no signs of any catastrophic haemorrhage or other signs of haemorrhage present and his right hand looks swollen.
- **A** – The patient called out to you as you walk up to his door, therefore his airway must be clear, plus you don't hear any abnormal audible sounds like stridor or wheezing.
- **B** – The patient called out to you, so therefore he must be breathing and as you walk towards him, you can see he is showing signs of pain, but no signs of any difficulty breathing. The patient's initial respiration rate is 18.
- **C** – Your patient appears to be in obvious pain, but is pink and well perfused as you walk towards him. The patient's initial radial pulse rate is 90.
- **D** – Your patient is talking to you and moving normally; he is obviously alert.
- **E** – No need to expose the patient or evacuate them from the environment. The scene is safe and you are inside. Looking at the patient's right hand, it does appear swollen.

The next part of the patient assessment systematic approach is referred to as the *secondary survey*. This is when you gather the following information about the patient:

- A comprehensive patient history.
- An initial vital signs survey (VSS).
- A complete physical examination of the patient from head to toe.

The secondary survey is the foundational platform on which all future patient care is built, and it is vital you complete every step to ensure you can deliver a gold standard of patient care.

To complete the comprehensive patient history, you need to review the following areas:

- Presenting symptoms (PS)
  - What is the main reason they have called the paramedics today, in the patient's own words?
- History of presenting illness (HPI)
  - What are the details of the current symptoms/complaints today?
  - Is there any history of a previous/similar issue today or recently?
  - Have they tried any treatment prior to your arrival (drugs, rest, heat, etc.) and has it worked?
  - Is this condition causing any functional disability and if so, how bad is it?
- Past history (PH)
  - What is the patient's past medication history?
  - Does your patient have any drug allergies?
  - Does your patient have any current prescribed medications?
  - For a female patient, does she have any menstrual or reproductive issues?
- Social history (SH)
  - What is the patient's occupation? (Some occupations have associated conditions related to them.)
  - Is there any history of smoking, if so how much?
  - What is the patient's alcohol intake? Yes, no, how much, how regular?
  - Is there any history of illicit drug taking? If so, of what and how often?
  - What is the patient's sexual history?
  - Has there been any recent overseas travel, and if so where and when?
- Family History (FH)
  - What diseases are there in the family? This is particularly relevant at first-degree level, such as a patient's father having had a heart attack when he was 39, or a patient's mother suffering from diabetes.

Along with the comprehensive history taking, you also need to assess the symptom(s) that our patient has called you here for. There are multiple different assessment acronyms available for use, but most of them focus mainly on pain. The SOCRATES (Talley and O'Connor 2018) acronym can be used across pain and other symptom assessment as well. This acronym stands for:

- **S** – **S**ite
- **O** – **O**nset
- **C** – **C**haracter and severity
- **R** – **R**adiation
- **A** – **A**ggravation and relieving factors
- **T** – **T**iming
- **E** – **Exacerbating** factors and associated symptoms
- **S** – **S**ocial effects of the symptom or illness

The last letter is reserved more for chronic conditions, as it relates to issues that stop the patient from working or cause significant social withdrawal from normal activities. However, an acute patient issue could be a potential broken leg, which could put the patient off work for a short period of time during recovery.

The VSS is used to gather a thorough and accurate collection of information related to this patient and to help assess whether any of these vital signs reflects relevance or concern relating to your patient's PS.

The HTT provides a very comprehensive assessment from your patient's head all the way down to their toes. In Chapter 27, Low Acuity, we will expand this examination into something called a systems review.

Now let us put all of this information into one systematic approach that covers your entire secondary survey (Table 20.2).

Table 20.2 Secondary survey.

Signs and symptoms	Presenting symptoms (PS) • **S**ite • **O**nset • **C**haracter and severity • **R**adiation • **A**ggravating and relieving factors • **T**iming • **E**xacerbating factors and associated symptoms • **S**ocial effects of the symptoms/illness History of presenting illness (HPI)
Patient history	Past history (PH) Social history (SH) Family history (FH)
Last ins and outs	Food, fluid, urinary output (colour, smell, frequency), bowel movements (colour, frequency, consistency)
Events leading up	Any information leading up to this event, further information that may not have been included in the HPI, and any other relevant information related to this condition that is not already covered.
Vital signs survey (VSS) **Perfusion status assessment (PSA)** **Respiratory status assessment (RSA)** **Neurological status assessment (NSA)**	Complete a thorough assessment across all appropriate vital signs for the patient. • Pulse • Respiration rate • Blood pressure • Temperature • **SpO_2/pulse oximetry** • Respiration effort • Skin • Blood glucose level (BGL) • **Glasgow coma score** (GCS) • 12-Lead electrocardiogram (ECG) • Pain level • Sounds (chest, heart, abdomen) • Pupils (size, reactive, reactive speed)
Physical examination head to toe (HTT)	Complete a very comprehensive assessment from your patient's head right the way down to their toes. This assessment will include: **Head** • *General inspection* for lacerations, deformity, facial muscle asymmetry • *Inspecting the eyes* for even pupils, evidence of raccoon eyes • *Inspecting the ears* for signs of blood in the ear canal, cerebrospinal fluid (yellow fluid) leaking from the ear canal, and any possible **Battle's signs** behind the ears that could represent a base-of-skull fracture • *Inspecting the nose* for any deformity or bleeding • *Inspecting the mouth* for any missing teeth, a bite malocclusion (broken jaw), and any obvious airway or tongue swelling • *Listening to the voice* for whether it sounds different, strange, or hoarse, indicating a blow to the voice box or other associated blunt trauma • *Palpation of the head* for any boggy mass, or subcutaneous emphysema (*Continued*)

Table 20.2 (*Continued*)

	Neck • *General inspection* for any signs of raised jugular venous pressure, lacerations, or neck deformity (bulges or an unusual shape) • *Palpation of the neck* for any tenderness in the cervical vertebrae (C1–C7) **Chest** • *General inspection* for chest expansion to see if it is normal, no use of accessory muscles, no lacerations or deformity (flail chest segments) • *Palpation of the chest* for any apex beat, tenderness, or subcutaneous emphysema • *Auscultation of the chest* for normal heart sounds (S1 and S2), normal (vesicular) breath sounds, and good air entry bilaterally **Upper limbs** • *General inspection* for any obvious bruising, deformities, fractures, Medi-Alerts, lacerations, or rotation • *Palpation of upper limbs* for any obvious difference in grip, strength, and pull on either side; checking for any tenderness around the bones, ligaments, and joint movement; checking radial and brachial pulses to see if absent, strong, regular, or weak **Abdomen** • *General inspection* for any obvious bruising and its location on the abdomen, or for any lacerations, distention, or priapism • *Palpation of the abdomen*, light to start with, feeling around the nine quadrants for any tenderness, guarding, rigidity, or masses; deep palpation for any tenderness, guarding, rigidity, or masses • *Auscultation of the abdomen* for bowel sounds, present or absent **Pelvis** • *General inspection* for any obvious bruising, lacerations, and deformities • *Palpation of the pelvis* for any tenderness **Lower limbs** • *General inspection* for any obvious bruising, deformities, fractures, lacerations, shortening, or rotation • *Palpation of lower limbs* with feet for any obvious difference in strength on either side; checking for any tenderness around the bones, ligaments, and joint movement; checking femoral and petal pulses to see if absent, strong, regular, or weak **Back** • *General inspection* for any obvious bruising, lacerations, tenderness, or hidden wounds under clothes or undergarments • *Palpation of the back* for any pain or tenderness along the thoracic and lumbar vertebrae, or for any fluid or blood that may have been missed on the general inspection coming from hard-to-see lacerations under clothes or undergarments

That is the complete secondary survey. Again, it can seem like a lot to do, but with practice and experience as a paramedic, you will complete your secondary survey in about 10–15 minutes on most patients. Some of your patients may need a little more time, whilst with others you may even complete it more quickly.

Let us go back to the case study and apply the secondary survey to this example.

Case study 2: Implementing the secondary survey

We will continue with the previous patient, a 55-year-old man who is complaining of potential broken fingers. You have completed the primary survey already; now to complete the secondary survey.

Signs and symptoms

PS – Pain in his right hand after dropping a box on it:

- S – right hand
- – 10 minutes before calling the ambulance, he tells you
- C – he is in severe pain, he describes the severity as if someone had stabbed his hand
- R – he tells you that the pain slightly radiates up his right arm
- A – he tells you if he doesn't move his hand, the pain is OK, but if he moves his hand around the pain is unbearable
- T – he tells you the pain was instantaneous from the moment the box landed on his hand
- E – he informs you that any movement causes a massive increase in his pain levels
- S – he informs you that he works in an office and is left handed, so even if the hand is broken, he will be able to return to work

HPI – 'Just slipped lifting the box and it came down heavy on my right hand'

Patient history

PH

- Medical history – asthma
- Allergies – nil
- Medications – Asmol (as required)

SC

- Doesn't smoke, not a drug user
- Social drinker, about four standard drinks a week
- Hasn't travelled overseas recently
- Married, 10 years

FH

- Parents on both sides (husband and wife) still alive, with no current medical conditions

Last ins and outs

- Had breakfast this morning, no issues going to the bathroom
- Drinking water regularly whilst moving today

Events leading up

- Already covered in the HPI, but the patient wasn't wearing any shoes when he was climbing up on the ladder and probably slipped on the rails as he lifted the box above his head

VSS

- Pain level 5/10 stationary, 10/10 on any movement
- Pulse 90 and regular
- Respiration rate 18, effort normal
- Blood pressure 130/80
- Temperature 37.4 °C
- SpO_2 97% on room air
- Skin appears flushed and a little moist
- BGL 4.7 mmol/l
- GCS 15
- Sounds – chest normal, breath L = R and normal, no signs of wheeze related to his asthma, abdominal sounds normal
- Pupils – normal, pupils equal and reactive to light (PEARL)
- 12-Lead ECG – normal sinus rhythm

HTT

- Head – no abnormalities detected (NAD); the patient did not hit his head or lose conscious at any time; has complete recall of time, date, and place
- Neck – NAD
- Chest – NAD
- Upper limbs – Right hand very swollen, can't move it, significant pain on palpation; left hand NAD
- Abdomen – NAD
- Pelvis – NAD
- Lower limbs – NAD
- Back – NAD

So now you have completed the primary and secondary surveys for your patient. As mentioned previously, it does seem like a highly detailed process, but with practice and experience, it will become second nature. You would have also noticed how systematic the whole process is, from the primary survey to the end of the secondary survey. Follow this process with every patient, with the appropriate patient communication techniques, and you'll be able to provide a gold standard of patient care every time.

Before we move onto Part 2 of this chapter, we will discuss the next stages of management for conscious patients. These involve:

- Managing pain levels
- Managing nausea and/or vomiting
- Managing presenting condition(s)
- Packaging and transporting the patient
- Hospital handover

Pain management

Pain management provides a therapeutic relief to patients when they are in pain. When you were a child your parents may have given you liquid paracetamol, for example, or if you are suffering a headache you might have taken some ibuprofen. The ambulance service you work with will have its own preferred pain relief medications for you to use. Examples of pain relief medications used by paramedics are:

- Narcotics – e.g. morphine or fentanyl (synthetic/manmade narcotic)
- Analgesic – e.g. ketamine, paracetamol, methoxyflurane, or Entonox

Managing nausea and/or vomiting

The management of nausea and vomiting using anti-emetics can provide therapeutic relief for pain and discomfort, which is normally your body's physiological response to the effects vomiting has on the body systems involved, when the **vagus nerve** triggers the vomiting centre in your **medulla oblongata**. Anti-emetics' primary purpose, however, is to stop the physical effects of the vomiting and take away further feelings associated with nausea as well.

Management of nausea and vomiting can also be used for precautionary purposes. Examples of this include:

- Patients with a predisposition to vomiting after administration of narcotic analgesia.
- Patients with suspected traumatic brain injuries, to avoid raised intracranial pressure (Reed 2015).

Examples of anti-emetic medications used by ambulance services include:

- Ondansetron
- Maxolone
- Dimenhydrinate

Managing presenting condition(s) and establishing your provisional diagnosis

Managing your patient's presenting condition(s) is a matter of prioritising which aspect is the most important. If your patient is only suffering from a single complaint, then addressing this is your primary role for that patient. However, not all your patients will have just one medical complaint; some may have multiple complaints, and some of these may not even be related to your original call-out in the first place. In a complex scenario of this kind, the simplest approach to management is the following:

- Identify the complaints your patient presents with.
- Identify the most serious of these presenting complaints.
- Rank the remaining presenting complaints in order of importance.
- Treat each complaint in the order you have ranked them.

This entire process is referred to as 'triage', which is a French word meaning 'to sort'. When attending incidents that involve more patients than there are paramedics to treat them, a mass casualty incident (MCI), triage is used to sort our patients from highest to lowest priority (NAEMT 2014). So, just like in an MCI, you will need to triage your patient's presenting conditions in the same way, to ensure the most appropriate treatment over the most appropriate timeframe to treat their presenting complaints.

Practice insight

Keep in mind that sometimes fixing one complaint can unmask another, previously hidden complaint. This may then result in you having to completely re-prioritise your list to treat this new, now unmasked complaint. A common example of this is a patient with a polypharmacy overdose. You might fix the presenting overdose condition, only to unmask another overdose condition for a different drug they may have taken at the same time.

Packing and transporting your patient

After you have completed your primary survey, secondary survey, and any initial treatment and management, your next task is to package your patient for transport. Depending on the nature of their injuries or their presenting complaint, your patient may be time or transport critical.

Time-critical patients require a minimal on-scene time, performing your treatment en route wherever possible, and prompt transport to a receiving facility (ACT Ambulance Service 2010). Ambulance services around the world will have their own guidelines as to what categorises a time-critical patient.

Transport-critical patients are those experiencing an acute life-threatening illness emergency due to lack of either diagnostic facilities, staff, or clinical expertise (ANZCA 2015). In these case paramedics are often required to continue treatment during transportation by land, air, or sea, sometimes all the way into theatre.

Once you have determined the criticality of your patient, you will then need to determine the most appropriate method or equipment to facilitate how you package your patient. This could include:

- Splinting – long bone, short bone, pelvis etc.
- Bandaging – lacerations, amputations etc.
- Positioning of your patient – supine, lateral, semi-recumbent, sitting etc.
- Positioning of diagnostic equipment – cardiac monitor, ventilators etc.

Your final task is transferring your patient onto your stretcher, continuing to monitor, reassess, and provide additional treatment as required, whilst transporting them to hospital.

Hospital handover

Communication plays a vital role in the management of patients. Not only do paramedics require critical communication skills when speaking with patients to ensure they can ascertain the best patient history to create the treatment plan, they also need to do the same when communicating with other healthcare workers. Nowhere is this more important than when completing a hospital handover.

There are a few acronyms available to codify the process of handover. Perhaps the most useful is IMIST-AMBO (Wood et al. 2015; QAS 2016), which you can use for both hospital handovers and pretty much every other clinical handover you might need to perform as a paramedic (Table 20.3).

Case study 3: Completing the systematic approach

We will continue with the previous patient who is complaining of potential broken fingers. You have completed your primary and secondary surveys for this patient; now you need to treat, package, transport, and hand over at hospital.

You have identified what is physically wrong with the patient via a complete HTT, as well as performing a full VSS. Based on that information, as the treating paramedic you decide to do the following:

- *Pain management* **–** You provide pain management to your patient to help lower his pain level and make him more comfortable.
- *Nausea and vomiting* – this patient has no current nausea and vomiting.
- *Managing presenting conditions* – after providing pain relief to lower your patient's pain level and make him more comfortable, you apply a vacuum splint to support his suspected broken right hand.
- Packaging and transporting the patient – the patient is able to walk with you out to the ambulance and you position him in a semi-recumbent position on the stretcher, securing all restraints, and transport him to hospital, performing ongoing reassessments en route.

Table 20.3 IMIST-AMBO clinical handover acronym.

I	Identification	Your patient's name and age/date of birth
M	Mechanism of injury or medical complaint	What is the mechanism of injury? What is the medical complaint or presenting problem you were called for?
I	Injuries or information relevant to complaint	Patient assessment and history that are relevant to the complaint you were called for
S	Signs	Vital signs you have taken Any changes you noticed (good or bad) Glasgow coma score of your patient Did it change during treatment?
T	Treatment and trends	What treatment interventions did you perform? What was your patient's response to treatment?
A	Allergies (medical or nonmedical)	Allergies your patient may have: • Medical allergies (pharmacology or other items like medical tape, latex, or betadine etc.) • Nonmedical allergies (seafood, cats, grass etc.)
M	Medications	What medications are they taking? • Prescribed • Not prescribed
B	Background	Medical history • Surgical history • Current medical conditions • Past history/past medical conditions (if relevant) • Social history (if relevant) • Family history (if relevant)
O	Other issues not already identified	What did the scene look like (vehicle accident, fall – how high, smoke or other potential issues)? Social situation of the patient (how clean was the house/apartment, patient's social status, if relevant to condition)? Any advanced health directives like do not resuscitate etc.? Any belongings the patient may have with them? Cultural or religious considerations the patient may have? Any need for an interpreter?

- **Hospital handover**
  - **I** – This is patient John Smith who is 55 years old.
  - **M** – He has dropped a box on his right hand whilst trying to position it on a high shelf this morning.
  - **I** – His right hand appears swollen, extremely painful to touch, and pain increases on movement, radiating up his right arm.
  - **S** – His vital signs have remained constant. He has a normotensive blood pressure, pulse 90, resp. rate 18, SpO_2 97% RA, temp 37.4, BGL 4.7, PEARL, chest sound clear, and he has had a constant GCS of 15.

- **T** – We have given him pain relief (you would state the name, dose, and response), which relieved his pain. We have also applied a vacuum splint around the right hand, which has provided support and additional pain relief.
- **A** – He has no medical or nonmedical allergies.
- **M** – He takes Asmol as required.
- **B** – He does suffer from occasional asthma, nil other medical issues.
- He did not hit his head or lose conscious from anything hitting him when the box came down above him; his right hand took the full impact. His wife is on her way to the hospital.

That concludes Part 1 on the conscious patient. If you follow this straightforward, systematic approach with each of your conscious patients, no matter how complicated their condition(s) might be, you will be able to provide the high level of care that patients expect from their treating paramedic.

Part 2: The unconscious patient

The approach and primary survey change for unconscious patients and remain distinct until you can find a way to reverse the cause of **unconsciousness**. If paramedics are successful in reversing the cause of unconsciousness, they would then complete a secondary survey as discussed in Part 1, following the same systematic approach all the way to hospital.

When managing the unconscious patient, first establish if the patient is in cardiac arrest and establish cardiopulmonary resuscitation (CPR) and defibrillation without delay if they are (ANZCOR 2017; ARC 2015; ERC 2015; ERC 2015). If they are not in cardiac arrest, you must find the cause of the unconsciousness and manage it.

Let us now break down the areas you will need to consider when completing a modified primary survey for the unconscious patient (Table 20.4).

This chapter follows the current contemporary approach of DRHCABDE (AHA 2015; ERC 2015, 2017; ANZCOR 2017). However, this may not be the method/approach adopted by all ambulance jurisdictions, some of whom prefer or still use DRHABCDE. It is recommended that you check with your ambulance service to identify which method/approach to use.

Reversible causes of cardiac arrest

Reversible causes of cardiac arrest can be grouped into a collection of areas, which as paramedics we have the ability to manage and treat. These reversible causes are referred to as the 5Hs and 5Ts:

- The 5Hs
  - Hypovolaemia or haemorrhage
  - Hypoxia
  - Hypothermia
  - Hypo/hyperkalaemia
  - Hydrogen ion (acidosis)
- The 5Ts
  - Tablets (drug overdose)
  - Cardiac tamponade
  - Tension pneumothorax
  - Coronary thrombosis
  - Thrombosis (pulmonary embolism)

How do you work out which one or which combination led to your patient being unconscious? The systematic approach outlined in Part 1 shows that you move from the primary survey to the secondary survey. Although your patient may still be unconscious, there are multiple ways in which you can obtain the information at each step of the secondary survey.

Table 20.4 Primary survey.

Danger	Looking for danger to yourself, partner, patient, or others around you
Response	What is your patient's response? Do they know you are even present? To assess your patient, perform the AVPU scale assessment on them: • **A** – Is your patient *Alert*? • **V** – Is your patient responding to *Verbal* stimuli/voice? • **P** – Is your patient responding to *Pressure* stimuli?* • **U** – Is your patient *Unresponsive*? * When you apply a pressure stimulus, you should only use enough force to gain a response. You are not trying to hurt your patient, you are just trying to get either a slight physical response, such as the patient pulling away, or a groaning/moaning.
Haemorrhage (when considering the cause of the patient being unconscious, is it related to significant or catastrophic trauma?)	Is it catastrophic – needing immediate attention without which your patient will die? If the answer is yes, one of you should fix the catastrophic haemorrhage cause via a tourniquet or similar equipment, whilst simultaneously your partner begins *Circulation* in the primary survey. If you don't fix a catastrophic haemorrhage or put fast measures in place to slow it down, beginning cardiopulmonary resuscitation (CPR) will only accelerate the blood loss and your patient will die more quickly. Refer to Chapter 14 on Trauma for more information about managing a catastrophic haemorrhage. If there is no sign of catastrophic haemorrhage, which would be visible to you as you walk towards your patient, then move immediately to *Circulation*.
Circulation	In the context of cardiac arrest, checking a patient's pulse has now been de-emphasised by resuscitation councils for health professionals (ANZCOR 2017; ERC 2015). Evidence has shown that even skilled and experienced clinicians take too long to establish if a pulse is present when CPR is the priority. In these situations, move quickly to CPR. Furthermore, current contemporary evidence supports that good quality basic life support (BLS) for six minutes before starting any other advanced resuscitative procedures greatly improves patient outcomes as well (AHA 2015; ERC 2015, 2017; ANZCOR 2017). In all cardiac arrest situations, apply the defibrillation pads as soon as possible and defibrillate any shockable rhythm immediately (AHA 2015; ERC 2015, 2017; ANZCOR 2017). *Do not leave heart fibrillation for lower-priority tasks*. In a situation where there is no cardiac arrest, establish the pulse characteristics and monitor for changes.
Airway	You need to check your patient's airway. Make sure it is clear with no chance or danger of airway obstruction. If the airway is not clear, do something to clear it: • **Suctioning** • Laryngoscope and Magill forceps to remove any large obstructions *(Continued)*

Table 20.4 (*Continued*)

	Implement any airway adjuncts, as indicated by your ambulance service protocols on which airway adjunct is used and when. For example: • Triple airway manoeuvre – basic airway adjunct • Oropharyngeal airway (OPA) – basic airway adjunct • Nasopharyngeal airway (NPA) – basic airway adjunct • Laryngeal mask airway (LMA) or i-Gels – advanced airway adjunct • Endotracheal tube (ETT) – advanced airway adjunct If you suspect that the patient is in cardiac arrest, simply open the airway and move to Breathing. In a situation where there is no cardiac arrest, an airway adjunct should be implemented quickly, but in a cardiac arrest situation it should be inserted after defibrillation and with no disruption to CPR.
Breathing	Check if your patient is breathing normally, and if they have adequate ventilation for their presenting condition. If your patient is not breathing adequately then you will need to assist them with medical oxygen via **intermittent positive pressure ventilation (IPPV)** using a bag-valve-mask (BVM). If the patient is not breathing normally, or not breathing at all and appears to be in cardiac arrest, start CPR right away. If the patient is in respiratory arrest but not full cardiac arrest, start ventilating the patient. Once a supraglottic airway is established, attach the BVM directly to the tube, disconnecting the standard facemask.
Disability	In a situation that is not a cardiac arrest, ask if your patient is talking and moving normally. Also look for: • Facial symmetry • Gross motor movement If your patient is obviously Alert, then you would move to *Expose/Evacuate*.
Expose	Here you need to scan the entire body area and environment in which your patient is located. You are looking for: • Has the patient been subjected to trauma? – Expose • Are the environmental conditions going to make your treatment dangerous or difficult? – Evacuate • What major/significant injuries do you see (stab wounds, obvious fractures, bullet wounds)? Such wounds need to be treated immediately as a major medical emergency. • What minor injuries so you see? Make a mental note and then treat during your secondary survey
Situational report (SITREP)	An unconscious patient is a situation in which one paramedic crew may need assistance. A SITREP is required to confirm you have an unconscious patient and that you need additional support as soon as possible.

Secondary survey in an unconscious patient

Patient history

The required history you need for the PH could be gathered from bystanders, police, friends, or family that may be present at the time of your arrival. Just how much information you will be able to obtain will depend on how much information the bystanders (police or others) can provide.

Patient vital signs

Next to your HTT examination, the VSS will be one of the most important parts of gathering information during your secondary survey. The aspects of the VSS already covered in Part 1 detail a list of vital signs, all of which can help narrow down and rule out items listed on the 5Hs and 5Ts. Examples of how your diagnostic equipment can show key clinical numbers from the 5Hs and 5Ts are:

- Low SpO_2 for hypoxia (refer to Chapter 19, Respiratory Assessment, for more information).
- ECG rhythms that show peaked T waves for hyperkalaemia, ST elevation for coronary thrombosis (refer to Chapter 15 on ECGs for more information).
- Blood glucose machine – low BGL readings for hypoglycaemia (low blood sugar) or high BGL readings for hyperglycaemia (high blood sugar; refer to Chapter 23, Medical Emergencies, for more information).

Your diagnostic equipment, when used correctly, is one of your most powerful tools. The only thing more powerful than diagnostic equipment is your communication skills.

Head to toe

The HTT examination can often lead you to the final piece of the puzzle that helps solve or finally identify what is wrong with your unconscious patient. Examples of how the HTT can help you identify a potential 5H or 5T reversible cause are:

- Needle/track marks to indicate a drug user (tablets – drug overdose).
- Bruising or significant marks around the upper chest and unequal breath sounds on chest auscultation, which could indicate a tension pneumothorax.
- A patient who feels cold to touch, whose extremities are blue, who was found outside during cold weather or pulled from the water after being in it a long time could indicate hypothermia.
- Medi-Alert bracelets may identify a specific medical condition such as an allergic reaction (medical or nonmedical), diabetes, or a metabolic disorder.

Secondary to the standard HTT approach, with an unconscious patient you may also need to check in their pockets or any bags they may have with them to help you identify:

- Who they are.
- Any allergies they might have.
- Medications they may on them that could lead to you identifying any medical conditions they might have.
- Patient information chart/document card – some patients who have multiple medical conditions carry such documents on them, just in case they are found unconscious.
- Medi-Alert bracelet identifying their condition.
- Mobile phone – some patients have an in case of emergency (ICE) app on their phone or a dedicated number with ICE assigned to it.

So even though your patient may be unconscious, other than a slight change to the way your approach your primary survey, your systematic approach remains the same throughout your management of an unconscious patient.

The benefit of adopting a systematic approach is that if you get lost during your treatment process, either because of a distraction on scene or from a sudden change in your patient's presenting condition, this need not rattle you. Go back to the beginning of your systematic approach and start again. It will not take very long for you to locate where you left off and then continue with your treatment.

Now we are going to apply this systematic approach to an unconscious patient.

Case study 4: The unconscious patient systematic approach

You are dispatched to a 28-year-old female patient at a campsite, who is unresponsive. You learn that the patient was last seen 30 minutes ago, and was found unconscious and unresponsive by her friends after they had returned from a trip to the beach.

Primary survey

- **D** – There is no danger to you or your partner. The area has good access and you are in the shade.
- **R** – When you complete your AVPU assessment, your patient is U – Unresponsive.
- **H** – There are no obvious signs of haemorrhage, so you move immediately to Circulation,=.
- **C** – Your partner immediately applied defibrillator pads, which identified that your patient had a heart rate. Checking your patient you find they have a good carotid and radial pulses, at a rate of 88 beats per minute
- **A** – Your patient does have a clear and patent airway.
- **B** – Your patient is breathing at a rate of 10 breaths per minute, with no abnormal auditable airway sounds heard (like stridor or audible wheezing).
- **D –** Your patient is unresponsive.
- **E –** There is no sign of trauma or major/minor injuries that would require you to expose your patient, and your current environmental location does not require you to evacuate your patient to another location for assessment or treatment.
- **S** – Your initial SITREP to your communications centre confirms you have an unconscious patient, unknown cause at this stage, and a request for an additional crew code 1, with a further SITREP to follow.

Secondary survey

Signs and Symptoms (identify what is wrong/reversible causes 5Hs and 5Ts)

PS – Unresponsive

- **S** – Unknown cause – which one of the 5Hs and 5Ts could it be?
- **O** – Friends left 30 minutes ago to got to the beach and found the patient like this on their return
- **C** – Unable to obtain
- **R** – Unknown at this stage
- **A** – Unknown at this stage
- **T** – 30-minute window from when friends last saw the patient
- **E** – Unknown at this stage
- **S** – Unknown at this stage
- **HPI** – Unknown with 30 minutes between when the patient was seen awake to being found unresponsive

Patient history

PH

- Medical history – One friend believes she could be a diabetic
- Allergies – Unknown
- Medications – Unknown

SC

- Friends say she doesn't smoke or take illicit drugs
- Social drinker
- Just came back from a trip to the USA last week
- Engaged

FH

- Unknown, friends don't know

Last ins and outs

- Friends state the patient hasn't eaten much all day, has been active and that the weather has been hot.
- She has drunk one 600 ml bottle of water all day

Events leading up

- 'She didn't feel like going to the beach with us, stated she felt a bit tired'

VSS

- Pulse 78 and regular
- Respiration rate 10, effort normal
- BGL 2.1 mmol/l
- Blood pressure 110/70 mmHg
- SpO_2 97% of room air
- Temperature 37.8 °C
- Skin appears pale, warm, and moist to touch
- Pupils – size 4 – PEARL
- Sounds – chest normal, breath L = R, normal work of breathing, abdo sounds faint, but present
- ECG normal sinus rhythm
- GCS 3

HTT

- Head – NAD. The patient did not hit her head or lose consciousness at any time; has complete recall of time, date, and place
- Neck – NAD
- Chest – NAD
- Upper limbs – Medi-Alert bracelet found on right wrist, Type I diabetic, no other abnormalities detected

- Abdomen – NAD
- Pelvis – NAD
- Lower limbs – NAD
- Back – NAD

That completes the systematic primary and secondary surveys for this unconscious patient. During the PS in the secondary survey, a friend mentioned this patient might be a *diabetic*. Your VSS also shows your patient has a *BGL of 2.9*, which can be a key indicator that a patient is suffering from hypoglycaemia, regardless of a history of diabetes. Your HTT confirmed your patient was a diagnosed diabetic via her *Medi-Alert bracelet* and, based on all these findings, you begin your treatment protocols for an unconscious hypoglycaemic patient. For more information relating to hypoglycaemia, refer to Chapter 23, Medical Emergencies.

Practice tip

For areas identified in the secondary survey as unknown, once the patient regains consciousness and has GCS 15, you would be able gain the remaining missing PH items.

Cardiopulmonary resuscitation

During Part 2, the primary survey approach changed to focus on an unconscious patient, the potential need for resuscitative support, and the focus on immediate BLS before any other advanced resuscitative techniques are performed (AHA 2015; ERC 2015, 2017; ANZCOR 2017). Updates and evidence in this area change quicker than textbook publishers can print, which is why there was no dedicated detail about how to perform CPR within this chapter. However, CPR is a vital skill that paramedics must master. Every ambulance service approaches these skills in its own way and each has its own clinical guidelines and procedures on how to do it. However, all of them follow the advice set out by the International Liaison Committee on Resuscitation (ILCOR). Members of this include the American Heart and Stroke Association, European Resuscitation Council, Heart and Stroke Association of Canada, Australian and New Zealand Committee on Resuscitation, Resuscitation Council of South Africa, and Resuscitation Council of Asia.

Professional development and ongoing maintenance of clinical skills

As paramedics we train and learn more skills, techniques, procedures, and drug therapy protocols than we could ever use on just one patient. Therefore it is vital that from the very beginning of your career you ensure that your own professional development and clinical skills are maintained to the highest standard.

Maintaining clinical skills can sometimes seem like a very large mountain to climb, taking all your effort to reach the summit, but it need not be that way. Spend time with your partner, mentor some new students, do blended/online learning, and practise self-directed learning whilst you're still studying to be a paramedic. Every little bit helps and ensures you stay up to date and current with your clinical skills throughout your career. If your ambulance service, area, or station is holding a clinical skills day to update or refresh your skills, go along and be part of it. Take turns being the patient and then providing patient care. You'll build lasting relationships and maintain your clinical skills at the same time.

Professional development is an excellent opportunity for you to see what the rest of the world is currently doing and potentially into the future of your workplace. It can also provide you with new opportunities or upgrades to higher paramedic clinical skill levels. Local, national, and overseas conferences also provide rich opportunities in the area of professional development.

Conclusion

A paramedic requires a systematic approach to patient care. All paramedic skills and procedures applied in this systematic way will ultimately lead to a paramedic practising a gold standard of patient care. It is extremely easy to get task fixated or become distracted when performing the very complex and life-saving skills that paramedics are required to do. However, by adopting a systematic approach with structured primary and secondary surveys; applying the necessary clinical skills, procedures, and reasoning; and drawing on high-quality communication skills, a paramedic will be able to tackle any condition a patient may present with.

Picture glossary

Patient positioning

The **lateral position** (see Figure 20.1) is sometimes referred to as the recovery position. It provides postural drainage and positioning in this way can assist the body with its own airway maintenance.

Airway adjuncts

The **pistol grip** (Figure 20.2) enables you to open up your patient's airway and look inside to see if there are any obstructions or foreign bodies in your patient's mouth.

The **triple airway manoeuvre** (Figure 20.3) is designed to obtain linear alignment of the pharyngeal axis, by which the tongue moves forward, allowing for the free passage of air. As the images describe, it is broken up into three steps which involve tilting the head (Step 1), lifting the chin (Step 2), and a jaw thrust (Step 3).

There are three **airway axes** (Figure 20.4): oral, pharyngeal, and tracheal. These are the points at which paramedics position a patient's head to allow the best position for passage of air or introduction of airway adjuncts. As you can see from Figure 20.4, additional support like towels or sheets may be needed to enable correct orientation.

Figure 20.1 Lateral position.

Figure 20.2 Pistol grip.

Figure 20.3 Triple airway manoeuvre. Source: N. Raja, Melbourne, Australia, 2014. Reproduced with permission of N. Raja.

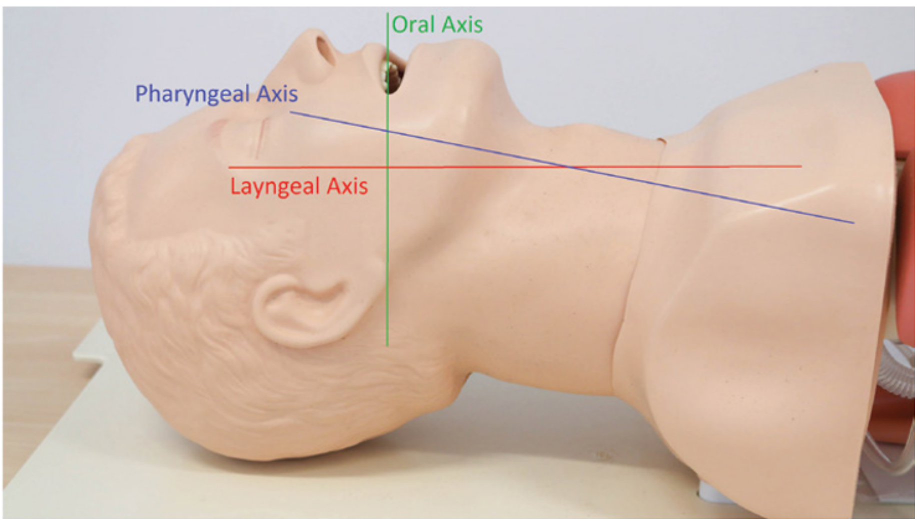

Figure 20.4 Airway axes.

The **oropharyngeal airway** (Figure 20.5) is a curved, rigid instrument used to prevent the base of the tongue from occluding the hypopharynx (Long et al. 2016).

The **nasopharyngeal airway** (Figure 20.6) is made of pliable material and is placed into the nostril, displacing the soft palate and posterior tongue. Nasal airways are helpful in patients with an intact gag reflex absent any midface trauma (Long et al. 2016).

The **bag-valve mask** (BVM) is a self-inflating insufflation bag that is coupled with a face mask and a valve to prevent re-inhalation of exhaled air (Figure 20.7). To achieve effective BVM ventilation, it requires the user to obtain a good seal and a patent airway.

Supraglottic airways (Figure 20.8) provide a more advanced and secure form of airway management. They are placed within your patient's oropharynx, allowing for oxygenation and ventilation via a BVM connected to medical oxygen, without the use of an endotracheal tube. Examples include Laryngeal Mask Airways (LMA™) and i-Gel®, a second-generation supraglottic airway.

Laryngoscopy (Figure 20.9) is used to visualise inside the oropharynx to enable the removal of foreign objects or assist in the insertion of an ETT. There are two distinct blade types: curved blades called 'Macintosh' and straight blades called 'Miller'. Blades and handles are used depending on the type of airway you need to access.

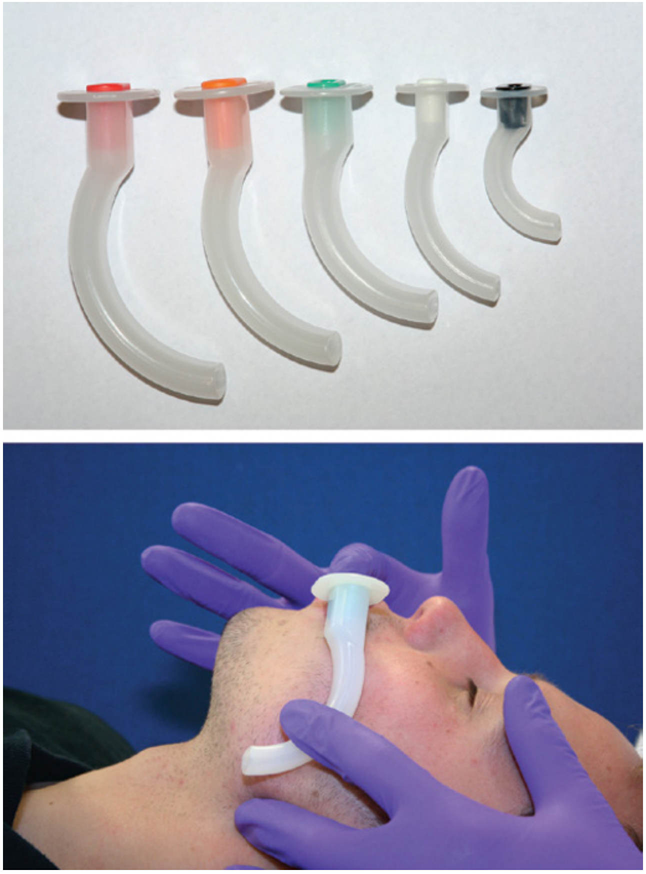

Figure 20.5 Oropharyngeal airway. Source: Gregory and Mursell (2010), p. 12. Reproduced with permission of John Wiley & Sons.

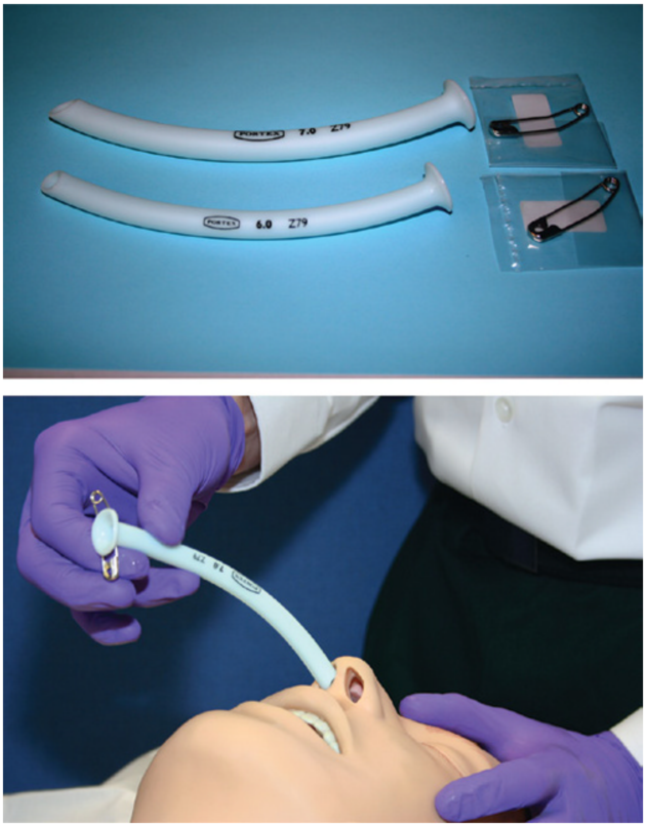

Figure 20.6 Nasopharyngeal airway. Source: Gregory and Mursell (2010), p. 8. Reproduced with permission of John Wiley & Sons.

Figure 20.7 Bag-valve mask ventilation using the EC grip.

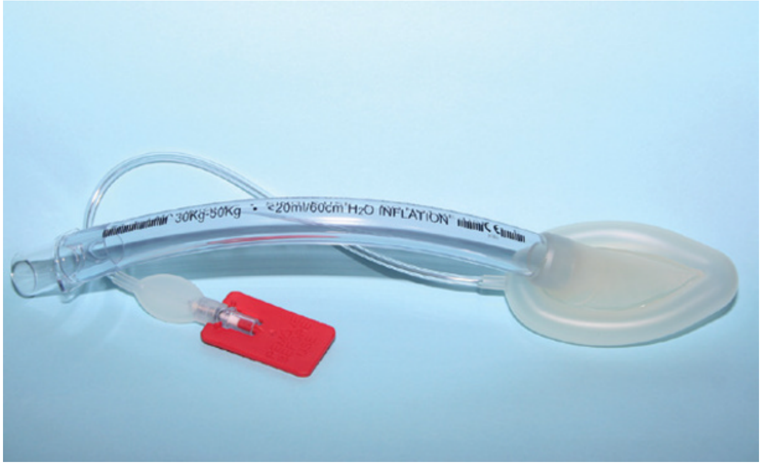

Figure 20.8 Supraglottic airways. Source: Gregory and Mursell (2010), p. 16. Reproduced with permission of John Wiley & Sons.

Figure 20.9 Laryngoscopy.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. What does the SOCRATES mnemonic stand for?
2. What does the AVPU mnemonic stand for?

Activity 20.1

Discuss with a partner your assessment of your own level of clinical skills. Which skills would most benefit from professional development and practice opportunities?

Activity 20.2

To support a calm and systematic approach, there are many acronyms and mnemonics used in paramedic assessment. Working with a partner, test each other's knowledge of some of the different acronyms and mnemonics described in this chapter.

Glossary

Accessory muscles	Muscles used when in respiratory distress, such as the shoulder girdles.
Battle's signs	Discolouration behind the ears that indicates serious trauma to the base of the skull.
Catastrophic haemorrhage	A process when someone has lost large amounts of blood or more blood than the body can reproduce to sustain life.
Cyanosis	Bluish/purplish discolouration of the skin caused by inadequate oxygenation of the blood or poor circulation.
Exacerbating	To make a bad situation/problem worse.
Glasgow coma score (GCS)	International terminology for identifying your patient's level of consciousness and assessing patients suffering a suspected traumatic brain injury. It is assessed by three criteria, with each criterion given a score to rank the severity out of 15: eye opening (scored out of 4), verbal response (scored out of 5), and motor response (scored out of 6).

Intermittent positive pressure ventilation (IPPV)	The process of providing ventilation to an apnoeic patient.
Medulla oblongata	The lowest portion of the brain, located at the top of the spinal cord.
Perfusion	The circulation of blood to the tissues and organs to provide nutrients and remove waste to meet metabolic demand at any given time.
SpO_2/pulse oximetry	A process to monitor the peripheral oxygen saturations in a patient's blood.
Stimulus	Something that causes the body to react.
Stridor	High-pitched respiratory sound caused by obstruction.
Suctioning	The process of removing foreign substances, liquid, or small solids from the patient's mouth, enabling paramedics to clear any obstructions to the patient's airway.
Systematic approach	A methodical and step-by-step approach to an activity.
Unconsciousness	A condition in which the patient does not respond to any verbal or pressure stimuli. These patients may or may not require additional cardiovascular or respiratory system support.
Vagus nerve	A cranial nerve located in the medulla oblongata, responsible for taste, movement, and swallowing.

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21

Birth and the paramedic

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Contents

Fundamentals of Paramedic Practice: A Systems Approach, Second Edition. Edited by Sam Willis and Roger Dalrymple.

Companion website: www.wileyfundamentalseries.com/paramedic

Learning outcomes

On completion of this chapter the reader will be able to:

- Recognise a range of normal pregnancy-related terms.
- Recognise a range of abnormal pregnancy-related terms.
- Recognise and respond to the physiology of birth in a prehospital setting.
- Triage pregnant/labouring clients appropriately.
- Contribute to the management of childbirth complications in a nonhospital setting.

Case study

You are called to attend a private address where there are reports of a female giving birth. When you arrive the woman is upstairs in the bedroom alone, lying on the bed. Further investigation reveals this is her first child, and that according to recent scans the foetus has developed well, is in the normal head-down position, and is engaged. You note that the contractions are approximately four minutes apart and increasing in duration. The child's head is not yet visible, but the crew decide to stay on scene and deliver the baby.

Introduction

Most of the many births occurring each and every day occur problem free and as planned. However, there are occasions when complications arise or the mother may be caught off guard, having inadequately prepared for birth or even being unaware that she is pregnant. During these circumstances an ambulance is usually called. Different women behave differently in labour, often dependent on a wide range of factors, including previous births, culture, and ability to cope with discomfort. When faced by an imminent birth (delivery), paramedics must use their existing 'triage skills' and must be able to birth the newborn. This involves identifying the stage of labour, making the mother comfortable, birthing the baby, and ensuring both mother and child are safe and well following the birth.

This chapter will provide an overview of the likely progress of a physiological (normal) birth and the care that the paramedic may need to provide. It outlines some of the complications that occasionally arise, detailing the steps the paramedic should take in such circumstances.

Physiological birth

The normal birth process involves the expulsion of the term foetus (between 37 and 42 weeks' gestation) out of the **uterus** via its exit (the **cervix**), through the vagina and into the arms of the labouring woman. This process of labour in the first-time mother (nulliparous) typically takes over 24 hours of regular **contractions**. If labour occurs prior to 37 completed weeks' gestation then the foetus is premature, smaller, and may be born more quickly.

Sometimes paramedics are the first responders to a labouring woman who has progressed faster than anticipated. These labours are likely to progress smoothly, apart from the potential worry caused by a different birth location than had been planned for. Increasing numbers of women choose to give birth outside the disease centre/hospital setting. Your role in such circumstances is to maintain a safe environment and support and encourage the mother to calmly give birth to her infant. Communicate with ambulance control and the receiving delivery suite and remember to note significant events. Paramedics may also attend a home birth following a request from the midwife, who may sometimes need assistance with moving or transporting the mother, or providing peripheral cannulation for intravenous medications.

Birth phases

No two births are the same and every person responds slightly different to childbirth. Knowing the phases or stages of birth can help with understanding what is likely to occur. The process of childbirth comprises two distinct phases, known as latent and active.

Latent phase

The latent phase is the period of irregular contractions, which build in intensity and prepare the cervix to dilate and permit the passage of the foetus out of the uterus. In pregnancy the cervix is two centimetres long, tubular, firm, and muscly, sitting at the back of the vagina. The cervix holds the pregnancy safe inside the uterus and prevents infection ascending to the growing foetus. As labour begins, the irregular contractions (tightening of the uterine muscles) shorten the cervix, pull it to the front of the vagina, and press the head of the foetus down onto the cervix. This pressure causes stronger contractions under the control of hormones such as **oxytocin**. For labour to progress effectively, the woman must be relaxed and feel safe and supported (Walsh 2012). Eventually contractions will completely thin out the cervix, a process called **effacement**, and begin to dilate it, completing the latent phase of labour (Figure 21.1). The cervix will be pulled over the head of the foetus by contractions (like pulling a polo-neck jumper on).

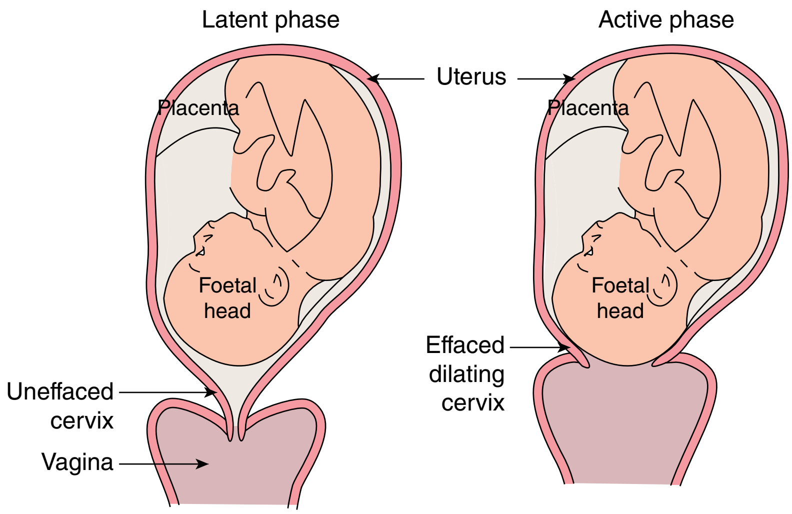

Figure 21.1 Effacement of cervix.

It is common for a first-time mother to be in latent labour for 12–24 hours, during which time she will experience irregular contractions (sometimes two in 10 minutes, sometimes none for an hour or so; Henderson and Macdonald 2004). She should remain mobile, resting when necessary, and is likely to be advised to stay at home where she can be more relaxed. She may be advised to soak in a warm bath and/or take some paracetamol. She may experience a **show** or waters passing vaginally during this phase of labour, but they may not occur until the birth happens. If her waters break (discharge of amniotic fluid in which the foetus floats, contained by membranes), she should be seen by her midwife, who will need to know what colour the waters are – if they are stained green it could indicate that the foetus is/has been distressed. Similarly, any vaginal bleeding needs checking by a midwife or obstetrician. The midwife will let the woman or her partner know the urgency of any situation and whether an ambulance should be called. Women are requested to plan their own transport to hospital, as birth is rarely an emergency situation. Women who have given birth before (multiparous) are likely to have much faster latent phases of labour, and some are unaware of this part of the process (Henderson and Macdonald 2004). It is usually safe to transfer a client in latent labour to hospital, as birth is not imminent.

Active phase

Once the cervix is thinned out and beginning to dilate, oxytocin is likely to be causing contractions very regularly and of increasing strength and duration. It is common for women to experience contractions three times in 10 minutes, and at their peak these will last up to a minute. The woman needs calm reassurance and encouragement not to hold her breath during contractions, despite the strength of the sensation. Entonox may be useful to help her focus on her breathing, providing an 'activity' and some analgesic effect. Regular contractions are powerful muscular activity of the uterus as it pushes the foetus onto the dilating cervix. Most women will prefer an upright or left-lateral position and should not be laid supine (in pregnancy or birth), as this may interrupt the blood flow to and from the **placenta**. Limit verbal communication to the gaps between contractions, the force of which may render the woman unable to answer questions. The first-time mother is likely to experience 8–12 hours of regular strong contractions during the active phase of labour, whilst a multiparous woman may be ready to push after two or three hours. Women may experience a show or waters coming away vaginally during the active phase. If contractions can be palpated at the top of the uterus and are 'regular as clockwork', then the mother is likely to be in the active phase. As the uterus contracts, the muscles become taut and hard, which can usually be felt (gain consent prior to undertaking palpation).

Practice insight

Giving birth can be a stressful event for both the mother and other family members on scene. Remember to provide reassurance to others who are in direct contact with the mother and help them to stay calm in order to reduce the stress to the mother.

Historically the active phase of labour is split into three stages (Table 21.1) – this helps us theorise the process, but for the woman it is a continuous stream of labour (Downe 2008). The change between the first and second stages is usually noticeable from the mother's behaviour. During the regular contractions of the active phase, the woman is focused on breathing and letting the contraction peak and then ebb away. Once the contractions have pulled almost all the cervix over the descending foetal head, the behaviour of the woman is likely to change – she may become unsure of her ability to continue as the contractions reach their peak. It may be at this point that she will vow never to become pregnant again, or berate her partner – keep her focused on breathing, and again, Entonox may be valuable.

It is usually safe to transfer a client in active labour to hospital, as birth is not imminent, but if the client has urges to push or there are external signs of birth (see next section), then transfer is likely to be inadvisable.

Table 21.1 Stages of labour.

Stage of labour	Signs and physiology
First (includes latent and active phases)	Ripening, effacement, and dilation of cervix; descent and flexion of foetal presenting part (usually head); regular palpable contractions
Second	Full dilation of cervix to birth of infant; expulsive contractions
Third	Birth of placenta and membranes; control of bleeding.

Preparing for the birth

Once the cervix is fully dilated, the woman's behaviour is likely to change again. She will begin to bear down at the peak of the contraction, making a guttural sound as she exhales and pushes for two or three seconds. She does not need to be told to push – she cannot stop herself as the descending foetal head pushes the back wall of the vagina against the bowel. She will feel as if she needs to have her bowels open and this is a sign of imminent birth (second stage of labour).

Practice insight

Where resources permit, when you suspect that you may be delivering a child at home, always take two maternity packs into the address with you. You never know when you might require the additional resources.

Once the woman starts pushing, external signs of birth are likely to be apparent, which may include:

- Crowning foetal head causing bulging **perineum**.
- Gaping anus as the foetal head descends lower.
- Grunting, guttural straining (sounds from the throat) as she pushes.

In the first-time mother it may take up to an hour of pushing before these external signs are apparent, but a multiparous mother may push her foetus out in only a handful of pushes. Keep visual contact with the vagina and be vigilant for the top of the foetal head. Prepare for the arrival of the infant by warming the environment, collecting two dry towels or similar, and making sure the woman is in a safe place. Locate your neonatal resuscitation bag and mask as a precaution, and put gloves on.

The foetal scalp becomes **ruched** as it passes through the vagina, so it may appear ridged and blue in colour as it appears, but hair should be clearly visible. As the woman pushes, the foetus will advance gradually, but between contractions is likely to retreat back into the vagina ('two steps forward, one step back') – this protects the woman's tissues and also allows re-oxygenation of the foetus between contractions. Reassure the woman that this is normal. However, as she continues to push, more and more of the foetal head will show until it no longer retreats between contractions. At this point, the perineum, vagina, and anus will be stretched considerably and this is distressing for the woman – let her know the likely course of events and that the stretching is normal; it will increase as the head of the foetus is born (crowning), and may turn to burning sensations. Any bowel contents 'in the way' of the foetal head will be expelled and should be removed to keep a clean area for the birth. Usually by now the membranes will have ruptured, but rarely they may present at this point at the maternal vagina as a cream-coloured, fluid-filled balloon. Tear the membranes with fingers, or carefully puncture with an instrument, and note the time and the colour of the water coming away.

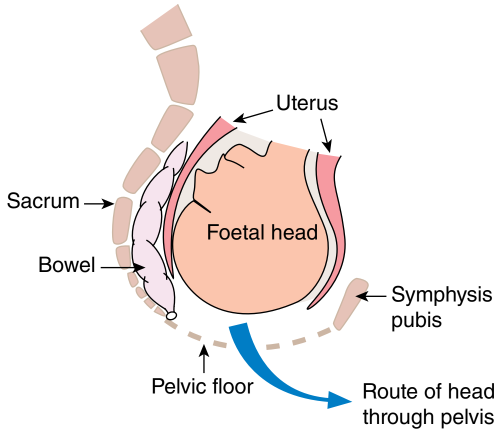

Figure 21.2 Curve of carus.

Encourage and reassure the mother and motivate the father to be part of this important, life-defining moment. Attendant fathers/partners can be involved by timekeeping and note taking during the delivery.

Help the mother get comfortable by choosing a position that is acceptable to her, and one where you can see the vagina and advancement of the foetus. In order for the foetal head to exit the pelvis, it must negotiate the curved pathway through it (curve of Carus, Figure 21.2) caused by the natural inclination of the pelvis (this contributes to the 'two steps forward, one step back' progression of the foetus).

Remember this curved route as the foetus is born – put a hand on either side of the foetal head and feel it turn in order to negotiate the shoulders through the widest diameter of the pelvis. This may take one or two contractions once the head is born. As the shoulders emerge, gently pull the foetus in a laterally pivoting motion around the **symphysis pubis** and towards the maternal abdomen. If the umbilical cord is wrapped around the foetal neck two or more times, pull one loop at a time over the foetal head to ease the birth of the rest of the foetus. Umbilical cords are:

- Semi-opaque
- Pale straw coloured
- Rubbery
- About two centimetres in diameter

Blood vessels may be visible within the cord. At least 90% of women will sustain some kind of tear or graze to the vagina or perineum during birth (Royal College of Obstetricians 2014). This number is significantly higher in first-time mothers, and is estimated to be around 95%; the midwife will assess and treat either in the woman's home or in hospital. Minimise tearing by aiming for a slow, controlled birth of the foetal head.

Paramedic intervention following normal childbirth

1. Once the baby has been born, use a dry towel to rub and stimulate it all over and then promptly place the naked infant on the mother's naked chest.
2. Cover them both with another dry towel. This skin-to-skin contact keeps the infant at body temperature and reassures woman and child (UNICEF 2012).

3. Observe the infant for signs of the onset of respiration and try to note both the time of birth and the time of the first breath.
4. Undertake an APGAR score to determine the health of the newborn (see Practice Insight).
5. Monitor vaginal blood loss, which is typically 200–300 ml – sit the mother (with infant skin to skin) onto a clean incontinence pad so that you can see how much blood has been lost since the birth.
6. Leave the umbilical cord intact and await signs of placental separation and delivery (third stage of labour). The normal foetus may take up to three minutes to take its first breath. Stimulation by towelling the foetus dry will usually cause it to gasp, as will the colder temperature it is now experiencing.
7. It may be necessary to blow into the face of the infant to promote the sensation of a colder temperature. Flicking the soles of the infant's feet will also stimulate it. Never shake a baby. If there are concerns about the onset of respiration, then begin neonatal resuscitation procedure.
8. Continue to provide pain relief as necessary and undertake a set of baseline observations.

Practice insight

APGAR is a quick assessment undertaken at one- and five-minute intervals following birth. APGAR stands for Appearance, Pulse, Grimace, Activity (muscle tone), Respirations. Add an APGAR cheat sheet to your current clinical guidelines to help you remember the scoring and make a note of the outcomes.

It is hoped that by now midwifery support will be in attendance – keep monitoring vaginal blood loss and listen for cues from the mother that the placenta has separated from its site inside the uterus. When it does this, the cord lengthens at the vagina, there is a fresh trickle of blood vaginally, and the woman may report pressure in the vagina, or the need to push again. Find a receiver for the placenta, sit the woman more upright, and encourage her to push once more. The placenta will appear bluish, veiny, and shiny, covered in tough membrane and with the cord attached to it – if it is visible at the vagina, the midwife will gently pull the cord to expedite delivery. Retain the placenta and membranes for midwifery inspection, either at the woman's home or once you have transferred to hospital. If transportation to hospital is required, encourage the continuation of skin-to-skin contact between newborn and mother. Should the woman be unable to provide this contact, then fathers or partners should be recruited to warm the naked infant next to their naked chests (with blanket, towel, or jacket over both).

Birth complications

Most births will run smoothly; however, there are occasions when things go wrong. Complications of childbirth include shoulder dystocia, breech birth, postpartum haemorrhage, transverse shoulder presentation, and cord prolapse. It is important that the paramedic knows how to manage these cases.

Shoulder dystocia

This is a rare complication of the second stage of labour whereby one of the foetal shoulders gets jammed behind the maternal symphysis pubis (Figure 21.3) or against the **sacral promontory**. It can only be diagnosed following the birth of the foetal head and whilst waiting for the birth of the foetal shoulders. Once the foetal head is born, encourage the woman to push for the next two contractions to see if she is able to turn the foetus so that its shoulders are manoeuvred into the widest diameter of the maternal pelvis and the birth progresses.

Usually when the head is born it is possible see the foetal neck clearly and there is 'space' between the foetal chin and the maternal perineum, because the shoulders have progressed below the symphysis pubis and are now in the cavity of the pelvis. However, in the case of a shoulder dystocia, because the foetus is being held back

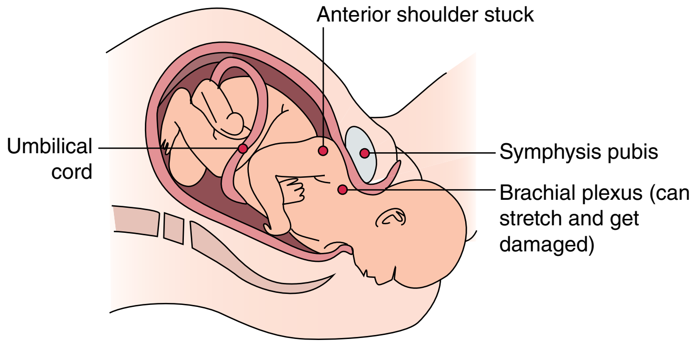

Figure 21.3 Shoulder dystocia.

by the maternal symphysis pubis, the head only just squeezes out of the vagina and the foetal chin will be tightly drawn up against the maternal perineum. Encourage the woman to push for the next two contractions, but if after this the foetus does not advance and reveal the neck, or ease away from the perineum, then shoulder dystocia should be suspected and managed. Do not pull on or twist the foetal head at this point. The neck is already extended due to the shoulders being stuck, and further traction can cause significant damage. Note the time that you decide that shoulder dystocia has occurred and communicate this to colleagues at ambulance despatch or the delivery suite. *This is a time-critical complication*.

Communicate calmly with the woman and her partner – let them know their cooperation is needed to resolve this delay in the birth of the infant, and if possible be sure to have the neonatal resuscitation equipment to hand (bag-valve-mask, flat surface, warm towels or similar). Explain to the mother that she will need to push on instruction, and not to wait for contractions to generate pushing urges. Avoid describing the foetus as 'stuck' as this may panic the woman; rather, describe the foetus as in need of assistance to move through the pelvis.

The resolution of dystocia by moving the foetal shoulders past the maternal symphysis pubis is best achieved by changing the woman's position. In the majority of cases of shoulder dystocia the anterior foetal shoulder is wedged behind the maternal symphysis pubis and a series of manoeuvres need to be executed to resolve it (Henderson and Macdonald 2004). The paramedic in attendance may try the following four manoeuvres:

1. The first manoeuvre involves placing the woman supine and requires two people/paramedics/attendants. Each person helps the woman bring her bent legs towards her abdomen to achieve a 'knees to ears position' without too much abduction. This is known as McRoberts' position (Figure 21.4). When this position has been achieved, the woman should be encouraged *not* to push, whilst gentle traction is applied to the foetal head in a downward direction (towards the floor, as this is more likely to squeeze the shoulder under the symphysis pubis). Attempt to deliver the foetus for up to 30 seconds. Move on to the next manoeuvre if you see no progress of shoulders/the foetal neck (Royal College Obstetricians and Gynaecologists 2012).
2. The second manoeuvre involves maintenance of McRoberts' position, whilst trying to push the stuck shoulder round in the pelvis. Establish the location of the foetal back – usually done by passing one or two fingers down the back of the foetal head and into the vagina (with consent) to confirm which side the foetus is lying on. Pressure should now be applied supra-pubically by one attendant, with the intention of rotating the foetal shoulders out of the vertical axis into an oblique axis. The foetal shoulders are wedged antero-posteriorly (i.e. at 6 o'clock if you imagine a clock face) – you are trying to push the shoulders to 7 o'clock to disimpact the anterior shoulder. This is usually done with the heel of the interlaced hands (similar to the technique used for cardiac massage during adult cardiopulmonary resuscitation) on the maternal abdomen just above the symphysis pubis and involves constant pressure. The second helper applies traction to the foetal head in a downward direction. The woman should not push. Attempt this for up to 30 seconds before moving on to the next manoeuvre (Royal College Obstetricians and Gynaecologists 2012).

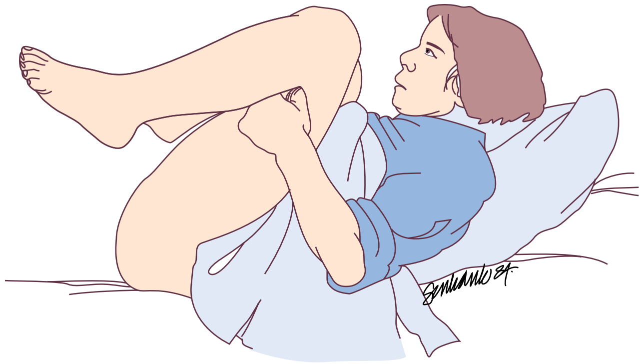

Figure 21.4 McRoberts' position.

3. The third manoeuvre is a continuation of the second, but now the attendant who is applying supra-pubic pressure changes from continuous pressure to rocking pressure, trying to move the foetal shoulders from the stuck antero-posterior position/diameter of the pelvis into an oblique and larger diameter of the pelvis. Whilst the first attendant applies this rocking pressure abdominally and supra-pubically, the other attendant applies downward traction on the foetal head. The woman should not push. Keep trying this manoeuvre for up to 30 seconds (Royal College Obstetricians and Gynaecologists 2012).
4. If no signs of advancement of the foetus are apparent, the fourth manoeuvre is to request that the woman moves onto an all-fours position. It is hoped that this will recruit gravity and cause the foetus to drop towards the maternal abdomen. With maternal consent it may now be possible to grasp the posterior arm (the foetal arm nearest the maternal back) from within the vagina, bend it at the elbow, and pull it out. This will then release the anterior shoulder and the foetal body will follow. This should be attempted for up to 30 seconds. If unsuccessful, re-run the sequence of four manoeuvres from the beginning. You may be in a situation where this fourth manoeuvre seems to be the most practical one to try first – possibly there is nowhere to lie the woman flat, or she is unable to assume a supine position (Gaskin 2003).

Once the infant is born it is likely to require resuscitation, as it may well have been deprived of oxygen during the dystocia. Note the time of birth and of any resuscitation interventions.

Breech birth

In some births the foetus assumes a head-up position with the bottom, folded legs, or knees presenting upon the cervix. This is known as a breech presentation, of which there are several types, but all mean that instead of the head being the first foetal part to be born, it becomes the last. Most women with a known breech presentation will be having a planned birth in hospital, but occasionally a breech foetus is not discovered until the birth. The paramedic may be called by an attending midwife, or it may be that the paramedic is the first responder to a birth that is progressing rapidly at home.

Labour will progress in the same way as normal and it will only be when the woman is pushing that it becomes apparent that it is a bottom or legs that are being born first. Imminent breech birth may be heralded by the passage of **meconium** from the woman's vagina as the foetus is being squeezed through the pelvis. This will appear like 'black toothpaste' being squeezed from a toothpaste tube. If you suspect breech birth is imminent, this should be communicated to control or the local delivery suite. If you can see the foetal bottom or legs, then it is probably too late to transfer the woman to hospital and preparations should be made for imminent birth.

Where the paramedic detects a breech presentation and it is too late or not possible to transfer to an obstetric unit, ensure that the midwife is on their way, keep the woman in an upright position (sitting forward on the edge of chair/bed), and do not touch the baby as it is born. Prepare for neonatal resuscitation and remember to reassure/encourage the woman as she pushes when her body tells her to.

Postpartum haemorrhage

This is a complication that can affect normal or breech birth and is usually due to brisk bleeding from a uterus that has lost muscular tone following the birth of the infant, and whilst waiting for, during, or after the birth of the placenta. Because of the size of the placenta (about 20 cm diameter) and the way it attaches to the inside of the uterus wall, when it detaches in the third stage it leaves a large open wound on the inside of the uterus. Thus a postpartum haemorrhage can be very heavy and rapidly lead to hypovolemic shock.

As the prime reason is a loss of uterine tone, the immediate response is to stimulate the uterus by rubbing the top (fundus) of it through the maternal abdomen (with consent) (Henderson and Macdonald 2004). The fundus is likely to be at a point midway between the maternal navel and the bottom of the rib cage, depending upon whether the placenta has separated or not. If the placenta has not separated, then the fundus will be higher and feel wide and soft. If the placenta has separated the fundus is likely to be hard, muscular, at the level of the maternal navel, and about as big as an orange. As the fundus is rubbed through the maternal abdomen in a firm and circular motion, it is hoped that you will feel the muscle of the uterus contract and become hard, and that the bleeding will slow. This massage of the uterus should take priority, and if possible a colleague should cannulate the woman with a wide-bore cannula, monitor her for signs of hypovolemia (rising pulse, falling blood pressure, clamminess, and confusion), and if necessary provide intravenous fluids to support the circulating volume. Follow local guidelines with regard to administering 1 ml Syntometrine. This should be done intramuscularly at the same time as massaging the uterus (note the time it is given). Arrange urgent transfer, whilst being vigilant over uterine muscle tone; retain all blood-soaked pads and towels to enable estimation of blood loss, and the placenta if delivered; and bring the infant with the mother.

Transverse/shoulder presentation

Very rarely, a foetus lies sideways in the uterus. If this is the case at a rapidly progressing labour to which the paramedic is called, the most likely sign is a foetal hand or arm presenting at the maternal vagina. Immediately inform control or the delivery suite and transfer urgently. Vaginal birth is usually impossible and therefore the woman needs to be taken to a unit with caesarean section facilities. Reassure the woman that everything possible is being done; transfer her in a left lateral position and provide Entonox. Keep the presenting foetal part warm with a blanket over the woman and encourage her to breathe the Entonox rather than push. She will need to be reminded not to push with each contraction, as the urges are overwhelming. If possible, cannulate the woman with a wide-bore cannula (16 gauge/grey) in anticipation of her surgery.

Cord prolapse

This is another very rare complication of birth whereby a loop of umbilical cord slips past the foetal head or bottom, through the dilating maternal cervix and out of the vagina (Figure 21.5). This is more likely in premature or breech birth, but is still very rare. The woman is likely to be in the latent or active phases of labour but not yet pushing, and she may report an unrecognised object protruding vaginally. With maternal consent, inspect the vagina and if umbilical cord is recognised the woman needs urgent transfer to a delivery suite.

From this point, the aim is to stop the uterine contractions from squashing the cord against the maternal cervix, which will cut off the oxygen supply to the foetus. This is best achieved via an exaggerated recovery position with a pillow under the lower hip and a head-down tilt or the knee-to-chest position ('call to prayer' or bottom-in-the-air position, which may pose safety issues in the ambulance). Whilst transferring, keep the cord warm and moist with damp towels or similar, but avoid 'fiddling' with the cord as stimulation can cause it to stop working and foetal demise will soon follow. During the transfer consider facial oxygen for the woman at 4 l per minute, as this may improve oxygenation of the foetus (Henderson and Macdonald 2004).

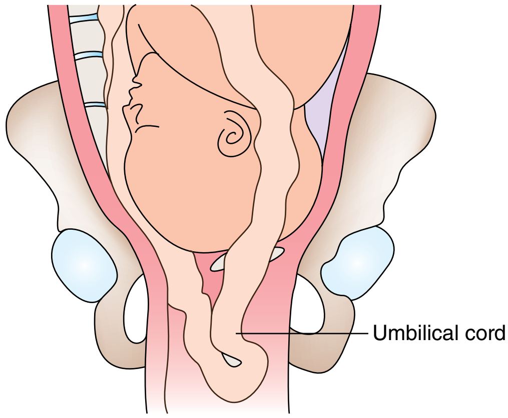

Figure 21.5 Umbilical cord prolapse.

Conclusion

Childbirth is a reason for celebration for most parents and is a naturally occurring event. In the majority of occasions, childbirth occurs problem free. This chapter has outlined the progress of normal labours and births, and the cues that the paramedic can use to decide if transfer is advisable and what to do if birth is imminent. An overview has also been provided of some of the complications that the paramedic might encounter, with practical suggestions for their management.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. What is a normal gestation period?
2. How many phases of childbirth are there and what are they?
3. How many stages of active labour are there?
4. List five complications of childbirth.

Activity 21.1

1. In pregnancy, how is the cervix structured?
2. What is the latent phase of childbirth?
3. At what point is the latent phase of labour complete?
4. How long can the latent phase last for?
5. What actions should the mother take during this period?

Activity 21.2

1. Define the term shoulder dystocia.
2. At what point will it become evident that a breech birth is present?

Activity 21.3

What causes postpartum haemorrhage?

Activity 21.4

What is the aim of the paramedic when presented with cord prolapse?

Glossary

Cervix:	The tubular exit from the uterus, continuous with the vagina.
Contraction:	The action of the uterine muscles that open the cervix and push the foetus out of the vagina.
Effacement:	Thinning out and shortening of the cervix caused by contractions.
Meconium:	Foetal bowel contents.
Oxytocin:	One of the hormones that promotes labour.
Perineum:	The area between anus and vagina.
Placenta:	The structure that embeds in the inner wall of the uterus in early pregnancy and transfers oxygen and nutrients from woman to foetus.
Ruched:	Visible pleating/folding of tissue.
Sacral promontory:	The bulge of sacral vertebrae into the space of the pelvis.
Show:	Loss of the blood-stained mucus plug that seals the cervix during pregnancy.
Symphysis pubis:	Front bones of the pelvis palpable at the bikini line.
Uterus:	The womb, in which the foetus develops before birth.

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22

Paediatrics

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Contents

Fundamentals of Paramedic Practice: A Systems Approach, Second Edition. Edited by Sam Willis and Roger Dalrymple.

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Learning outcomes

On completion of this chapter the reader will be able to:

- Identify differences between paediatric and adult anatomy and physiology.
- Recognise differences in vital signs across paediatric age groups.
- Identify a systematic approach to 'hands-off' assessment using the paediatric assessment triangle.
- Identify a systematic approach to a 'hands-on' management approach.
- Discuss the management of paediatric emergencies.

Case study

You are part of a two-person paramedic crew who has been dispatched to the local primary school where you are advised there is an unwell 5-year-old. On arrival, an administration officer from the office guides you to the sick bay where the child is lying prone on a bed. A rapid assessment reveals the child has been feeling unwell since yesterday and is currently febrile with a developing rash across his abdomen. You gently recommend the child is transported to hospital with the ambulance.

Introduction

The Australian Institute of Health and Welfare reported that between 2016 and 2017 just over 1.9 million people were transported by ambulance in Australia, during which time there were just over 900 000 paediatric presentations to emergency departments. In the UK it is reported that children account for up to 13% of all ambulance service transports to hospital (Breon et al. 2011). The likelihood of serious illness or injury is quite high when a parent calls for an ambulance, and preparedness for paediatric prehospital care is a fundamental aspect of paramedic practice. Indeed, a comparison of presenting complaints to UK emergency departments over the past 10 years by Sands et al. (2012) shows that 83% of medical admissions of paediatrics can be related to six presenting complaints: breathing difficulties, feverish illness, diarrhoea and/or vomiting, abdominal pain, seizure, and rash. Similarly, a recent study of paediatric aeromedical retrievals from remote areas of Northern Australia showed that the five most common presentations were respiratory illness (82%), trauma (11%), gastroenteritis (10%), cellulitis (9%), and infection (8%) (Barker and Ross 2014).

Following a brief summary of paediatric anatomy and physiology, this chapter will outline some of the most prevalent paediatric scenarios the paramedic is likely to encounter, including the unconscious child and cardiorespiratory arrest.

Paediatric anatomy and physiology

Due to marked anatomical and physiological differences in children, their assessment must be modified in comparison to adults. Children are constantly developing and evolving and it is important for assessment purposes to distinguish key stages in paediatric development:

- Neonate – first 28 days of life
- Infant – up to 12 months of age

- Toddler – 1–3 years
- Preschooler – 3–5 years
- Older child – 6–12 years
- Adolescent – 13–18 years (Sanders 2012)

The assessment of a paediatric patient requires an advanced understanding of key physiological changes as well as the common development milestones. This information in conjunction with sound clinical knowledge is paramount in paediatric assessment and selecting appropriate interventions. Some common differences in paediatrics include:

- Larger head with a shorter neck; this can lead to hyperflexion of the neck.
- Proportionately larger tongue, which can occlude an airway.
- Infants are often nasal breathers in the beginning and the nasal airways have a higher risk of becoming blocked with mucus secretions due to narrowness.
- Reduced alveoli sacks, which increase in number over the first eight years of life.
- Narrow airways (trachea, bronchi, and bronchioles), the nature of which increases the likelihood of airway obstruction.
- An epiglottis that is long, stiff, and flops posteriorly (Sanders 2012).

Paediatric vital signs

As discussed, the physiological differences in children of different ages will have an impact on their vital signs. It is imperative that a clinician possesses an understanding of the vital sign values that are considered normal, as shown in Tables 22.1 and 22.2. In particular:

- Infants breathe mainly with their diaphragm; the ribcage lies horizontally to the chest and has less impact on chest expansion. This can limit the ability to take a deeper breath as an adult would when required; to compensate, the respiratory rate is therefore increased.
- Increased respiratory rates lead to muscle fatigue.
- The chest wall is very compliant so any injury, with or without rib fractures, can result in serious lung tissue (parenchymal) damage.
- The respiratory rates in an infant are higher, due to an increased metabolic rate and oxygen consumption.
- A blockage of the airways or decrease in lung function will lead to sternal and intercostal recession due to flexibility of the patient's chest wall.

Table 22.1 Respiratory rates.

Age (years)	Respiratory rate at rest (breaths/minute)
Neonate	40–60
<1	30–40
1–3	25–35
3–5	20–25
6–12	15–25
>12	15–20

Source: Adapted from Sanders (2012).

Table 22.2 Pulse rates.

Age (years)	Normal pulse (beats/minute)
Neonate	120–160
<1	80–140
1–3	80–120
3–5	70–115
6–12	70–115
>12	70–90

Source: Adapted from Sanders (2012).

The paediatric cardiac system is distinctly different from that of an adult, in that the normal heart rate is higher and the blood pressure is lower. The myocardium is less contractile, which reduces the ventricles' ability to generate tension and this has a direct impact on stroke volume. This means that cardiac output is rate dependent. As age increases in the child, the heart rate decreases as the ventricles become more compliant and able to generate tension during contraction. Furthermore, paramedics need to be aware that a paediatric body has a reduced amount of circulating fluid due to size. Any loss of blood in a paediatric patient can be critical and requires urgent preventative management.

Paediatric examination

Paediatric assessment is often made challenging by a child's heightened anxiety, differing levels of communicative ability, the presence of concerned or volatile parents, and the potential speed of patient deterioration (Porter et al. 2005).

When dealing with a sick child, it is imperative to apply the key observation ranges of heart rate, respiratory rate, oxygen saturation, and core capillary refill time. An understanding of these key observations can help to distinguish between major or minor illness.

Child behaviour can be an important index of the seriousness of a condition. Sometimes, a child who has been listless and refusing food can appear happy, smiling, and playing with toys on the arrival of the paramedic. Whilst frustrating for the parents, who have called for assistance, this 'up and down' pattern is common and is a positive sign that the child is not seriously ill. By contrast, where a child presents as listless without any 'up' moments, this is a more serious sign, where further investigation in hospital will be required.

Practice insight

Use a toy or other distracting method in order to calm a child. Where possible, make sure that the parents are involved when caring for the child.

Patient assessment triangle

A 'doorway diagnosis' tool has been developed to allow the paramedic to be able to spot a sick child simply by looking at them. The patient assessment triangle (PAT) gives an impression of the patient's overall health from a distance, which will lead to a quick determination of whether the patient is sick or not sick (Caroline 2013). There are three elements to the PAT: appearance, effort of breathing, and circulation.

Table 22.3 Prodromal symptoms of meningitis.

Severe irritability
Reduced levels of consciousness (LoC)
Fever
Neck stiffness
Photophobia
Rash
In infants can include poor feeding, vomiting, and diarrhoea

Appearance

The 'appearance' arm of the triangle is age dependent and indicates the adequacy of respiratory oxygenation, brain perfusion, body homeostasis, and central nervous system function. The important features and characteristics of appearance are assessed using the TICLS mnemonic (Table 22.3).

A poor, abnormal appearance is a reliable indicator of a seriously ill child. The physiological causes of these changes may be:

- Respiratory – poor oxygenation and/or ventilation
- Cardiovascular – poor brain perfusion
- Systemic or metabolic – poisoning, hypoglycaemia, brain injury.

The remaining two dimensions of the PAT will help the clinician identify the underlying cause of illness.

Effort of breathing

A good effort of breathing is a positive clinical indicator of the patient's respiratory status; it will highlight the effort required by the child to maintain oxygen perfusion and ventilation (Horeczko and Gausche-Hill 2011). Increased respiratory effort is shown by a higher rate, audible respiratory noises, abnormal positioning, flaring of nostrils, and accessory muscle use. Increased effort of breathing alongside poor appearance leads the paramedic to conclude the illness is of respiratory origin.

Circulation

A quick circulatory assessment is used to determine the child's cardiac output and the perfusion of blood throughout the body. The body responds to a reduction in cardiac output by moving the oxygenated blood away from the peripheries to the core organs. The main focus points of the rapid circulation examination are colour and colour pattern of the skin and mucus membranes, i.e. abnormalities like cyanosis and mottling, which reflect a poor or reduced cardiac output. Poor appearance with the addition of reduced cardiac output leads to a conclusion of an illness of cardiovascular origin.

Application of the patient assessment triangle

A paramedic's general clinical impression can be acquired from a rapid assessment using the PAT. It quickly answers the questions: 'Is this child sick or not sick?' 'Stable or unstable?' There are six main clinical impressions that the PAT can establish (Table 22.4).

In all these scenarios, communication with a child patient should be *simple*, involving easily understood language without abbreviations or acronyms. For successful communication with children, several environmental factors should

Table 22.4 Signs of respiratory distress.

Sign	Description
Tachypnoea	The medical term for fast breathing. It is important that the paramedic can identify abnormal breathing rates and patterns. Table 22.1 shows normal respiratory rates in children. Paramedics also need to take note of very slow respiratory rates, as this could indicate imminent respiratory arrest or opiate poisoning.
Intercostal and sternal recession	A movement involving drawing in the intercostal and abdominal muscles during respiration, which is more pronounced in young children. With infants you may not see any accessory muscles, but you may notice a bobbing of the head. With this in mind, assessing any child with respiratory difficulties should include removing the child's upper clothing for inspection.
Cyanosis	Presentation of an abnormal blue skin and mucosal membrane tone. It is a sign of increased levels of deoxygenated haemoglobin saturation. Cyanosis can be seen in the tongue and lips due to cardiac and respiratory disorders. Peripheral cyanosis can be seen with a localised decrease in circulation to the peripheries.
Nasal flaring	Extension of the nasal openings.
Tripodding	Positioning with the patient sitting upright, leaning forward to rest on their knees or clasp their feet. This position is seen to optimise the physical structure of the lungs and accessory muscles, allowing the child to breathe with more efficiency.

be considered, and creating a calm and relaxed atmosphere is a key factor. For instance, if a child suffering an acute asthma attack is kept calm, they will be less likely to become tired and require intensive care once at the hospital. Providing a range of the child's toys during examination will help the practitioner engage with the child and ensure confidence. Be sure to include the family in the child's care wherever possible, as this will further reduce anxiety.

Paediatric emergencies

The unconscious child

Whilst there are many causes of unconsciousness, there are a few specific causes solely related to paediatrics. As a paramedic you need to be able to identify the cause and manage appropriately. This section provides some examples of what paramedics might expect to find in an unconscious child.

Head injury

Look for any obvious signs of trauma, such as skull fractures, lacerations, haematomas, and haemorrhage. A history of a fall, assault, or road traffic collision should indicate a possible head injury. Consider nonaccidental injury, such as physical abuse, as a cause and manage accordingly.

Febrile convulsions

Febrile convulsions are the most common childhood seizure and are caused by a fever, usually greater than 39 °C. Status epilepticus occurs in less than 5% of febrile convulsions (Patel 2015, p. 30) and there is a rather low risk (1–40) of developing epilepsy from febrile seizures (Patel 2015, p. 27).

A seizure which is unrelated to fever will have occurred in 1% of children by the age of 14. Seizures can be described as generalised or focal:

- Generalised:
  - Tonic – sustained contraction and stiffness.
  - Clonic – rhythmic jerking of one limb, one side, or the whole body.
  - Tonic/clonic – a combination of both.
  - Absence – an impairment of consciousness lasting less than 20 seconds.
- Focal: focal seizures affect one area of the brain initially; this may spread across the entire brain, becoming generalised. The physical presentation will depend on the location within the brain.

A seizure lasting more than 30 minutes or a series of seizures without significant recovery over 30 minutes is defined as status epilepticus (Miall et al. 2007), which can occur during a seizure of any origin, i.e. febrile or neurological. It is more common for a child who suffers with epilepsy to have prolonged seizures.

With any child who has a seizure, supplying oxygen therapy whilst managing the airway is imperative. Hypoxia is common during a convulsion, as the diaphragm is paralysed. Diazepam, a central nervous system depressant, is the drug of choice to manage this case, acting as an anti-convulsant and sedative, and administered by intravenous (IV) injection or rectally using a rectal tube. Some children with epilepsy may have their own anti-convulsant medications prescribed, such as midazolam. In this instance, the paramedic needs to take into consideration any medications that have already been administered.

Metabolic disorders

The paramedic must consider a range of **metabolic disorders** when assessing and managing the child. For the purposes of this chapter, the term metabolic refers to the symptoms of malfunctioning organs of metabolism and digestion.

Hypoglycaemia is a common metabolic disorder that can render a child unconscious. With this in mind, a blood glucose reading should be taken with all children presenting with reduced levels of consciousness. Hypoglycaemia is present when it is low enough for the patient to display symptoms of impaired brain function, and usually occurs with a blood glucose level of <2.6–4 mmol/l (Royal Children's Hospital [RCH] Victoria, 2016; Couper and Jones 2012). Specific treatment can include oral glucose (if the child is fully alert and able to swallow and follow instructions), intramuscular glucagon, and/or IV dextrose.

Hyperglycaemia is also a common condition in children and can be an indicator of serious underlying illness, including diabetic ketoacidosis (DKA; Dabelea et al. 2014). DKA can be the first presentation of undiagnosed diabetes (Craig et al. 2011; Couper and Jones 2012). The Royal Children's Hospital in Victoria, Australia (2017) recommends that any child with a blood glucose level of >11.1 mmol/l receives further investigation. It would seem reasonable for any child with this level of hyperglycaemia to be transported to an appropriate hospital. Symptoms associated with DKA include polydipsia and polyuria, as well as signs of dehydration (reduced skin turgor and reduced capillary refill) and hypoperfusion (tachycardia, hypotension, and shock; Craig et al. 2011; Miall et al. 2013, p. 126). If signs of hypoperfusion are present, this can be managed with 0.9% saline in a 10 ml/kg bolus, repeated once if required (RCH Victoria 2017a). Patients may also present with rapid, deep breaths that smell of acetone (Kussmaul respirations; Craig et al. 2011; Couper and Jones 2012).

Abdominal pain

Abdominal pain in children is a common presentation. Acute abdominal pain is predominantly self-limiting and due to a functional disorder such as gastroenteritis. Indeed, approximately 3–8% of acute abdominal pain in children is due to organic disease, as seen in appendicitis (Berger et al. 2007). It is important to identify any potential organic-related abdominal pain, as these conditions can require surgical intervention (Miall et al. 2012, p. 72).

The presentation will differ depending on the age of the child; infants may present with loss of appetite and persistent crying. The older the child, the clearer the history may become, as they are able to answer specific questions. Asking about the location, duration, and character of the pain will highlight any significant red flags with the child. With older girls, gynaecological causes also need to be considered.

Abdominal pain can be caused by any of the following pathologies.

Acute appendicitis

This is the most common cause of abdominal pain in children and occurs in 3–4 per 1000 children (Miall et al. 2012). It most commonly affects the over 5s, but can also present in younger patients. The diagnosis of appendicitis is difficult to make without ultrasound and surgical intervention. Typical symptoms of appendicitis include central abdominal pain that migrates over a few hours to the right iliac fossa, guarding of the abdomen, and boarding. Tests such as the psoas test, which involves flexing the hip, or Rovsing's sign, which involves pressure on the left iliac fossa, can reveal right iliac fossa peritonitis. Other symptoms may include anorexia, tachycardia, tachypnoea, and a reluctance to move. Vomiting may occur, along with constipation and mild fever.

Mesenteric adenitis

Following a viral infection such as gastroenteritis or upper respiratory tract infection (URTI), the intra-abdominal lymph nodes can become inflamed, causing acute pain that mimics appendicitis. With mesenteric adenitis, peritonitis will not be present. Knowing the history of any recent viral infection is imperative, as this can help exclude appendicitis.

Intussusception

Intussusception is caused by invagination, where part of the bowel infolds with another, forming a pocket. This condition mainly presents between 3 and 12 months of age and accounts for up to 25% of abdominal emergencies in children (Sharp et al. 2013). Symptoms can be nonspecific, including periodic and episodic screaming. More severe symptoms include pallor, with or without signs of shock. Blood in the stools is a late sign and occurs in two-thirds of cases. As a paramedic in the prehospital environment, awareness of intussusception can provide patients with the surgical assessment they require in the emergency department.

Other common causes of acute abdominal pain include:

- Inflammatory bowel disease:
  - History of diarrhoea in the family
  - Recent weight loss
  - Blood/mucus in the stools
- DKA
- Lower-lobe pneumonia
- Constipation
  - Hard or infrequent stools
  - Mass in left iliac fossa
- Urinary tract infection (UTI)
  - Dysuria, frequency
  - Back pain
  - Bed wetting
  - Vomiting

Poisoning

In Australia over 3500 children aged between 0 and 4 years are admitted to paediatric hospitals with poison-related presentations annually (Tibballs et al. 2012). In England and Wales, Anderson et al. (2016) report that between 2001 and 2013, 28 children aged 4 years or under were reported to have died following poisoning by pharmaceutical products. With any poisoning incident, whether accidental or intentional, the paramedic needs to identify a range of key information, including (Victorian Poisons Information Centre, Melbourne):

- Poisoning substance
- Time of poisoning
- Amount of substance involved
- Route of exposure (ingested, inhaled, absorbed, injected)
- Weight of child

Commonly ingested drugs include paracetamol and antidepressants, as well as household products such as bleach, weedkiller, and disinfectant, due to their storage location. Early contact with a poisons centre to discuss possible effects and treatments available is strongly encouraged.

Anaphylaxis

Anaphylaxis is a sudden-onset, systemic, life-threatening allergic reaction that occurs after the patient has had an exposure to an **allergen** (Resuscitation Council [UK] 2008). Common allergens include nuts and dairy/milk formula (ANZCOR 2016; Andrew et al. 2018). Onset of anaphylaxis is usually within 30 minutes, but can be delayed by up to four hours. The most common triggers for anaphylaxis in children are food, medications, and insect stings.

Across the developed world, there is evidence that the incidence of anaphylaxis is increasing significantly (Andrew et al. 2018; Resuscitation Council UK 2008).

Anaphylaxis can be identified by utilising the RASH criteria, sudden onset of illness with two or more of the following symptoms:

- **R**espiratory symptoms (shortness of breath, wheeze, constriction of throat)
- **A**bdominal symptoms (vomiting, diarrhoea, incontinence, cramps)
- **S**kin symptoms (angioedema, urticaria, erythema, itchiness)
- **H**ypotension (blood pressure [BP] <100) *or* isolated hypotension (BP <90) with a exposure to a known allergen for the patient

Children particularly may also present with severe abdominal pain, hives, respiratory distress, rhinitis, conjunctivitis, and flushing (Huang et al. 2012). Anaphylaxis can be difficult to diagnose in children, so gaining an in-depth history of any potential allergens with which the child has been in contact is required. It is also important to identify if the child has previously had an anaphylactic reaction. Children who have already suffered an anaphylactic attack will potentially have a management plan and an auto-injector, which is a self-administered dose of adrenaline prescribed by the general practitioner that will be carried by the child, parent/guardian, or school nurse.

Adrenaline is the initial drug used by a paramedic with a patient suffering anaphylaxis. Adrenaline provides significant benefit in this setting, including:

- Vasoconstriction
- Bronchodilator
- Stabilisation of Mast cell walls
- Reducing permeability of the vessel walls, preventing further fluid loss

Adrenaline for anaphylaxis is administered by intramuscular injection into the anterolateral aspect of the upper thigh (Gaudio et al. 2014; ANZCOR 2016). If clinically indicated, a repeat dose can be administered after five minutes. Also consider salbutamol when a wheeze is present (ANZCOR 2016; Ambulance Victoria 2018, p. 111).

Infection

Paediatric infections can stem from various causes. Paramedics may face children with conditions such as meningitis (and meningococcal disease) and UTIs that present with fever and may lead to convulsions. The most common sign of infection is a high temperature (also referred to as pyrexia, or fever).

Pyrexia (fever)

The National Institute of Health and Clinical Excellence (NICE 2013) reports that fever is the second most common cause of admission to hospital for children and the leading cause of death in those under 5 years of age. Between 20% and 40% of parents report feverish illness in their children on an annual basis. There are several causes of fever, and children presenting with fever can be difficult to assess and manage.

Clinical assessment

Fever generally becomes clinically significant at core body temperature rises above 38 °C. It is usually a response to a bacterial or viral illness. It is common for a feverish illness to be of viral origin, self-limiting, and to resolve itself without any medical intervention. Paramedics always have to consider a more serious bacterial infection such as meningitis or pneumonia with any seriously ill children with pyrexia.

The traffic light system is widely utilised as a tool to identify the risk of serious illness associated with fever (NICE 2013; Royal Children's Hospital 2011). The Royal Children's Hospital (2011) also specifically recommends that when presented with the following signs and symptoms, the patient should be considered unwell:

- lethargy
- poor interaction
- inconsolability
- tachypnoea
- tachycardia
- cyanosis
- poor peripheral perfusion

Prehospital management

NICE guidelines (2013) offer the following advice for the treatment of fever:

- Children should not be under- or overdressed.
- Tepid sponging is no longer recommended.
- Anti-pyretic therapies should only be considered in children who appear distressed or unwell.
- Anti-pyretics should not be routinely used with the goal of reducing body temperature in children who are otherwise well.
- Anti-pyretics do not prevent febrile convulsions, so should not be used for this purpose.
- Either paracetamol or ibuprofen can be used to reduce temperature, but should not be administered at the same time.

The Royal Children's Hospital in Victoria, Australia (2011) published guidelines recommending only treating a child with a fever above 38.5 °C if the child is significantly distressed. Giving frequent sips of clear fluid and undressing the child are suggested as simple ways to assist in keeping the patient comfortable (Miall et al. 2012, p. 60; Royal Children's Hospital 2016). Other diseases that may present as fever include meningitis and UTIs.

Meningitis and meningococcal disease

Meningitis is an inflammation of the meninges that surround the brain (Figure 22.1) and is caused by either a bacterial or a viral infection. Meningitis should be considered with any **prodromal** symptoms in Table 22.5.

The meningitis centre of Australia indicates that 'Bacterial meningitis is aggressive, develops quickly and can lead to permanent disability or death in a matter of hours.' A nonblanching purpuric rash in this setting (Figure 22.2) indicates meningococcal septicaemia (Booy and Jones 2012). These patients are commonly treated with antibiotics such as **ceftriaxone**. Seizures can be a feature of bacterial meningitis in 20–30% of cases (Booy and Jones 2012). Bacterial meningitis is infectious and clinicians exposed to it should be wearing an appropriate level of personal protective equipment.

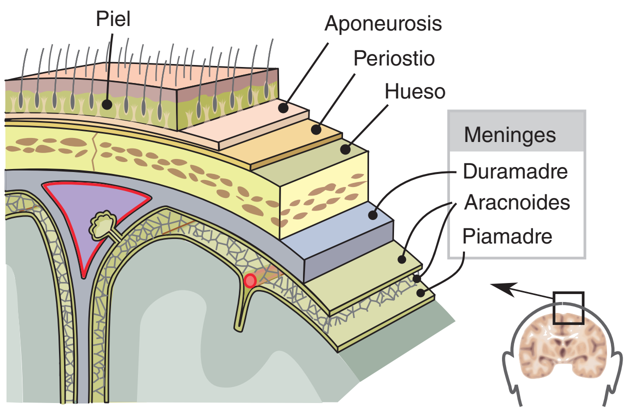

Figure 22.1 Meningitis. Source: Jenkins and Tortora (2014). Reproduced by permission of John Wiley & Sons.

Table 22.5 The TICLS mnemonic.

Characteristic	Normal features	Abnormal features
Tone	Sitting or standing Good strong muscle tone	Resisting exam Limp, listless and flaccid
Interactiveness	Engaging and alert Playing with toys or objects Distractible	Uninterested or vacant Not interested in play Not distractible by sound or light
Consolability	Easily consoled by parent or paramedic	Inconsolable crying, even with reassurance
Look or gaze	Visual tracking of eyes Eyes focus on light or moving objects	Fixed, vacant stare
Speech or cry	Normal cry or level of communication such as speech	Strong, weak, or high-pitched cry Confused or muddled speech

Source: Adapted from Caroline (2013).

Figure 22.2 Nonblanching rash of meningococcal septicaemia.

Meningococcal disease is any infection caused by the very specific bacterium *Neisseria meningitidis* (also termed *meningococcus*). If left untreated, it carries a high mortality rate. Meningococcal disease is a potentially life-threatening illness that can progress very rapidly and cause meningitis and **septic shock** if left untreated.

Clinical assessment

In the early stages, a child can suffer nonspecific symptoms such as:

- Being generally unwell
- Malaise
- High fever (>39 °C)
- Abdominal or leg pain

Later signs (>12 hours) include:

- Altered conscious state
- Neck stiffness, headache, and photophobia
- A nonblanching purpuric rash. This may start as an erythemic rash, so regular observation is required.

One possible test to assist in the identification of a purpuric rash is the glass test. This is completed by rolling a glass firmly over the rash. If the rash does not fade, it is a nonblanching rash, which is an indicator of potential meningococcal disease (University Hospital of South Manchester 2017).

Prehospital management

Early treatment with antibiotics is the key lifesaving intervention in this setting (RCH 2010). Meningococcal septicaemia is managed initially with a dose of ceftriaxone, preferably administered by slow IV injection. If IV access is not attainable, intramuscular injection is the next preferred route (Amb Vic 2018, p. 237). If ceftriaxone is not available, an alternative is penicillin (RCH 2017a).

Urinary tract infection

Children are susceptible to UTIs, which can be in the upper or lower urinary tract. The location of the infection will alter the presenting symptoms.

Symptoms of an upper UTI include:

- Fever
- Vomiting
- Loin pain

Symptoms of a lower UTI include:

- Dysuria
- Urinary frequency changes
- Mild abdominal pain

In infants, nonspecific symptoms such as fever, vomiting, diarrhoea, poor feeding, irritability, or prolonged neonatal jaundice can be clinical features of a UTI (RCH 2017b). A definitive diagnosis requires a urine sample for dipstick, microscopy, and culturing (RCH 2017b). The majority of cases will not cause any longlasting damage to the renal system; however, recurrent UTIs can cause renal scarring. Therefore, children who present as seriously unwell or have **renal impairment** should have a renal ultrasound. Treatments for UTIs include antibiotic therapies prescribed by the doctor; the severity of the infection will determine whether oral or IV antibiotics are required.

Febrile convulsion

A febrile convulsion is a seizure caused by a sudden change in the patient's temperature (RCH 2017a). Approximately 1 in 30 children (around 3%) will experience a febrile convulsion during childhood. These convulsions generally are **benign** and are not associated with the development of epilepsy later in life. Febrile convulsions are mostly self-limiting and normally stop within five minutes. They are treated in the same way as any other convulsions. It is important that the patient is protected from physical trauma during the seizure by placing them on a soft surface away from hard, sharp, or heavy objects.

Breathing difficulties

The paramedic will face many paediatric patients with respiratory distress, defined by Miall et al. (2016, p. 148) as 'Inadequate respiration to maintain normal arterial oxygen and carbon dioxide concentrations.' **Apnoea** and cyanosis are obvious signs of respiratory failure. Paramedics need to promote early detection and intervention prior to the onset of respiratory failure.

Signs of respiratory distress

When assessing a child for signs of respiratory distress, look for those described in Table 22.6.

Practice insight

It is crucial to expose the child's chest when undertaking respiratory assessment. Be aware of your environment when exposing a child's chest and maintain their full dignity wherever possible.

Symptoms of respiratory distress

Typical symptoms of respiratory distress in children are wheeze, stridor, dyspnoea, and cough.

Table 22.6 Elements of the paediatric assessment triangle (PAT).

Impression	PAT abnormalities
Stable	None
Respiratory distress	Effort of breathing (+ or – circulation to skin)
Respiratory failure	Effort of breathing + appearance (+ or – circulation to skin)
Shock	Circulation to the skin + appearance (= or – effort of breathing)
Central nervous system/metabolic	Appearance
Cardiopulmonary failure	Effort of breathing + appearance + circulation to skin

Source: Adapted from Horeczko and Gausche-Hill (2011).

Wheeze

A wheeze is a continuous, coarse, whistling sound that is heard during the expiratory phase of respiration due to the narrowing of the airways. It can be associated with asthma, viral infections, and lung disease, and may respond well to bronchodilators such as salbutamol.

Stridor

Stridor is a loud, harsh, high-pitched inspiratory noise due to a narrowing of the extrathoracic upper airway (trachea, larynx, or pharynx). Acute stridor can be heard in:

- Croup
- Upper respiratory tract infection (URTI)
- Foreign body airway obstruction
- Epiglottis
- Abscess
- Anaphylaxis

Dyspnoea

Dyspnoea or difficulty in breathing can be caused by a wide range of factors, including infection, heart disease, or lung disease; with the latter it occurs due to a lack of oxygen perfusion, airway obstruction, or abnormal structures of the lung. When the body is deprived of oxygen, hypoxia occurs. To combat this, the child will breathe faster to increase oxygen levels in the blood. Acute dyspnoea can be caused by:

- Asthma
- Pneumonia
- Bronchiolitis
- Croup
- Congenital disease
- Trauma
- Foreign body
- Neonatal lung disease

Cough

When the airways are irritated or partially blocked by mucus, a foreign body, or smoke, the body's reaction is to cough in attempt to remove the irritation. A cough's main function is to force air up out of the lower and upper airways. Common causes of a cough include:

- Common cold
- URTI
- Allergy
- Asthma
- Lower respiratory tract infection
- Pneumonia
- Foreign body

A cough itself is not usually treated; instead. the underlying cause of the cough is investigated.

Snoring is a sign of an upper airway obstruction and is described as ineffective breathing over a period lasting 15 seconds or more. This breathing pattern may be seen in a seizing child or during sleep apnoea.

Acute upper respiratory tract infection

URTIs are a frequent occurrence in paediatric patients, but in most circumstances are not acute emergencies and require only supportive care and comfort (Cotton et al. 2008). Most URTIs are caused by a virus, mild in nature, and of short duration. However, URTIs can lead to complications including acute **sinusitis**, acute **otitis media,** and lower respiratory tract infections. They can also exacerbate other conditions such as asthma, leading to acute respiratory distress.

Pneumonia

Pneumonia is an infection of the lower respiratory tract; there are several infecting agents, viral or bacterial, but 20–60% of pathogens are unknown in children. The child with pneumonia may present with a history of:

- Being unwell and lethargic
- Persistent fever
- Cough
- Tachypnoea at rest
- Grunting in infants
- Intercostal recession

All these are indicative of respiratory distress. On examination, you may encounter bronchial breathing, dullness on percussion, and crackles. These clinical findings expose underlying consolidation within the lung. A useful tool in the diagnosis of pneumonia is a posito-anterior chest X-ray. Treatment includes antibiotics, oxygenation, and fluid therapy (RCH 2017a).

Asthma

Asthma is a common respiratory complaint in children, with up to 15% of children affected (Miall et al. 2013, p. 68). It is a reversible, chronic inflammatory disease of the lower airways characterised by mucosal plugging, mucosal oedema, and bronchospasm. This leads to acute respiratory distress, often with a wheeze. Patients can have specific triggers such as pollen, dust, and exercise. Acute exacerbations can be managed with salbutamol (via metered dose inhaler/spacer or nebuliser), ipratropium bromide, and systemic corticosteroids as such as dexamethasone (AV 2018, p. 219; Miall et al. 2013, p. 64).

Bronchiolitis

Bronchiolitis generally occurs in infants under 12 months old; the age commonly differentiates this condition from asthma. It is a viral infection of the lower respiratory tract that can cause acute respiratory distress, including wheezing, cough, tachypnoea, and intercostal retractions. Treatment is symptomatic and normally includes oxygenation with appropriate feeding and fluid intake and minimal handling (RCH 2017a).

Croup (Laryngotracheobronchitis)

Croup is a viral infection of the upper airway, larynx, trachea, and bronchi, causing swelling. It normally occurs in children between the ages of 6 months and 3 years and is characterised by a barking cough and inspiratory stridor (Miall et al. 2013, p. 65). It is usually associated with wheeze and increased work of breathing, and fever can also be present. Severe croup can present with irritability, lethargy, stridor at rest, tracheal tug, nasal flaring, chest wall retraction, and hypoxemia (Amb Vic 2018; RCH 2011). Management is symptomatic and includes oxygenation and in severe cause nebulised adrenaline (Amb Vic 2018, RCH 2011). It is important that the child is not distressed unnecessarily with interventions such as IV access and that handling is kept to a minimum (RCH 2011).

Acute epiglottitis

This bacterial infection, caused by *Haemophilus influenzae*, can progress quickly to be life threatening (Miall et al. 2013, p. 65). It is characterised by a child with expiratory stridor and/or snoring, often positioned leaning forward and drooling. It is important the child is encouraged to settle as far as practicable, with expeditious transport to hospital (RCH 2015).

Conclusion

The paramedic must be able to assess and manage a range of conditions affecting the paediatric patient. As with all patients, paramedics need to remain calm and professional when dealing with the stresses involved in paediatric emergencies. Working with the child's parents to provide adequate and effective communication is key, and is a communicative skill that needs constant development for all healthcare professionals. Remembering to revert to basic practices when required, managing ABCs (Airway, Breathing, Circulation), and adopting a methodical and systematic approach will help the paramedic to manage paediatric emergencies effectively.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

Mark the following statements as true or false:

1. Hypoglycaemia is clinically defined when it is low enough for the patient to display symptoms of impaired brain function. True or false?

2. Kussmaul respirations (rapid, deep breaths that smell of acetone) are a clinical sign of diabetic ketoacidosis. True or false?
3. Important information to gather when managing a poisoning includes the poisoning substance, the amount of poison, and the time of the poisoning. True or false?
4. RASH criteria can be used to identify anaphylaxis. True or false?
5. The 'A' in RASH stands for allergy. True or false?
6. The traffic light system is a useful tool to identify the risk of serious illness associated with fever. True or false?
7. The glass test can be used to identify a purpuric rash associated with meningococcal disease. True or false?
8. Croup is a bacterial infection of the upper airway. True or false?
9. Bronchiolitis normally occurs in children over 12 months old. True or false?
10. Epiglottitis is characterised by a child with stridor, positioned forward and drooling. True or false?

Glossary

Allergen: A substance that when introduced to the body results in an allergic reaction. Common examples are nuts, penicillin, plant seeds, and pollen.

Apnoea: The absence of spontaneous breathing.

Benign: Not harmful or noncancerous (in reference to a tumour).

Ceftriaxone: A broad-spectrum cephalosporin antibiotic.

Cyanosis: A bluish discoloration of the skin and/or mucosal membranes associated with hypoxemia.

Metabolic disorder: Any range of disorders which directly affect organs associated with metabolism.

Otitis media: Infection or inflammation of the middle ear. Commonly viral in origin, but can be bacterial or allergy related.

Prodromal: Relating to the earliest stages of disease progression.

Renal impairment: Disorder in the function of the kidney.

Septic shock: Poor end-organ perfusion commonly resulting from bacteria within the bloodstream releasing a range of toxins. These toxins initiate an inflammatory response, resulting in widespread vasodilation and hypotension.

Sinusitis: Inflammation of one or more of the sinuses. Swelling of mucus membranes within a sinus can obstruct the drainage of secretions, resulting in congestion, pain, tenderness, and headache.

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23

Medical emergencies

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Contents

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Learning outcomes

On completion of this chapter the reader will be able to:

- Recognise signs, symptoms, and prehospital management of a range of commonly presenting medical emergencies.
- Identify how seizures may present to the paramedic and outline principles of management.
- Recognise hypoglycaemic and hyperglycaemic states and principles of management.
- Discuss complexities surrounding managing end-of-life care in the prehospital setting.
- Apply theoretical principles to the management of patients who present with cellulitis and sepsis.

Case study

You have been called to a patient who is unconscious with a blood glucose level of 2.2 mmol/l. His carer states the patient is usually fed through a tube directly into his stomach (PEG feed); however, she accidentally forgot to administer his normal feed this morning. You are unable to gain intravenous access on this patient, but need to reverse the hypoglycaemia.

Introduction

Paramedics will attend many patients who present with life-threatening medical emergencies. This chapter identifies and discusses a range of emergencies that a paramedic may encounter on a day-to-day basis. This includes neurological emergencies (cerebro-vascular events and seizures), metabolic emergencies (hypoglycaemia and hyperglycaemia), immunological conditions (sepsis and **cellulitis**), and end-of-life care. For each condition, the chapter provides a discussion of the pathophysiology and the signs and symptoms that a paramedic may gain from assessment data, and key management principles in the prehospital environment. The aim of this chapter is to provide foundational knowledge of some of the most common medical emergencies, and inspire further reading on each topic.

Neurological emergencies

Neurological emergencies are emergencies affecting the nervous system. Two commonly occurring neurological emergencies are seizures and strokes (cerebro-vascular events). Stroke occurs approximately 152 000 times per year in the UK (Stroke Association 2016), and is the second largest cause of death worldwide (Stroke Association 2016). Up to 18% of adults in the UK access hospitals due to seizure disorders (Osborne et al. 2015).

Seizures

The human brain communicates with the body by sending messages via electrical impulses down specific pathways. A seizure is a mass discharge of electricity within the brain, triggering a response in the body. Some patients have a diagnosis of epilepsy, indicating that their brain is prone to these electrical discharges, and other individuals may suffer from seizures due to a specific trigger (Moshé et al. 2015; World Health Organization [WHO] 2018). Such triggers include:

- Sudden changes in core body temperature ('febrile convulsions' in children).
- Alterations to glucose or electrolyte levels in the bloodstream (typically low blood glucose levels [BGL]).
- Space-occupying lesions (tumours in the brain).
- Use of certain drugs.
- Alcohol withdrawal.
- Head trauma (Pohlmann-Eden 2006; WHO 2018).

There are different forms of seizure and each will correlate with a different section or percentage of the brain. Table 23.1 identifies two commonly occurring seizures, focal seizures and generalised seizures, and identifies typical signs and symptoms of each (Epilepsy Australia n.d.; Moshé et al. 2015).

During seizures (particularly generalised seizures) it is common for patients to experience incontinence and injury due to falling and/or hitting objects. It is also common to see **trismus** or 'lock-jaw' in seizing patients, and as such they can experience mouth trauma due to biting down. At the beginning of a seizure there may also be a loud vocalisation like a scream – this occurs as the air is forced out of the lungs past the vocal chords. After a generalised seizure patients can become 'post-ictal', where they are extremely confused and often agitated and/or aggressive due to the apnoea (cessation of breathing) during seizures (Epilepsy Australia n.d.).

On many occasions seizures will self-resolve with minimal paramedic intervention. However, when seizures do not self-terminate, paramedics carry a range of seizure-surpressing drugs to terminate recurring seizures, or seizures lasting for prolonged periods of time (Osborne et al. 2015). For instance, midazolam is a benzodiazepine which enhances the action of a specific neurotransmitter in the brain to reverse seizure activity (Osborne et al. 2015).

Clinical assessment

- Ask about history of seizures – previous occurrence, normal presentation during a seizure.
- Medication history – have they taken their medications as usual? Are there any recent changes to medications?
- Assess for causes of seizure – have they got a low blood glucose or high temperature? Have they recently suffered a head injury? Are they withdrawing from alcohol?
- Head-to-toe assessment – have they suffered any injuries which may have caused the seizure, or arising from the seizure?

Table 23.1 Signs, symptoms, and description of focal and generalised seizures.

Seizure type	Signs, symptoms, and description
Focal seizure	During focal seizures only a small portion of the brain is involved, and the patient is conscious, but not always aware of their surroundings. The seizure activity will be limited to: • alteration to a sense, i.e. hearing, vision, or touch • repetitive movement or fidgeting, i.e. lip smacking, finger tapping
Generalised seizure	Generalised seizures include: • absence seizures (where a patient 'goes blank' briefly) • myoclonic seizures (muscle jerking to one muscle/group) • tonic–clonic seizures (full body stiffening and twitching, 'grand mal' seizures) • tonic (where there is whole-body increased muscle tone and therefore collapse) or atonic (whole body 'floppiness' and collapse)

Source: Adapted from Epilepsy Australia (n.d.)

Prehospital management

- Manage ABCs (Airway, Breathing, Circulation) as required, inserting a nasopharyngeal tube.
- Protect the patient from harm, for example by placing a blanket under the head during the seizure.
- Administer medications to stop the seizure in line with local guidelines.
- Reverse other obvious causes of seizure, for example low BGL.
- Provide oxygen therapy if indicated (if signs of hypoxia are present).
- Treat any obvious injuries.
- Provide reassurance to the patient during the recovery phase.
- Transport to hospital (Osborne et al. 2015).

Stroke (Cerebrovascular event)

There are two kinds of stroke: haemorrhagic and ischaemic (Stroke Association 2016). Both types will present with similar symptoms, but require significantly different management at hospital.

Ischaemic strokes occur when there is a blood clot that occludes one or more blood vessels in the brain – this can be due to local clotting after vessel damage, or as an embolus (a clot that has travelled from elsewhere in the body). Once this clot blocks a blood vessel, blood is no longer able to travel to nearby brain tissue to perfuse it, and therefore that brain tissue starts to die (Stroke Association 2016).

A *haemorrhagic stroke* is a burst blood vessel in the brain due to trauma or an anatomical aneurysm, which causes an interruption of normal blood flow and a haematoma (large blood clot) in the brain, which compresses neighbouring brain tissue and prevents adequate perfusion (Stroke Association 2016). Strokes rarely have a clear trigger, however there can be warning signs, such as a transient ischaemic attack (TIA) or 'mini stroke', which consists of stroke symptoms that self-resolve within 24 hours (Stroke Association 2016). The majority of strokes are ischaemic (approximately 85%), with only 15% attributable to haemorrhagic origins (Magistris et al. 2013; Stroke Association 2016).

Clinical assessment

Strokes are easily identifiable using the 'FAST' assessment – Face, Arms, Speech, and Time. Patients will often suffer from any combination of facial droop, weakness to one arm and/or leg on one side of the body, as well as confused or slurred speech. Any patient who presents with any one of these symptoms is considered to be 'FAST positive', meaning there are positive (present) signs. If none of these signs is present the patient is considered 'FAST negative'.

There is often also associated vision loss and cognitive impairment (Fassbender et al. 2013). When assessing these patients you may notice significant hypertension, and specific note should be taken if there are changes to pupils (one larger than the other).

Also check for signs of raised intracranial pressure by looking for Cushing's triad (Magistris et al. 2013):

- Hypertension (widening pulse pressure)
- Bradycardia
- Altered respirations

Paramedic assessment should include:

- A thorough assessment of the primary survey.
- A full neurological assessment (see Chapter 17).
- A FAST assessment, including an assessment of power and sensation to limbs.

- A thorough history taking, identifying the precise onset of stroke (if this cannot be determined, then the last time the patient was noticed as 'normal' should be noted).
- Other standard assessments, including BGL.

Prehospital management

Management of stroke patients in the prehospital setting depends on the severity of the presentation, but focuses around symptom management, including maintaining a clear airway and providing plenty of reassurance. These patients require urgent transportation to a stroke referral hospital (Fassbender et al. 2013). In the meantime, consider the following pharmacological interventions:

- An anti-emetic (anti-sickness) drug to prevent vomiting, as strokes can impair effective vomit reflex.
- Oxygen if the patient is hypoxic.
- Pain relief as required.

Stroke patients may find it difficult to communicate, so be patient and maintain high levels of communication throughout. In the presence of limb weakness, be sure to place the patient on their noninjured side.

Practice insight

On arrival at hospital, stroke patients will require an urgent computerised tomography (CT) scan to differentiate ischaemic stroke from haemorrhagic, and may receive clot-dissolving drugs for ischaemic strokes within a given timeframe (Stroke Association 2016). If possible, prenotify the receiving facility so they can prepare the CT scanner and appropriate medical team.

Metabolic emergencies

Paramedics will often attend to patients who suffer from problems which affect their metabolism. Commonly occurring metabolic disorders include both hyperglycaemia (high blood glucose) and hypoglycaemia (low blood glucose).

Hyperglycaemia

Hyperglycaemia is generally a symptom of poorly controlled diabetes mellitus, a disease which affects 1.7 million Australians (Diabetes Australia 2015) and over 3 million UK citizens (Diabetes 2016). There are two key classifications of hyperglycaemia that a paramedic may encounter: diabetic ketoacidosis (DKA) and hyperglycaemic hyperosmolar state (HHS).

In normal body function, the hormone insulin helps the body move glucose from the bloodstream after we eat, into cells to use as energy, or to store for later use (Maletkovic and Drexler 2013). In diabetic patients, there is an insufficiency of insulin and they are therefore susceptible to complications. In the case of DKA (common in type one diabetes mellitus), there is an absence or severe insufficiency of insulin, and therefore the cells are not able to receive glucose for energy as usual. As a result, the body must break down fat cells to use as energy for survival (Maletkovic and Drexler 2013; Wolfsdorf et al. 2014). Byproducts of this process are **ketones**, acidic units that are released into the blood when fat is used for energy. In DKA, this process has occurred to such a degree that the level of ketones in the blood has caused acidaemia and is life threatening due to the disruption of homeostasis (Maletkovic and Drexler 2013; Wolfsdorf et al. 2014). Simultaneously, as there is no insulin to move glucose from the bloodstream to the cells, the serum glucose levels are significantly elevated (Maletkovic and Drexler 2013; Wolfsdorf et al. 2014).

HHS generally occurs in type two diabetics who have some insulin function. These patients suffer from largely deranged BGL (over 30 mmol/l), but due to the partial function of insulin these patients do not trigger ketoacidosis (Maletkovic and Drexler 2013). Instead, their kidneys filter out large amounts of glucose into the urine, and water follows as per the laws of osmosis. As a result, the systemic bloodstream is left relatively dehydrated with the depletion of large amounts of water, and therefore has a higher concentration of solutes, making it hyperosmolar (Maletkovic and Drexler 2013; Wolfsdorf et al. 2014). Whilst there is an absence of life-threatening acidosis, these patients are profoundly dehydrated and require extensive fluid and electrolyte resuscitation.

Clinical assessment

The paramedic should inquire about and assess for signs and symptoms relating to each body system listed in Table 23.2.

Prehospital management

Management of DKA and HHS extends much further than the prehospital environment. Both conditions will require admission to hospital until homeostasis can be achieved. Prehospital management focuses around the following principles:

- Airway management as required.
- Fluid administration in line with local guidelines to treat dehydration and dilute sugar levels.
- Symptom management, i.e. cardiac dysrhythmias, nausea and vomiting, hypoxia, and pain.
- Make the patient comfortable.

Hypoglycaemia

Hypoglycaemia, defined as BGL below 4.0 mmol/l, can occur in anyone, but it is more common in diabetic patients, where it can be due to incorrect administration of glucose-altering medications (incorrect calculation

Table 23.2 Signs, symptoms, and clinical findings of diabetic ketoacidosis (DKA) and hyperglycaemic hyperosmolar state (HHS).

Body system	DKA	HHS
Neurological	Lethargy, malaise, fatigue, confusion, coma	Lethargy, confusion, altered conscious state, coma
Respiratory	Kussmaul respirations, fruity acetone breath	Tachypnoea
Cardiovascular	Tachycardia, hypotension, dysrhythmias	Tachycardia, pronounced hypotension, dysrhythmias
Integumentary	Flushed skin, dry mucous membranes, poor skin turgor	Flushed skin, severely dry mucosal membranes, poor skin turgor
Renal	Polydipsia, polyuria, ketonuria	Polydipsia, polyuria, glycosuria
Gastrointestinal	Nausea, vomiting, abdominal cramps	Less severe symptoms than DKA
Serum levels	Blood glucose level >14.0 mmol/l	Blood glucose level <50 mmol/l; osmolarity >330 mOsm/kg

Source: Adapted from Wolfsdorf et al. (2014).

of carbohydrates to insulin, unexpected exercise, accidental overdoses of insulin) or poor management of the condition (NHS 2010; Diabetes Australia 2015). In nondiabetic patients, hypoglycaemia can occur from simply not eating a sufficient amount to match glucose requirements.

All organs and tissues require glucose for energy, and therefore when amounts of glucose are insufficient normal body processes are interrupted. The brain is particularly sensitive to changes in glucose levels, and this is where most symptoms will become obvious. The mnemonic UPCASTS can be used to help the paramedic identify symptoms of hypoglycaemia:

- **U**nconsciousness
- **P**allor and diaphoresis (sweating)
- **C**onfusion and alterations to conscious state
- **A**gitation
- **S**eizures
- **T**remors and/or ataxia
- **S**lurred speech (Diabetes Australia 2015; NHS 2010)

Clinical assessment

The paramedic should focus their attention on identifying the signs and symptoms listed earlier. In addition, a full vital signs survey should be undertaken, with urgent BGL taking priority. A thorough history from the patient if they are conscious, and/or from bystanders, will aid in diagnosis. If the patient usually manages their diabetes well, it is important to establish why they have become hypoglycaemic on this occasion. This will involve a thorough history taking once they have recovered.

Prehospital management

Reversing hypoglycaemia requires the administration of glucose. Recovery of these patients is surprisingly rapid once the glucose reaches the bloodstream. Unfortunately, due to the nature of the symptoms, safe glucose administration is not always easy. Consider the following (NHS 2010):

- If the patient is conscious with an intact swallow reflex, administer oral glucose (i.e. glucose gel or tablets; fizzy drinks, fruit juice, honey, jelly beans).
- If the patient has an altered level of consciousness, it is unsafe to administer oral glucose. Instead, attempt intravenous (IV) access.
- If you achieve IV access, administer IV glucose in line with local guidelines as a firstline treatment.
- If IV access is unsuccessful, consider intramuscular (IM) hyperglycaemic agents such as glucagon.

Regardless of whether oral, IV, or IM agents are used, all hypoglycaemic patients should also be given carbohydrates (e.g. jam sandwich, biscuits) after they regain consciousness – carbohydrates are 'long-acting' sugars that will prevent a relapse of hyperglycaemia (Diabetes Australia 2015).

Practice insight

You may wonder why glucagon is not preferred above IV glucose due to ease of administration. Glucagon works in the body to convert stored glucose from the liver to useable glucose in the bloodstream (NHS 2010). The downfall, however, is that it only works if the liver already has a stock of stored glucose available for use. In patients with significant diabetic histories, this is not always the case. Therefore, it is best to attempt IV glucose first, as it does not rely on glucose storage levels (NHS 2010).

End-of-life care

End-of-life care is a sensitive issue, and one that presents paramedics with many legal and ethical challenges. Paramedics are not always well prepared to handle these cases, which can be due to a lack of knowledge and understanding around the issue, or simply a restriction of appropriate care by local guidelines.

Ambulance callouts for end-of-life care

Many individuals with chronic illnesses choose to remain in the community rather than be admitted to hospital (Carron et al. 2014). There are **palliative care** services available in most districts that will support the individual to receive what they need in the community so that their wishes can be respected. Sometimes, however, patients may experience symptoms that the patient and/or family simply cannot cope with in the home environment any longer (Carron et al. 2014).

Patients may choose to palliate at home for end-stage cancer, dementia, renal disease, cardiovascular disease, respiratory or neurological conditions such as chronic obstructive pulmonary disease or stroke, and any number of other conditions (Carron et al. 2014). Generally, the patient is dispensed appropriate information and medication to manage foreseeable symptoms at home. However, if the situation changes a paramedic may be called.

Examples of situations where a patient receiving end-of-life care may call a paramedic include the following (Carron et al. 2014):

- *Pain management* – either the patient has inappropriate medication to manage their pain; or they have used up all of their pain medication; or their pain has changed or intensified.
- *Nausea and vomiting* – often as the organs cease to function effectively, patients will experience nausea and vomiting that cause significant distress.
- *Dehydration* – due to nausea and vomiting, or simply decreased appetite and increased sleeping, patients are unable to take in appropriate fluids.
- *Weakness and/or falls* – resulting from any combination of causes, patients are no longer able to complete their activities of daily living at home due to weakness, including toileting, hygiene, eating, mobility.
- *Breathing difficulty* – patients may experience an exacerbation of respiratory issues, or develop an infection on top of their underlying illness, which affects their breathing and can cause significant anxiety,
- *Confusion* – more common in neurological diagnoses, patients may become increasingly confused or agitated at home, making care difficult for families.
- *Fear and anxiety* – the patient may have initially decided to remain at home until the end of their life, but as their condition progresses, they become fearful of what may occur and feel safer in a hospital or care facility.

Barriers to care

Some paramedics struggle to provide adequate care for palliative patients. Barriers in these cases include:

- Misunderstanding around pain relief – patient has multiple different pain-relief options at home but states they do not work, and paramedics can be hesitant to give further drugs.
- Lack of knowledge around palliation and care of the dying.
- Hesitation to interfere with medical action plans by palliative care teams.
- Frustration that these are not 'high-adrenaline' cases.

It is important that clinicians understand the skills they can gain by caring for end-of-life patients appropriately, and the satisfaction and gratitude they can receive when the patient is comfortably transferred to hospital.

Occasionally these patients require you to go over and above what you may consider standard care, but you must think about what you may want for a loved one in a similar situation and act professionally.

Legal considerations, dignity, and choice

As clinicians, most of our training and education focus on life-saving treatments and, as such, it can be a foreign concept to withhold care. All patients have the right to refuse medical treatment at the end of their life and have the ability to legally document such requests to ensure adherence (NHS 2017; Queensland Government 2018). These legal documents are known by a number of names, depending on the state or region: statement of choices, advanced health directives, do-not-resuscitate orders, advanced resuscitation plans, and living wills (NHS 2017; Queensland Government 2018).

Regardless of the name, it is a paramedic's responsibility to familiarise themselves with the documents used in their local area and ensure they understand what is required of them if they must care for a patient with such an order. Generally, these documents will outline which care provisions a patient would like to receive, and what they want withheld. This may include cardiopulmonary resuscitation, defibrillation, IV fluids and antibiotics, oxygen, intubation and ventilation, and hydration and nutrition. Patients are often able to make specific requests, such as 'attempt resuscitation for five minutes only' or 'do not attempt resuscitation unless there is a chance of a meaningful outcome'. Often, these documents also allow the patient to nominate a substitute decision-maker if they are not able to make informed medical decisions (Queensland Government 2018).

Practice insight

Generally, resuscitation plans are only valid if a paramedic has access to the original or a certified copy of the document. If the document is not present at the point of care, paramedics are legally bound to act within their local guidelines, which may include initiating resuscitation efforts.

Paramedic considerations:

- Whenever transferring patients from permanent care facilities (i.e. nursing homes), always ask if there is a resuscitation plan.
- Where possible and appropriate, start a conversation with patients about resuscitation plans – the conversation does not have to be macabre: simply ask the patient to consider what they might want if they had a terminal illness, and to ensure their loved ones are aware of their wishes.
- If patients have a terminal illness, or other conditions where you suspect one may exist, ask if they have a resuscitation plan – and ensure you transfer the patient with this document.
- Patients may change their minds – the same patient whose resuscitation plan states they do not wish to receive oxygen may themselves request oxygen in a situation of acute deterioration. Respect your patient's wishes (in line with local guidelines) and treat them accordingly.

Death and dying require complex clinical management and delicate soft skills in order to achieve maximum patient care. Embrace the opportunity to care for these patients where possible in order to enhance your skills, and always treat them with dignity, respect, and compassion.

Infection

Paramedics will attend many infectious patients during the course of their work. Two commonly occurring infectious conditions are cellulitis and sepsis.

Cellulitis

Cellulitis, literally meaning inflammation of the cells, is an infection of the skin and soft tissues, often in a localised area of the body (Cranendonk et al. 2017). It is more prevalent in patients who are **immunocompromised**, or suffer conditions such as diabetes and obesity. Their susceptibility to this condition stems from impairment to immune responses and effective circulation to limbs, decreasing healing. In Australia in 2013–2014, cellulitis accounted for over 250 000 hospital bed days (ACSQHC 2017) and 59 466 total admissions in 2014–2015 (ACSQHC 2017).

Cellulitis involves an infiltration of bacteria into the deep dermal and subcutaneous layers of the skin (Raff and Kroshinsky 2016). This occurs via a breach of the integrity of the skin, via a wound or cut of some sort. Patients experience an immune response, which causes swelling, redness, and heat to the area (Raff and Kroshinsky 2016; Cranendonk et al. 2017), and often experience pain. *Streptococci* and *Staphylococcus aureas* are the most common bacteria present in patients with cellulitis (Cranendonk et al. 2017), but there are numerous **pathogens** that contribute depending on the trigger. Cellulitis often affects the lower legs and feet (Raff and Kroshinsky 2016), due to the decreased circulation and therefore decreased effective healing in at-risk patients. Other patients can also experience cellulitis secondary to bites (human or animal), open wounds exposed to contaminated water, or immunocompromise (i.e. patients on chemotherapy or other drugs). Due to high-risk patients suffering chronic conditions, these wounds are often chronic, or frequently recurring (Raff and Kroshinsky 2016; Cranendonk et al. 2017).

Clinical assessment

The paramedic should undertake a thorough history of the patient's condition and identify the following four key signs and symptoms of cellulitis (Figure 23.1):

- Localised redness/erythema
- Oedema
- Warmth
- Tenderness

Patients may also have **exudate** from these wounds in severe cases.

Figure 23.1 Classic cellulitis. Source: Bailey and Kroshinsky (2011). Reproduced by permission of John Wiley & Sons.

Prehospital management

Management of cellulitis cannot be achieved in the prehospital environment; however, paramedics can positively contribute to the patient's healthcare experience. Think about the following management options:

- Position the patient comfortably – consider elevating the affected limb.
- Provide analgesia in line with local guidelines.
- Consider applying a wet-wound dressing for comfort.
- Refer to hospital or general practitioner clinic for follow-up treatment.

Paramedics should also be aware that many patients with chronic cellulitis suffer from antibiotic-resistant superbugs such as **methicillin-resistant *Staphylococcus aureas* (**MRSA**)** (Raff and Koshinsky 2016). For this reason, paramedics should ensure they maintain contact precautions, and thoroughly disinfect any equipment that may be shared with other patients.

Sepsis

Sepsis is defined as 'life-threatening organ dysfunction caused by a dysregulated host response to infection' (Singer et al. 2016). Simply put, it is a life-threatening systemic condition whereby a patient is infected by a particular pathogen and experiences a systemic response that leads to organ dysfunction. An 'infection gone wrong', sepsis often affects those patients who are immunocompromised due to preexisting medical conditions (i.e. older persons, children, immunosuppression medication, diabetes, or poor health status; Gotts and Matthay 2016), but it does not discriminate – even the young, fit and healthy can be affected.

Sepsis is differentiated from a simple infection when it causes organ dysfunction (Singer et al. 2016). The pathophysiology of sepsis is **multisystemic**. The key effects are as follows (Gotts and Matthay 2016; Keegan and Wira 2014):

- Hypoperfusion to tissues/organs, triggering increased lactate levels.
- Vasodilation, causing decreased peripheral cardiovascular resistance.
- Increased permeability of endothelium, causing oedema.
- Impaired coagulation, causing both increased clotting and impaired clotting.
- Increased permeability to lungs, causing pulmonary oedema.
- Impairment of liver functions, causing worsened systemic inflammation.
- Acute kidney injury, secondary to immune-mediated renal dysfunction.
- Encephalopathy from impaired blood–brain barrier, causing delirium.
- Impaired immune response to secondary infections.

Sepsis was once screened using the Systemic Inflammatory Response Syndrome (SIRS) criteria, but research indicates that due to the complexity of organ dysfunction in sepsis, these criteria (consisting of two or more symptoms of fever, tachycardia, and/or tachypnoea) are no longer comprehensive (Singer et al. 2016). Paramedics are able to conduct a Quick Sequential Organ Failure Assessment or qSOFA in order to screen patients for sepsis in the prehospital environment. This assessment dictates that patients with a suspected infection and the following criteria are likely to suffer poor outcomes due to sepsis (Singer et al. 2016):

- Altered mentation (Glasgow coma score <15)
- Systolic blood pressure of 100 mmHg or less
- Respiratory rate >22 respirations per minute

Once patients arrive at hospital, a more comprehensive SOFA assessment is conducted utilising blood results (Singer et al. 2016).

Did you know?

Septic shock is defined as sepsis when there is an alteration to circulatory and cellular or metabolic abnormalities that put the patient at increased risk of mortality (Gotts and Matthay 2016; Singer et al. 2016). Clinically, these patients require **vasopressor** medication to maintain a **mean arterial pressure (**MAP**)** above 65 mmHg and have an elevated lactate level despite adequate fluid therapy (Gotts and Matthay 2016). As blood tests are not currently possible in the prehospital environment, it is important to understand the depth of illness your patients may suffer – you may simply identify persistent hypotension despite fluid administration.

Clinical assessment

Paramedics may identify various signs and symptoms in septic patients. These patients usually appear quite unwell, and you may identify any of the following obvious or subtle clinical signs:

- Obvious source of infection (i.e. productive cough, in-dwelling device such as catheter, obvious wound infection, urinary tract infection symptoms)
- Tachycardia
- Hypotension
- Fever
- Confusion or altered mentation
- Tachypnoea
- Dehydration
- Pallor
- Cool extremities
- Decreased urine output
- Crackles on lung auscultation
- New-onset impaired mobility or functional ability

Prehospital management

Sepsis patients require urgent tertiary care. In the meantime, paramedics should consider the following management strategy (Keegan and Wira 2014; Gotts and Matthay 2016):

- Maintain oxygenation in line with local guidelines.
- Maintain glycaemic control in line with local guidelines.
- Appropriate fluid resuscitation in line with local guidelines.
- Maintain normothermia in line with local guidelines.
- Consider antipyretic agent (i.e. paracetamol) as required, in line with local guidelines.
- Screening for sepsis using qSOFA or other screening tools, in line with local guidelines.
- Prenotify the receiving facility of your patient's condition, including assessment data.
- Consider critical-care paramedic support for further management scope of practice (i.e. inotropes).

Practice insight

Often, the first sign of serious infection in the older population is delirium and decreased function (i.e. mobility, ability to perform hygiene independently). It is important that you take such a symptom seriously and do not simply classify it as an exacerbation of underlying cognitive impairment.

Immunological emergencies

Immunological conditions can be minor or major. They do not always affect patients seriously enough that they need to call an ambulance, but when patients have an exacerbation of a chronic condition they can become life threatening, for example during an anaphylactic reaction.

Anaphylaxis

Anaphylaxis is defined as a severe, systemic hypersensitivity reaction whereby a patient may suffer life-threatening symptoms (Reber et al. 2017). Humans have the ability to create antibodies – these are proteins that trigger a response to foreign matter in the body. Normally, antibodies help fight off infection and illness by identifying foreign matter (antigen) and initiating an immune response to protect the body from harm. In anaphylaxis, these antibodies detect an antigen; however, instead of responding to a dangerous infection, they overreact to an everyday substance to which the patient has been exposed (Reber et al. 2017). An immune reaction is triggered, making the patient quite unwell.

Clinical assessment

Every patient will experience anaphylaxis slightly differently. The Australian Society of Clinical Immunology and Allergy (ASCIA) defines anaphylaxis as:

- Acute onset with skin features (i.e. urticarial rash, erythema, tongue swelling, facial swelling, hives/welts) PLUS
- Respiratory involvement (i.e. wheeze, difficulty in breathing, upper airway obstruction, throat swelling) OR
- Cardiovascular involvement (i.e. tachycardia, hypotension, dizziness, collapse) OR
- Persistent gastrointestinal upset (i.e. nausea, vomiting, diarrhoea, abdominal cramping)

Alternatively, the ASCIA indicates that anaphylaxis may also be identified in the presence of sudden onset of hypotension, bronchospasm, or upper airway obstruction in the absence of skin features (ASCIA 2016).

Prehospital management

Management of anaphylaxis includes the following (ASCIA 2016):

- Remove the antigen where possible.
- Manage patient seated/supine – avoid mobilising due to potential for collapse.
- Administer IM adrenaline in line with local guidelines – multiple doses may be required.
- Provide oxygen as required in line with local guidelines.
- Provide anti-emetic as required, in line with local guidelines.
- Consider IV cannulation and fluid administration, in line with local guidelines.
- Consider nebulised adrenaline where indicated, in line with local guidelines.
- Consider nebulised bronchodilators (i.e. salbutamol) where indicated, in line with local guidelines.
- Consider antihistamines and/or corticosteroids, in line with local guidelines.
- Consider definitive airway management (i.e. intubation) as required, in line with local guidelines and scope of practice.

Some patients will carry an adrenaline auto-injector (Figure 23.2). It is important to ask if this has been administered prior to arrival on scene, so that appropriate subsequent management can occur. Some patients may carry multiple auto-injectors, so make sure you ask how many they administered, and at what time. It is also handy to know how effective the auto-injector was, so you can appropriately guide your therapy.

Figure 23.2 Auto-injector. Source: Landy et al. (2013). Reproduced by permission of John Wiley & Sons.

Conclusion

Paramedics must be able to manage a plethora of different medical emergencies. This chapter has provided an overview of common medical emergencies that a paramedic will face. The chapter is not intended to be an all-inclusive guide, but rather a guide to learning – take your new knowledge and explore these conditions in greater depth in order to maximise your management of medical conditions.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. In your own words, define cellulitis.
2. What is anaphylaxis?
3. Complete the missing items from Table 23.2.

Body system	DKA	HHS
Neurological	Lethargy, malaise, fatigue, confusion, coma	Lethargy, confusion, altered conscious state, coma
Respiratory		Tachypnoea
Cardiovascular	Tachycardia, hypotension, dysrhythmias	Tachycardia, pronounced hypotension, dysrhythmias
Integumentary	Flushed skin, dry mucous membranes, poor skin turgor	Flushed skin, severely dry mucosal membranes, poor skin turgor
Renal	Polydipsia, polyuria, ketonuria	
Gastrointestinal	Nausea, vomiting, abdominal cramps	Less severe symptoms than DKA
Serum levels		

4. Fill in the missing words:
Septic shock is defined as ____, or metabolic abnormalities that put the patient at increased risk of mortality.
5. Describe the prehospital management of a generalised seizure.
6. What is the difference between an ischaemic stroke and a haemorrhagic stroke?
7. List three reasons why a person receiving palliative (end-of-life) care might call for an ambulance.
8. UPCASTS is a mnemonic used to recognise signs of hypoglycaemia. What does it stand for?
9. List three triggers of a seizure.
10. What is a vasopressor?

Glossary

Cellulitis:	An infection characterised by inflammation of the cells.
Exudate:	Blood cells and fluid that seep out of tissues during infection or inflammation.
Immunocompromised:	Weakened immune system.
Ketones:	By-product created when the body breaks down fat.
Mean arterial pressure (MAP):	An individual's average pressure in arteries during a cardiac cycle.
Methicillin-resistant staphylococcus aureus:	Bacteria that causes infection in the body which is difficult to treat due to its resistance to commonly used antibiotics.
Multisystemic:	Affecting more than one system (affecting many systems).
Palliative care:	A specialised type of care concerning care of the dying.
Pathogen:	Organism such as bacteria, fungi, or virus that causes disease.
Trismus:	Severe clenching of the teeth.
Vasopressor:	Drug that causes blood vessels to constrict, consequently raising blood pressure.

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24

Caring for older adults

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Contents

Fundamentals of Paramedic Practice: A Systems Approach, Second Edition. Edited by Sam Willis and Roger Dalrymple.

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Learning outcomes

On completion of this chapter the reader will be able to:

- Identify physiological and cognitive changes that occur as a result of the ageing process.
- Recognise frailty and its associated conditions.
- Describe additional assessments appropriate for the older adult.
- Identify causes of trauma in the elderly population.
- Discuss some of the considerations in dealing with patients at the end of life.

Case study

You have been called to attend Jim, a 74-year-old diabetic patient, by a concerned neighbour. The neighbour tells you that Jim doesn't seem his usual self. He appears quite confused and when you assess Jim you find that he is hypoglycaemic. You treat his condition with oral glucose and his blood sugar returns to a normal level. He is adamant that he will not go to hospital as he feels fine, but you are concerned that he may not be managing his situation, as you notice unwashed plates stacked in the sink and uneaten breakfast in a bowl. On talking to Jim, you discover that he is recently bereaved and feels depressed and lonely. He has lost his motivation to go out and see friends and hasn't felt like eating as he has no appetite. You explain to Jim the importance of eating when taking diabetic medication, but you feel that he needs further support. He is not averse to talking to the general practitioner (GP) about his situation and so with his agreement you speak to the GP, letting her know your concerns. The GP is happy to see Jim later that day and says that there are a number of local support groups that Jim could attend. You leave Jim with safety-netting advice, satisfied that you have enabled him to access further support. The GP is happy with the information you have provided and, ultimately, Jim is happy that he doesn't have to go to hospital and that he can talk to his GP, who knows him well.

Introduction

The population is getting older. This means that paramedics will need to know more and do more to help the elderly when they call for help. Ageing has been described as any deterioration that occurs in a mature organism that results in an increase in vulnerability (Forciea et al. 2004). This chapter identifies and discusses key concepts when caring for the elderly in the prehospital context.

The elderly population

In your work as a paramedic, most of your patients will be elderly. The elderly are not a **homogeneous** mass and are amongst the most interesting people you will ever meet. If you are lucky, your older patients will share with you some of their many and varied life experiences. Remember that you are in a privileged position to care for this patient group.

A number of physiological, psychological, and socio-emotional changes occur as part of the normal ageing process. Such changes have impacts on an individual's feeling of wellness and must be considered when we seek to treat their illnesses. With an ageing population, access to high-quality assessment, treatment and care should not be restricted by age (Banerjee et al. 2012). The care provided by ambulance services must fit the needs of older patients, which are different from those of the younger adult population due to their differing physiology, capabilities, and responses to illness and injury.

A study by Jones et al. (2017) found that older people are more likely than those who are younger to use ambulance services for transport to the emergency department, even after controlling for factors such as presenting condition and number of medical conditions. This is thought to be due to the belief amongst older people that the ambulance is necessary and is the only means of dealing with the situation (Jones et al., 2017), which exemplifies the requirement for specialist education in the area of **gerontology**, and tailoring services to meet the needs of the ageing population.

However, the role of the ambulance service has changed from being a means of conveyance to hospital to providing care or signposting to care. The skill of the paramedic is in deciding when to convey to hospital and when to refer on to an appropriate care pathway. Alternative care pathways, such as falls referral teams and specialist paramedics, are becoming increasingly available to help manage a variety of conditions and prevent hospital attendance (Banerjee et al. 2012).

Assessing older adults

When assessing older adults, a social assessment is as important as a physical assessment. The older body has a reduced ability to heal, and the location of a patient's recovery is likely to be determined by the level of social support to which they have access. It can be much easier for hospital staff to start planning for discharge if they have a good assessment from the person who saw the patient in their home context. A full comprehensive **geriatric** assessment (CGA) is beyond the scope of the paramedic and takes around 90 minutes to complete, so is not appropriate, but taking a good social history from the patient and from any relatives or carers on scene is important.

Ageing affects every body system. Two important questions to bear in mind when assessing the elderly are:

- What impact will age have on the system I am examining?
- Is the change I am seeing a normal age-related change?

To be able to answer these questions, the paramedic will require a good understanding of the physiological changes that occur during normal ageing.

Physiology of ageing

Physiological changes during the ageing process occur in every body system, including the cardiovascular system, respiratory system, musculoskeletal system, the skin, the special senses, immunity, thermoregulation (temperature), and in the brain.

Changes to the cardiovascular system due to ageing

A combination of factors results in a decrease in cardiac output after the age of 40. Changes in the blood vessels make it harder for blood to flow: the arteries stiffen due to arteriosclerosis and atherosclerosis develops. The heart wall also stiffens and response to inotropic hormones decreases. Systolic blood pressure increases more markedly than diastolic pressure (Pinto 2007). The pressure receptors that detect blood pressure become less responsive, which means that it takes longer for the blood pressure to change when required (Scott-Warren and Maguire 2017). This explains why **orthostatic hypotension** and orthostatic syncope are more common in elderly people. Orthostatic hypotension is a fall in systolic pressure of at least 20 mmHg or a fall in diastolic pressure of at least 10 mmHg within three minutes of standing. This may be due to age-related cardiovascular changes or may be medicine induced (Pinto 2007).

Changes to the respiratory system due to ageing

Although overall lung capacity remains constant, vital capacity decreases and residual volume increases. This is because the chest wall becomes more rigid, the effects of the respiratory muscles lessen, and there is less elastic recoil of the lung (Scott-Warren and Maguire 2017). Many protective mechanisms weaken. As less saliva is produced and the mucociliary escalator becomes less efficient, colonisation of bacteria becomes more likely, resulting in a higher frequency of infections.

Changes to the musculoskeletal system due to ageing

There is a progressive decrease in muscle mass with advancing age. This is due to **atrophy** and loss of muscle cells. The strength of muscle contraction decreases, as does innervation of muscles (Kevorkian 2006). Bone mass also decreases, with around 10% of mass lost per decade in women and 5% per decade in men. Degenerative joint disease is extremely common, with around 85% of the over-70s suffering some degree of pain and movement restriction.

Skin

The epidermis becomes thinner through atrophy. Sagging and wrinkling become evident as the skin loses elasticity, particularly in exposed areas such as the face and hands. The number of blood vessels serving the skin also decreases with age. This means that the skin has a reduced ability to heal and hence its immune function is reduced if the barrier is breached (Kevorkian 2006).

Special senses

There is a functional decline in all the senses as we age. The implications of a less sensitive sense of smell may range from the benign overuse of perfume to the potentially dangerous inability to smell a smoke from a fire. The sense of taste also declines, with flavours having to be at least twice as strong at age 70 as at age 20. This is potentially problematic, since an individual may not recognise when food is dangerously inedible.

Hearing loss tends to be greater in men than in women. This may make conversation difficult or embarrassing, which may lead to a lower desire for social interaction.

Reduced visual acuity may render furniture an obstacle course. However, most people become expert at navigating the furniture in their own house. Bear this in mind if you need to move any furniture during your encounter with an elderly patient. It is very important that it is returned to the exact spot from which it was taken. Glare becomes a problem too. Try to make sure you are well lit and do not have a window or other bright light directly behind you. Colour discrimination also reduces, which may have implications for self-administration of medication.

Appetite lessens as taste and smell decrease and the antrum of the stomach fills more quickly. This leads to weight loss, which can in turn lead to pressure ulcers, hip fractures, and cognitive impairment (Scott-Warren and Maguire 2017).

Immune function

Immune function deteriorates, meaning that the elderly are more at risk from infection. There is also an increased prevalence of autoimmune illness and **neoplasms**. The elderly have a decreased response to vaccines (Kevorkian 2006).

Thermoregulation

The response to cold diminishes as vasoconstriction decreases. The body is also less able to respond to heat, as sweating becomes impaired due to decreased output from each sweat gland and reduced skin blood flow (Scott-Warren and Maguire 2017).

Dementia

Dementia is a condition caused by structural changes in the brain. It is not a normal consequence of ageing, although it is more prevalent in older people. Currently 1 in 23 people aged 65 years and above in the UK has dementia (www.alzheimers.org.uk) and there are more than 400 000 people in Australia with dementia. Of those, about 55% are women (Health Direct 2017).

Common symptoms of the condition include:

- Problems with memory (especially short-term memory)
- Changes in mood
- Difficulty concentrating
- Difficulty communicating

People with dementia can display some or all of these, but be mindful that such symptoms can also be caused by other medical conditions. For example, a person with diabetes who experiences a hypoglycaemic episode may appear confused, but once correctly diagnosed and treated will quickly recover.

It is important also to consider the possibility that your patient is displaying delirium. Whilst there are some behavioural features common with dementia, delirium is characterised by an acute onset linked to an underlying physical condition. Typically, the patient will present with clouded consciousness, poor attention and concentration, and a fluctuating pattern of symptoms (Banerjee et al. 2012). Where a patient is presenting with confusion, the paramedic should take a good history from family members/carers and should suspect delirium where there is any *sudden* change in mental state or behaviour.

If you have concerns about your patient's cognitive function, a quick and simple tool that can help in your assessment is the Abbreviated Mental Test score (AMT-4). This involves asking about place, age, date of birth, and year, and is a quick and easy assessment of cognitive impairment (Swain et al. 2000).

Usually, when you are called to a patient with dementia, the presenting condition will not be the dementia, but something more acute. In these cases, your decision on whether to convey the patient to hospital will be guided not only by that presenting condition, but also by the presence of dementia. A change of environment or routine can have a negative impact on a patient with dementia (Banerjee et al. 2012). Consider whether transfer to the unfamiliar, and often noisy, emergency department is really necessary, or whether the patient's current condition would be better managed by the GP or district nurse.

Multimorbidity

Multimorbidity is the term used to describe the state where an individual is suffering an accumulation of problems due to the coexistence of two or more long-term conditions. In Western countries, it has been reported that 55–98% of the older population are affected by multimorbidity (van den Akker and Muth 2014). It impacts all aspects of a patient's well-being: as well as the physical effects, it can threaten a patient's mental health, their financial status, and their emotional well-being.

Multimorbidity is associated with increased demand on healthcare services, not only because patients require more assessment and treatment for their conditions, but also from some of the consequences of multiple treatments. The concurrent use of five or more medications on a long-term basis, known as polypharmacy, can lead to problems. The more medications a person takes, the greater their chance of experiencing an adverse drug reaction. Some medications interact with other medications, which may lead to undertreatment of a condition at one end of the spectrum, and to hospitalisation or death at the other (van den Akker and Muth 2014). When attending patients who take a long list of medications, ask them when they last had a medication review. This information may be pertinent in the handover either to hospital staff or to the GP.

Not all older people with multiple conditions will encounter such problems. Those with low social support and low self-efficacy are more likely to feel burdened by multiple treatments, which places them at greater risk of a reduced quality of life. For these patients, it is even more important to find solutions that not only relieve their symptoms, but also allow the patient a degree of control over their choices and encourage social support and interaction (Bayliss 2014). GPs are often thought of as the gatekeepers to other health and social care services, but as a paramedic you may be the only healthcare worker who sees the patient in their home environment. You may recognise signs that the patient is overburdened and discuss with them the possibility of GP referral for review. Some systems encourage 'GP triage', whereby the paramedic speaks directly to the GP. This shared decision-making between patient, paramedic, and GP ideally leads to the most appropriate care and follow-up, leaving all parties feeling empowered.

Frailty

Frailty can be thought of as the opposite of resilience. It is indicative of a person's vulnerability. Normally we can call on our body's reserves to battle through illness and injury and restore health to previous levels. The frail person is already employing their reserves just to keep them at their normal level of health. Thus, any further insult presents a major challenge to their body. Patients with frailty may not be able to recover to their prior levels of activity and health following illness or injury (Donatelli and Somes 2017).

Most commonly associated with older age, around 10% of the over-65s have frailty and 25–50% of those are over 85 years (Clegg et al. 2013). With both absolute and relative numbers of elderly persons increasing, the paramedic is increasingly likely to encounter frail patients as their career progresses.

The patient described in Box 24.1 displays many of the symptoms that characterise frailty: weight loss, slow gait, exhaustion, low levels of energy, and poor grip strength (Fried et al. 2001). She also describes a possible reason for her declining health: the added strain of caring for her husband and the loss of social contact. Often people are able to cope with additional stressors if they have the protective effects of a social network to support them. Without that boost to their reserves, they become vulnerable to the effects of further demands.

Recognition of frailty

Although those with frailty often have multiple long-term conditions, that is not necessarily the case: some patients may have frailty but no long-term conditions. This latter group of patients may not be known to the GP (BGS 2014). The paramedic may be the first person to recognise frailty and is therefore well placed to refer the patient for a fuller assessment. The validated method for assessing frailty in older people is by undertaking a CGA. This takes account of all aspects of the person and their situation, not only their physical condition. However,

Box 24.1 A paramedic's observation

My first impression of Mrs Grey was that she just didn't look well. Her clothes were hanging off her and she moved *very* slowly across the room, finally collapsing, exhausted, into her armchair. She told me that she normally coped well with her numerous medical conditions, but since her husband had been ill, and she had become his carer, she was struggling to manage her symptoms. She had lost her appetite, had become increasingly isolated, and was finding it hard to cope.

this is impractical in the emergency situation, since it takes around 90 minutes to complete. Ambulance services are using alternative methods of identifying frailty that may be applied quickly and easily. The Rockwood scale is such a frailty scoring scale. It does not take full account of the patient's situation as in the CGA, but the score may be useful when referring a patient on from your care.

Activity

Go online and search for the Rockwood clinical frailty scale. Look at the different components of the scale and consider how you would apply it to a patient.

Implications of frailty

Paramedics should be especially mindful of the five frailty syndromes, the presence of any of which should alert the paramedic to look beyond the obvious signs and symptoms. A patient with frailty may express a serious underlying condition via one or more of these syndromes, shown in Table 24.1.

Paramedics are frequently called to attend a patient who has a 'collapse in the home' or to a patient who is 'off her/his legs'. Sometimes the cause is not obvious. But frail patients may be expressing nonclassic symptoms of a serious underlying illness, such as sepsis, stroke, or myocardial infarction, which would present in more predictable ways in younger patients (BGS 2014). Be mindful that these frailty syndromes may be masking something more sinister.

In each case, assessment of the patient's clinical condition should take priority. If there are no red flags for conveyance to hospital, consider the person's ability to undertake their activities of daily living. Frailty can vary in severity and the condition can be made better or worse in particular individuals (BGS 2014). Many older people with frailty will have developed their own coping mechanisms for retaining control over their day-to-day living, but when challenged by illness or social circumstance they may lose some of this control. For example, can they get out of bed and get to the toilet? Is there a significant decline in their ability to perform these functions? Consider their mental status: is this worse than usual?

When the frail person suffers a crisis, it is the paramedic's job to help restore this control. If the patient is not unwell but there is a change in their care needs, there may be a community-based solution that is more appropriate than hospital admission (BGS 2014). They may require referral to the GP or local community geriatric services for a CGA and development of a care and support plan. This will depend on the alternative care pathways available in your locality. Older people with frailty will tend to do better in their home environment, but only with appropriate support (BGS 2014).

Table 24.1 Frailty syndrome presentations

Falls
Immobility
Delirium
Incontinence
Susceptibility to side effects of medication

Source: Adapted from British Geriatrics Society (2014).

Practice insight

Beware of labelling your patient as 'frail'. Whilst this is a term used by healthcare professionals, many older patients may acknowledge their 'oldness', but reject the label 'frail' due to the social stigma and negative connotations associated with it (Robertson and Cook 2016).

Trauma

Over half of all patients suffering major trauma in England and Wales are aged 60 and over (TARN 2017). Whereas it was previously thought that this group suffered more major trauma during the winter months due to bad weather, it is more likely that their injuries are sustained in the home, and so there is little seasonal variation. The oldest old (85 years and over) are less likely to survive traumatic injury compared to the younger old (64–84 years); this may be linked to the fact that these patients tend to have multiple co-morbidities, thus rendering them frail (Sammy et al. 2016).

Prehospital triage tends to identify major trauma in the older population less reliably, due probably to the heavy emphasis on the teaching of the mechanism of injury to identify high-energy impacts. The elderly suffer major injury at far lower-energy impacts. If triage is inadequate, this may lead to patients being taken to inappropriate destination hospitals, which may result in treatment delays and/or assessment by a less qualified clinician.

Traumatic brain injury makes up a significant proportion of major trauma injuries in the older population, yet this is the age group who wait longest for a scan, perhaps due to difficulties in diagnosis if dementia is also present, or due to the slower development of symptoms resulting from slow-onset subdural bleeds stemming from relatively minor trauma (TARN 2017).

Falls

Falls are the most common reason for presentation to urgent care services (Banerjee et al. 2012). Besides the obvious risk of injury, there are often unseen consequences of falling, such as a loss of self-confidence. This can produce a downward spiral of reduced mobility leading to reduced strength, increasing the risk of further falls.

Practice insight

One of the most common fall-related injuries is hip fracture, which can be a life-changing or even life-ending injury. The paramedic therefore has a role not only in assessing and treating patients who suffer a fall, but also in prevention of potential future falls.

It is important to assess thoroughly any patient who has suffered a fall. When attending the fallen patient, remember to consider possible head injury or C-spine fracture. On approaching the patient, in addition to your patient assessment triangle (see Chapter 22), consider the environment in which they have fallen. Perhaps they were sitting on the side of the bed and have merely slipped onto a carpeted floor, or maybe they have fallen from standing onto a hardwood floor, their head making contact with the mantelpiece as they fell. Obtain a good history if possible before examining the patient. The patient themselves may have no memory of falling, so question any witnesses for confirmation of what happened. It is important to distinguish between **intrinsic and extrinsic** causes of the fall, and to consider any red flags (see Table 24.2).

Table 24.2 Red flags for falls.

Change in level of consciousness
Pain suggestive of fracture
Head trauma

Change in level of consciousness

Up to 20% of falls may be due to a transient loss of consciousness (TLoC) or 'blackout' (Banerjee et al. 2012). It is especially useful to question a witness was present who may be able to describe what happened. Ask about what they saw, including the patient's colour, position when they collapsed, whether they were shaking/jerking, and how long the episode lasted. If the patient has no memory of falling, and there are no witnesses to suggest otherwise, suspect TLoC (NICE 2010).

There may not have been a total loss of consciousness, but a reduced level of consciousness or new-onset confusion may be present. In either case, the patient will need further investigation at hospital.

Pain suggestive of fracture

You will need to conduct your standard assessment and examine the patient in order to determine whether they are injured. Be mindful of painful distracting injuries. Before moving the patient, consider the possibility of a C-spine injury and be sure you can rule this out. Once you have established the nature and extent of injuries or their absence, the patient will need to be moved. You will learn about a range of equipment and techniques that will enable you to help the patient off the floor with minimal manual handling.

Head trauma

Falls in the elderly are a leading cause of traumatic brain injury (Flannagan et al. 2006). Older people are more susceptible to brain injury, as the blood vessels in the brain weaken as we age, making them more likely to rupture during head trauma. Some anti-coagulant medications commonly used by older patients, such as warfarin, increase the likelihood of bleeding in the brain. Any patient taking anti-coagulants who has sustained a head injury must be presumed to be at risk of brain injury and conveyed to hospital for further assessment.

Long lie

In some cases, your patient may have been unable to alert anyone to the fact that they had fallen. When a patient has been immobile on the floor for an extended period (a 'long lie'). they may start to develop a condition called **rhabdomyolysis**, which may lead to potentially life-threatening kidney injury. Prolonged contact with a hard surface places the underlying muscle tissue under sustained pressure, which can result in permanent damage. When striated muscle is damaged through trauma, muscle cells die and release their contents into the circulation. In mild cases the patient may be **asymptomatic**, but in severe cases large quantities of **myoglobin** are released, which may lead to acute renal failure (Bosch et al. 2009).

The length of time it takes to develop rhabdomyolysis will vary for different people depending on factors such as the type of surface, whether they have been able to move around, existing co-morbidities, and hydration status. You should recognise the potential for the development of this condition, which can only be identified and managed in hospital.

Additional assessments in the elderly

As well as taking a falls history and conducting your usual patient assessment, it is useful also to assess the following (NICE 2015):

- Gait, mobility, and balance
- Muscle strength
- Urinary continence
- Visual impairment
- Cognitive impairment
- Osteoporosis risk
- Home hazards
- Medication
- Person's own perceived functional ability and fear of falling

Practice insight

It is important to make patients aware of the need for adequate fluid intake, the protective value of exercise and mobilisation, and the value of falls referral schemes. This is health promotion in action and paramedics are in a unique position in the community to be able to offer brief advice which may spur patients into action.

Pain assessment

Many people believe that pain must simply be accepted as an unavoidable consequence of ageing. Although often associated with degenerative conditions of older age, pain should not be considered a normal state (Weiner 2012). Unfortunately, there are many myths surrounding pain. Patients may believe that they ought to be stoic and resist analgesia until their pain becomes unbearable (Mann and Carr 2009).

Chronic pain in older people is often multidimensional. It is influenced by more than mere tissue damage. Social isolation, depression, fear, and co-morbidities are all likely to have impacts on the experience of pain. Conversely, experiencing pain is likely to lead to or exacerbate these problems (Weiner 2012).

Where a patient has cognitive impairment, pain may be expressed in terms of increased confusion, aggression, or social withdrawal. Such changes are only possible to detect for those who know the patient, such as a carer or relative. Other nonverbal cues such as grimacing, guarding, and crying are more universal and should be considered as possible pain indicators. The Abbey pain scale scores various pain signs and is widely used in the UK for the assessment of pain in patient with cognitive impairment (BGS 2014).

Where possible, assess the multidimensional aspects of pain:

- Sensory: nature, location, and intensity (using a recognised pain score)
- Affective: emotional response to pain
- Impact: on function

End-of-life care

'End of life' refers to the period leading to anticipated death, a situation that is increasingly planned for. Paramedics are called usually to provide transport to another facility or to manage an unexpected crisis. In some cases you will be called to manage reversible emergencies. These are situations that require time-critical transfer to the emergency department in order to improve quality of life. They include metastatic spinal cord compression, superior vena cava compression, and neutropenic sepsis (AACE 2016).

Just as paramedics have a role throughout the life course in facilitating a good quality of life, the aim at the end of life is to help the patient achieve a good death. A 'good death' may mean different things to different people, but it has been suggested that the ability to make their own decisions, to be comfortable, to retain dignity, and to be with family members are likely priorities for most (Brady 2013).

The National Institute for Health and Care Excellence (NICE) lists a number of priorities for clinicians supporting patients at the end of life. These include:

- Recognising when a person is in the last days of life.
- Good communication (with the patient, their family, and carers to support shared decision-making).
- Maintaining good hydration (although this is likely to be managed by the community nursing team, you should monitor for signs of dehydration and may be required to help a patient take sips of fluid).
- Pharmacological intervention (paramedics may administer prescribed 'just in case' medications).

Recognising when a patient is at the end of their life can be challenging, as the patient is likely to be unknown to the paramedic. Some of the signs in Table 24.3 may be evident.

Whatever situation you are presented with, you have a small window of opportunity to get to know the patient and their wishes in dealing with whatever crisis has presented.

Table 24.3 End-of-life signs and symptoms.

Abnormal clinical observations
Irregular breathing, possibly with apnoeic periods
Reduced level of consciousness
Impaired vision/fixed stare
Restlessness
Confusion
Loss of appetite
Loss of bowel/bladder function
'Rattling' respiratory secretions
Cool peripheries

Source: Adapted from AACE (2016).

Practice insight

Two key paramedic skills come into play in end-of-life situations: listening and consulting. You will need to listen to the patient and their family members/carers to ascertain the patient's needs and wishes, and you will need to consult medical records and possibly the community care team in order to deliver the desired care.

You may find that you need to manage pain, especially 'breakthrough' pain, as well as other symptoms such as breathlessness and noisy secretions, nausea and vomiting, anxiety and agitation. As with many symptoms, nonpharmacological treatments such as patient positioning and reassurance should be your firstline treatment. Should you require medication, these may be provided in a 'just in case' box. Paramedics are able to administer these medications as long as they are competent in the method of delivery, have access to information about the medications, and a signed and authorised Patient Specific Medication chart is present (AACE 2016).

The paramedic also has a role in supporting people's grief. Whether this is the anticipatory grief of the patient (or their relatives) or the post-death grief of the relatives, it is important to allow individuals to share their memories and anxieties. You can support people with empathic listening and reassurance that these feelings are normal (Brady 2013). You may be able to relieve distress from various causes. If the patient is becoming confused, gently remind them of the place, the time, and who is present. If the patient is incontinent, replace soiled pads so that they feel dry. Keep their lips moist with lip balm and keep them warm with extra blankets (Kitchener 2017).

When death comes, tactfully and unobtrusively establish that life is extinct and explain this to the family. The usual protocols for expected death should be followed. Ensure that the family have been signposted to the various support mechanisms available before you leave (Kitchener 2017).

Conclusion

Paramedics will spend a large amount of their time caring for the elderly population. To do so effectively requires a sound understanding of how ageing affects the whole person. This chapter provides a summary of key issues that will influence paramedic care whilst caring for the elderly population.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. Are the following statements true or false?
   a. The majority of the patients you encounter are likely to be elderly – true or false?
   b. A long time spent on the floor is of little consequence to the older adult – true or false?
   c. Paramedics may not give 'just in case' medications to patients at the end of life under any circumstances – true or false?
   d. Pain is a normal state for an older person – true or false?
   e. Older adults are at greater risk of traumatic injury in the home than outside – true or false?
2. What are the implications for healthcare in a society where the proportion of older people is increasing? Think about the level of demand for different types of service and where these might best be delivered.

Glossary

Asymptomatic:	An individual who presents with no symptoms.
Atrophy:	Wasting away.
Frailty:	A state of increased vulnerability.
Geriatric:	Term used to describe an elderly person.
Gerontology:	The scientific study of the ageing process and problems that occur in older age.
Homogeneous:	An object or substance that is uniform in composition.
Intrinsic vs extrinsic causes:	Causes internal to the person (e.g. dizziness) vs those that are external (e.g. tripping over a loose rug).
Myoglobin:	An iron/oxygen-binding protein located in muscle cells.
Neoplasms:	Abnormal growth of tissue on the body.
Orthostatic hypotension:	A fall in systolic pressure of at least 20 mmHg or a fall in diastolic pressure of at least 10 mmHg within three minutes of standing.
Rhabdomyolysis:	A breakdown of muscle tissue that can lead to acute kidney injury.

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Managing minor injuries in the prehospital setting

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Contents

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Learning outcomes

On completion of this chapter the reader will be able to:

- Discuss the term 'minor injury'.
- Identify the importance of history taking when managing a patient with a minor injury.
- Define the structured systematic approach to clinical assessment in patients with minor injuries (Look, Feel, Move).
- Discuss documentation and the medical model history-taking process.
- Identify and discuss a range of minor medical conditions and how to manage them.

Case study

You have received a call to a 85-year-old female who has fallen in the garden. As she fell she put her left hand out in front of her to stop the fall, but sustained a deep laceration to her hand, a 10 cm laceration to her forehead, and sprained her left ankle.

Introduction

This chapter will equip you with the knowledge and skills required to assess, treat, and refer minor injury patients within your everyday practice. Recognising the challenges of assessment and treatment within the prehospital environment, the chapter will allow you to consider the different referral pathways available, giving you the confidence to make sound clinical decisions.

What is a 'minor injury'? The question is more complex than it might first appear, since there is no universally accepted definition across regions, with variations existing between each ambulance and primary care trust. A minor injury is whatever has been agreed within your local area: this will have been decided at a senior level (for example at the **Clinical Governance Board** or within the **Clinical Commissioning Group**), based on the skills and competences of the practitioner within these units. Within Oxfordshire in the UK, for example, the practitioners working in minor injury units (MIU) comprise **specialist paramedics** (SPs), **advanced paramedics** (APs), and **emergency nurse practitioners** (ENPs); the skill sets between nurses and paramedics in this setting are almost identical. Following the recent publication of 'Next steps on the NHS five year forward view' (NHS England 2017), we will soon see MIUs integrating to form part of new u**rgent treatment centres** (UTCs). These centres will offer a combination of minor injury/illness and acute rapid assessment, operated by a wider team of multidisciplinary professionals, thus offering an extensive range of patient-centred care and assessment within primary care.

The best advice in terms of establishing what an MIU or UTC might cover in your own region or service is to find out exactly what your local agreement is regarding the type of injuries that such an establishment will routinely see (Box 25.1).

Box 25.1 Common ground between minor injuries units and urgent treatment centres

- **Musculoskeletal** and **ligamentous** Injury
- Mild head injury (Glasgow coma score 15)
- Eye injury
- Burns
- Foreign body removal
- Bites and stings
- Wound care
- Limb fractures
- X-ray facility

Background

NHS England (2017) suggests that between 1.5 million and 3 million people who come to accident and emergency departments each year could have their needs addressed in other parts of the urgent care system. With the ever-growing need and demand for urgent and ambulatory care services, national encouragement for NHS ambulance services to provide urgent and ambulatory care to services users within the community is high (NHS England 2013). NHS ambulance services must provide such care if patients are to receive 'Right care, First time'. Doing so will see an improvement in patient care and satisfaction, and a reduction in the increasing demand in the wider NHS economy (NHS England 2015).

Following the recent publication of 'Next steps on the NHS five year forward view' (NHS England 2017), there is an even clearer and stronger need for urgent care services to be provided outside acute hospitals across England. This is a requirement not only for integrated UTCs, but also for national ambulance services to respond appropriately to the ever-growing urgent care needs of service users; this should see appropriate utilisation and mobilisation of the SP/AP workforce. This has already opened up opportunities for SPs/APs to practise clinically within primary care settings (general practice, community rapid assessment teams, and UTCs) as part of collaborative working partnerships.

It is evident from this shift in the conception of prehospital care that knowledge and education in respect of minor injuries and illnesses are now essential elements of the role of a registered paramedic. This education and learning will form a solid grounding for future career development opportunities, within SP and AP practice (UK College of Paramedics 2015).

The importance of history taking

As with every clinical assessment, history taking (Box 25.2) is an important aspect of the assessment process, allowing clear understanding of the **mechanism of injury**, direction, magnitude, and duration of force and progress.

Before starting any physical assessment, it is important that you listen to and observe the patient to establish the full mechanism of injury. A reflective method that can be used to establish the facts in every situation is the '*What* happened, *When* did it happen, *Where* did it happen, *How* did it happen and *Why* did it happen' approach (Ghaye 2011).

Only once you have obtained a full history can a systematic approach commence.

Box 25.2 History taking: The medical model (related to injury)

PC = Presenting complaint
What is wrong with your patient, i.e. leg injury (specific)?
HPC = History of presenting complaint
What actually happened (specific)?
OLDCART:
Onset
Location
Duration
Characteristics
Attributing factors
Relieving factors
Treatment already given
Shx = Social history
Demographics – age, gender, occupation, leisure and hobbies, social circumstances, e.g. do they live alone, occupation, hand dominance – in arm/shoulder-related injury

Dhx = Drug history
What medication/dosage?
Any self-administration of analgesia? Time/dose?
Any known allergies, e.g. medicines, dressings?
Tetanus status
Pmhx = Past medical history
Relevant medical history, previous injury/surgery

Practice insight

Be sure to get into the habit of asking *what*, *when*, *where*, *how*, and *why* early on in your practice and for every patient, in order to establish a baseline of questioning which you can then build on throughout your career.

Consent to treatment

Before any physical assessment takes place, it is important to obtain informed consent from your patient(s), unless 'assumed consent' is appointed in an emergency situation. The Health and Care Professions Council describes consent as:

> [P]ermission for a student or registrant to provide any care, treatment or other services, given by a service user, or someone acting on their behalf, after receiving all the information they reasonably need to make that decision. (HCPC 2016)

It is therefore important to ensure that you have gained consent before any procedures are carried out, taking into consideration the differing backgrounds of your patient(s), including age, communicative ability, any learning disabilities, intoxication, language barriers, and religious beliefs. The patient is also entitled to have a chaperone present during any examination; it is always good practice to have one (where practicable). During the documentation process, ensure you accurately record how and when consent was obtained, along with the full details of the chaperone present as applicable. If a chaperone was declined, this should also be fully documented.

Clinical examination

The examination of a patient with an acute minor injury can often be difficult due to bleeding, swelling, pain, and anxiety; however, a systematic approach is required with every clinical examination. Before the examination takes place, it is important to understand the anatomy in detail (cartilage, ligaments, tendons, joints, muscles, bones) and to be aware of common injury patterns. Ensure that both you and the patient are comfortable and that you are able to examine the patient easily.

Examination of limbs

During examination of limbs, it is important to expose both limbs to allow for comparison, as well as to expose and examine the joint above and below the injury site, as commonly there are associated injuries within these areas (Purcell 2016). Checking the joint proximal to the injury first is good practice; usually the joint above is unaffected and this helps to make contact with the patient without causing too much discomfort or pain. During examination you should establish what is 'normal' for your patient. For example, do they normally walk with a particular gait; how flexible are they normally; is their right ankle always more swollen than the left?

When carrying out your examination, follow the standard orthopaedic practice of Look, Feel, Move.

Look

- Compare with the unaffected side.
- Bleeding, swelling, bruising (Figure 25.1).

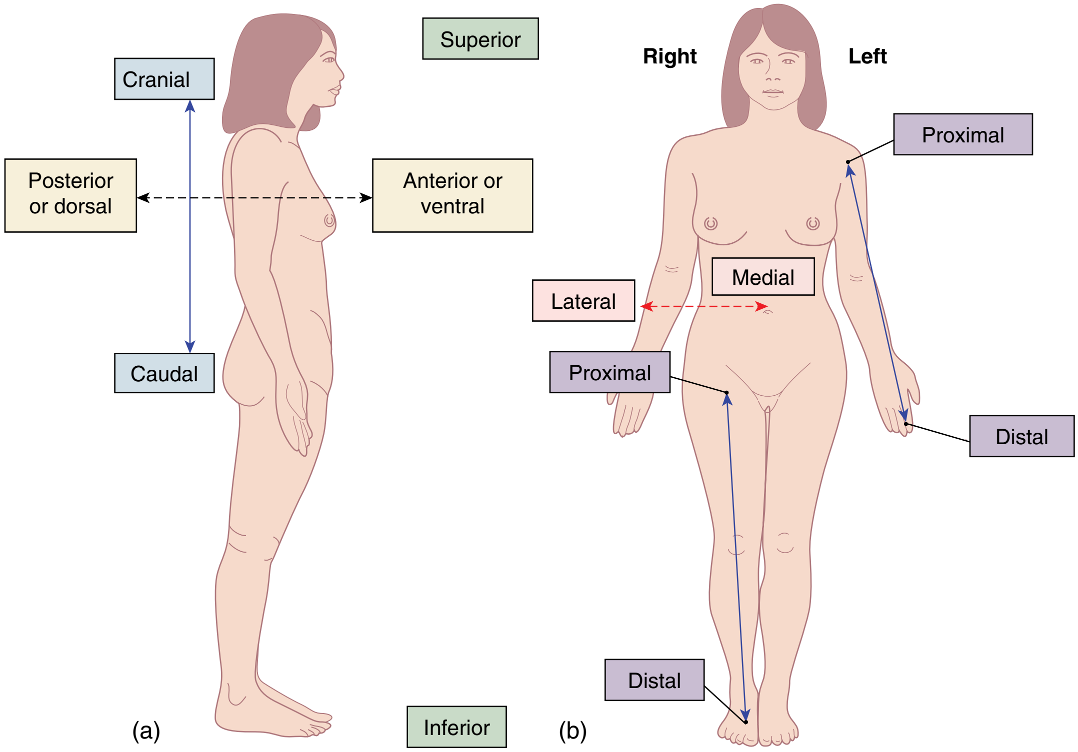

Figure 25.1 Anatomical positions – knowing your anatomical positions/landmarks will make for a smoother and more professional handover.

- Wounds/scars (Figure 25.1).
- Look from all angles/aspects.
- Foreign bodies.
- Deformity, wasting.
- Colour – cyanosis, pallor, **erythema**.
- **Tracking**, **lymphangitis**.

Feel

- Start palpating in the proximal joint away from the site of pain.
- Feel one area at a time, using a single finger.
- Identify the anatomical landmarks in a systemic manner.
- Relate surface anatomy to underlying structures and try to identify specific areas of tenderness.
- Observe for facial expressions and gestures, as well as verbal expressions of pain.
- Skin temperature.
- Crepitus.
- Check sensation (**two-point discrimination**).
- Feel for distal pulses/**capillary refill time**.

Any patient presenting with tenderness to any bony structures must be appropriately referred for an X-ray and further assessment.

Move

- Know how the joint is supposed to move.
- Compare the range of movement to the unaffected side.
- *Active movement* – the patient performs the movement, without assistance and using their own power.
- *Passive movement* – movement of the limb is performed on the patient by the clinician.
- *Resisted movement* – in testing resisted movement, the joints do not move and the integrity of the musculotendon is tested, e.g. a straight leg raise testing the extensor mechanism in the knee.

Any patient presenting with reduced movement should be referred to your local UTC or SP/AP for further assessment and possible physiotherapy review.

Your clinical assessment must indicate what injuries are possible and the urgency of diagnosis; this will help with decision-making and your referral process.

Practice insight

Be sure to protect the patient's dignity. For example, undertaking a 'Look, Feel, Move' assessment in the street might require blankets to be placed around the patient with assistance from police or other reliable bystanders.

Clinical documentation

Documentation is an important part of the examination process, allowing for clear and factual accounts of events, continuity of care, audit/research, and a legal record that can be used in a court of law. In court any account of events in which you have played a professional role will be taken from your notes made at the time of your assessment, thus the need for completeness and accuracy is paramount.

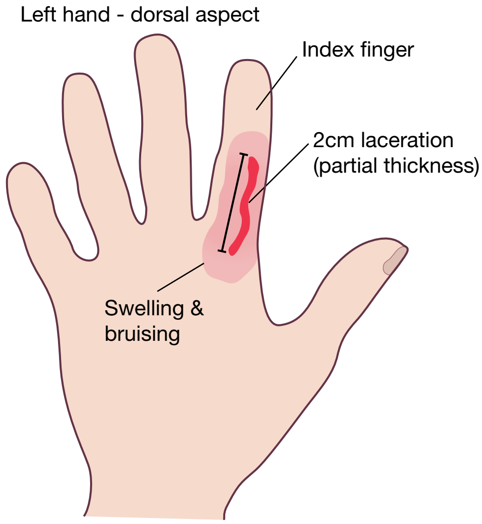

Figure 25.2 Assessment and measurement of a wound.

It is important to note and document exactly what your positive and negative findings are, following the Look, Feel, Move assessment method. Clearly document where these findings are situated anatomically (Figure 25.2). The use of diagrams to support your documentation is an excellent way to label and indicate where the injury is on the body. Most electronic patient records (EPRs) now have anatomical diagrams allowing the clinician to annotate the site of injury; however, if not you do not need to be an expert artist to produce diagrams. They will still prove to be a valuable aid and reference point, proving the value of the saying 'a picture is worth a thousand words'. Also remember to label the diagram, even if it is clear to you at the time of drawing; this includes labelling the body part, specifying whether it is right or left, back or front, and drawing and labelling the injury, specifying what the injury is, and its size and depth. Again, most EPRs will do this automatically for you, but is it always worth checking.

Be sure to document your findings, (both positive and negative) clearly and legibly, with the correct date, time, and patient details.

Minor head injuries

A significant number of emergency calls will require you to attend patients affected by falls, road traffic collisions, collapses, and assaults where patients or bystanders will state a history of a head injury. The severity of head injury can vary from patient to patient, depending on their perception of events, clinical observations, and the mechanism of injury. For example, a haematoma, laceration to scalp/eyebrow, or no visible injury to the head can all be classed as a head injury. All head injury patients need to be assessed neurologically in accordance with the UK's National Institute for Health and Clinical Excellence (NICE) Clinical Guideline 176 (2017) and the Joint Royal Colleges Ambulance Liaison Committee (JRCALC) Clinical Practice Guidelines (2016).

As the scalp has a complex vascular supply, when assessing head injuries it is important to establish the location of the wound and the source of the bleeding. The smallest of wounds in this area can cause extreme bleeding; it is important that the bleeding is controlled with basic techniques (pressure dressing), as some scalp lacerations are severe enough to cause hypovolemic shock and **acute anaemia**. Once you have controlled the bleeding, assessed the wound, and assessed the patient's neurological status, it may be appropriate to refer the patient to a UTC or SP/AP for wound closure. Once the bleeding has been controlled, a saline soak can be applied to keep the wound edges moist, allowing for good opposition of wound edges. The closure method will be at the discretion of the **autonomous practitioner** and may consist of staples, sutures, or skin adhesive.

Nasal injuries

Where a patient presents with a nose injury, a formal neurological head injury assessment must also be carried out. Remember to consider the mechanism of injury: was the patient knocked out and can you exclude a cervical spinal injury? Once you have carried out these assessments and ruled out any neurological deficits, an assessment of the nose itself can be carried out.

At this initial stage of the injury, there are some important areas that need to be assessed:

- Is the airway compromised?
- Is there a **septal haematoma**?
- Is there a severe **epistaxis**?
- Is there severe displacement?
- Are there associated fractures to the face?

If the answer to any of these questions is 'yes', then the patient needs to be transferred to the nearest emergency department for further assessment by ear, nose, and throat (ENT) specialists.

If a patient presents with a mild epistaxis (that has ceased) and/or mild displacement to the nose, then referral to a UTC or SP/AP would be an appropriate pathway. Following the practitioner's assessment, an outpatient ENT referral would be made, usually within 7–10 days of the initial injury. This allows for the initial swelling to subside and for easier manipulation to take place (Razavi et al. 2014; Basheeth et al. 2015).

Practice insight

When treating a nosebleed by pinching the cartilaginous aspect of the nose, do not be tempted to look for at least five minutes, as this may allow bleeding to resume. Also have a vomit bowl handy, as blood can sometimes find its way to the back of the patient's throat and they may need to expectorate excess blood.

Wound assessment and care

When it comes to wound care assessment, it is important to distinguish between the different types of wounds you are likely to assess (Box 25.3). This will assist in assessment, treatment, and documentation.

Assess and explore the wound fully to establish what type of wound you are dealing with, as well as assessing for underlying structural damage and possible foreign bodies, and of course establish the approximate size of the wound (Figure 25.1). Before you start to explore the wound, it is important that you explain the process to your patient and obtain verbal consent. It is also beneficial at this point to offer the patient simple analgesia, to allow for a comfortable examination where possible.

Areas of assessment for wounds include:

- History and mechanism
- Location and underlying structures
- Time of injury
- Size (accurate measurement) (Figure 25.1)

Box 25.3 Definitions of common wounds

- Cut (incised wound, incisional wound) – these involve a breach in the skin caused by a sharp edge, such as a kitchen knife or glass. The wound edges are well defined and are often straight, with little soft tissue bruising.
- Laceration (Latin *lacerare*, to tear) – a breach in the skin as a result of a fall, a blow from a blunt object, or crushing force. The wound is irregular, with tearing of the tissues.
- Contused wound – a breach in the skin with surrounding bruising.
- Contusion – an area of bruising due to a blunt force, without a break in the skin.
- Haematoma – a subcutaneous collection of blood giving rise to a fluctuant swelling.
- Penetrating wound – a wound with a fine path made by a pointed object, for example railing spike, knife, rusty nail.
- Burn – a wound caused by wet heat, dry heat, radiation, electricity, or chemicals.

- Colour and type of tissue bed (erythema, **exudate**, tracking)
- Description of wound edges and surrounding tissue
- Temperature (hot to touch; Baranoski and Ayello 2015)

Special considerations

Foreign Bodies

Ensure that the wound is clear from debris and foreign bodies before wound closure or dressing. If you are unable to clean the wound thoroughly, refer to and consult your local UTC or SP/AP for further guidance.

Fractures/bony involvement

Where a wound is present over a bony tender site, an open fracture should be considered until proven otherwise with radiological examination.

Range of movement

If you are able to see underlying visible structures (tendon or ligaments) or there is reduced range of movement (flexion/extension) at the joint of a wound, further investigation will be required.

Tetanus Status

Provided that the patient has had a full course of human tetanus immunoglobulin (five doses), it is considered sufficient to give lifetime immunity (NHS Choices 2016). Certain wounds are considered to be tetanus prone:

- Infected wounds
- Puncture wounds
- Wounds contaminated by soil or manure
- Wounds untreated >6 hours.

These patients may require passive immunisation with a human tetanus immunoglobulin; if there is any doubt, consult your local UTC or SP/AP for further guidance.

Bite wounds

Any patient who describes a human or animal bite (in particular from a cat or dog) should be assessed further by an SP/AP or practitioner within an UTC. These patients are usually commenced on prophylactic antibiotics due to the nature of the wound and the increased risks associated with infection.

Time of injury

A wound that requires suture closure >6 hours is assumed to be infected and therefore it is not always possible or appropriate for the SP/AP or UTC to commence closure. Again, you will need to consult your local UTC or SP/AP for further guidance, as some practitioners will close a wound >6 hours old.

Lip wound

If a facial wound crosses the boundaries of the lip, known as the 'vermilion border', these patients should be referred for a plastic surgeon assessment. This is due to cosmetic implications, as the vermilion boarder must be aligned so that the lip line is smooth. This referral can be made via the UTC or SP/AP.

Wound care

Once you have assessed the wound, you should clean it thoroughly with either running drinking water (Wilkins and Unverdorben 2013) or saline solution. It is important that the wound is cleaned as soon as possible to reduce the risk of infection and to remove any debris or foreign bodies to allow for adequate healing or wound closure.

Following your assessment of the wound, you may have decided that further assessment or wound closure is required. If the wound is open and requires closure, a nonabsorbent dressing soaked in saline or drinking water is preferable. This will allow the wound to be covered, reduce infection, control bleeding, prevent the dressing adhering to the wound, and allow the wound edges to remain moist, permitting good opposition of wound edges by the preferred method of closure. Wound closure can be achieved by many different methods:

- Sutures
- Staples
- Tissue adhesive (glue)
- Steristrips
- Skin link

Following further assessment by the autonomous practitioner (SP/AP/ENP), a decision will be made as to which method of wound closure would be appropriate, based on the information already discussed. All methods of wound closure can be carried out with ease by an SP/AP within the community environment. If closure of the wound is not required, the patient would benefit from an assessment from the local UTC or SP/AP, where they would be able to apply the appropriate dressing and refer to another healthcare professional in a few days, for further assessment and review (as required).

Ankle injuries

Ankle injuries make up a large percentage of emergency calls and account for about one-fifth of all sports injuries (Bahr and Maehlum 2004; Read 2008). They are also commonly caused by mechanical falls, with 85% of ankle injuries caused by inversion injuries. However, very little in the way of specific education in their treatment is offered to paramedics. As discussed earlier in this chapter, it is important to obtain a clear history and mechanism

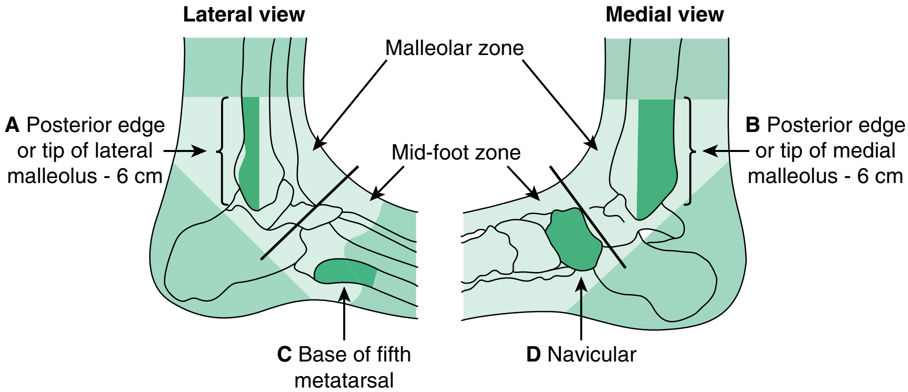

Figure 25.3 The Ottawa Ankle Rules. An X-ray image of the ankle is required only if the patient presents with tenderness in either the posterior edge or tip of the malleolus (a and b) or is unable to put weight on the ankle. An X-ray image of the foot is required only if the patient presents with tenderness in either the base of fifth metatarsal (c) or the navicular (d), or is unable to bear weight.

of injury from the patient and any bystanders. Doing so will help with diagnosis, treatment plan, and referral options to best meet the patient's clinical needs.

Once you have established a clear history and mechanism of injury, you will need to undertake a thorough clinical assessment using the Look, Feel, Move approach. Before you start your examination, it is important to explain the process to your patient, obtain verbal consent, and offer simple analgesia.

Assessment of an ankle injury should be guided by the Ottawa Ankle Rules (Figure 25.3), guidelines developed to aid emergency practitioners in deciding when to use radiography for patients with injuries to the ankle. Stiell et al. (1994) showed that these rules led to a decrease in the use of ankle radiography, waiting times, and costs, without patient dissatisfaction or missed fractures. The rules can be used by paramedics within the prehospital environment as an aid to clinical decision-making.

Using the Ottawa Ankle Rules as an aid to examination will allow for safe diagnosis and appropriate treatment of ankle injury. If, following your examination, you have excluded a bony injury and the need for ankle radiography, a referral to your local UTC or SP/AP for further advice and physiotherapy (as required) would be appropriate. It is important to understand that although your patient may not have a bony injury, they could be suffering from a ligamentous injury. These are graded according to the severity of the injury, and such patients should still be reviewed by your local UTC or SP/AP.

Minor burns

Minor burns and scalds, particularly in children, are a common occurrence in the prehospital setting. It is important to assess each burn individually and commence rapid treatment to minimise the risks of complications, such as scarring, blistering, and infection. Consider the six-stage treatment plan for minor burns shown in Table 25.1.

Most minor burns can be managed appropriately within the prehospital environment by an SP/AP or at a UTC, where there will be access to specialist dressings and referral pathways. A specialist follow-up referral can also be made to the nearest burns unit, allowing the patient to be assessed further as an outpatient if necessary.

Each ambulance service will be part of and have direct access to a burns network where there are referral guidelines and advice on hand for any type of burn. It is good practice to find out which burns network is your nearest and obtain a copy of its referral guidelines.

Table 25.1 Six-stage treatment plan for minor burns.

Stage	Treatment	
1	**Cooling**	Cool the affected body area for a minimum of 20 minutes, ideally with cool running water
2	**Analgesia**	Burns are very painful and it is important to administer appropriate analgesics as soon as possible
3	**Assessment**	Assess the burn thoroughly. Does the burn require further assessment or treatment? If so, be guided by your local referral guidelines
4	**Cover**	Cover the burn with clingfilm and cover the clingfilm with a wet dressing to keep the affected area cool. You may have to continue cooling on route to hospital using 0.9% sodium chloride
5	**Consideration**	Consider complications such as ABCs (Airway, Breathing, Circulation), hypothermia, intravenous fluid challenge, nonaccidental injury
6	**Review**	Continually review and assess

There has been a good deal of discussion about whether blisters should be removed. The London and South East Burns Network (LSEBN) recommends that burn blisters over the size of the patient's little fingernail should be 'de-roofed'. This is something that you will not be able to do as a paramedic, but it is a clinical skill which your SP/AP or local UTC will possess.

Transporting minor injury patients

Paramedics must possess the confidence, knowledge, and competence to make decisions regarding suitable alternative transport methods for onward referrals and treatment for patients with minor injuries. You should always ask yourself: 'Does my patient really need an emergency ambulance to safely transport them to the nearest UTC?' Consider the questions in Box 25.4.

It is the responsibility of the registered paramedic to ensure that they are confident and competent in their decision-making and actions, in accordance with local and national policies.

Box 25.4 Transport for minor injury patients

Question	Response	Safe outcome
Is the patient clinically stable? Have you ruled out all 'red flags'?	Yes	✓
Does the patient have capacity?	Yes	✓

Question	Response	Safe outcome
Do they require any ongoing treatment on route?	No	✓
Are they likely to deteriorate on route following their current injury?	No	✓
Have they been administered any analgesia such as intravenous morphine to manage their pain?	No	✓
Have you given the patient verbal and written 'safety netting' advise?	Yes	✓
Will they be safe via another method of transport? (relative, patient transport service, car, taxi)?	Yes	✓
Does your local policy/guidance support non-ambulance transport?	Yes	✓

If there is a safe outcome to all of these questions, ask yourself: 'Do they really need an emergency ambulance for transportation?'

Conclusion

This chapter has outlined methods of minor injury assessment and treatment in everyday paramedic practice and has indicated the different referral pathways available to paramedics, supported by their UTC or SP/APs, to make sound clinical and patient-focused decisions in order to achieve the best outcomes.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. Define 'mechanism of injury'.
2. List the characteristics of a Look, Feel, Move assessment.

3. Define the Ottawa Ankle Rules.
4. List the six-stage treatment plan for a minor burn.
5. Identify the referral criteria for an urgent treatment centre in relation to minor injuries.
6. What are the five wound-closure methods available in the prehospital setting?
7. What are the five considerations during a nose injury assessment?

Activity 25.1

Based on your prior experiences, write a detailed history using the 'medical model' approach to history taking. This should be based on a patient where you have been involved in the assessment or treatment process of an injury.

Activity 25.2

1. What is a haematoma?
2. What is a penetrating injury?
3. What is a contused wound?

Activity 25.3

Describe the different characteristics of the types of wounds you could encounter in your role as a paramedic and the considerations for these wounds.

Activity 25.4

1. Ankle injuries are commonly caused by which mechanism?
2. Do you need to gain verbal consent from your patient before assessing the limb?
3. What guidelines should guide the paramedic when treating an ankle injury?

Activity 25.5

Reflect on a variety of patients you have attended recently. Could any of them have been managed at home or by an alternative care pathway?

Make contact with your local urgent treatment centre and specialist/advanced paramedic, and find out what their referral criteria are for minor injuries. You may be surprised by what they can do to help!

Glossary

Acute anaemia: Anaemia caused by internal bleeding resulting from the rupture of a blood vessel.

Advanced paramedic (AP): An experienced paramedic who has undertaken, or is working towards, a Master's degree in a subject relevant to their practice. They will have acquired and continue to demonstrate an expert knowledge base, complex decision-making skills, competence, and judgement in their area of advanced practice.

Autonomous practitioner:	A practitioner with the authority to make decisions and the freedom to act in accordance with their professional knowledge and competence.
Capillary refill time:	The time taken for a distal capillary bed to regain its colour after pressure has been applied to cause blanching. On a healthy person/limb this should be <2 seconds.
Clinical Commissioning Groups	NHS organisations set up by the Health and Social Care Act 2012 to organise the delivery of NHS services in England. They include a wide range of multidisciplinary professionals, acting as commissioners of services.
Clinical Governance Board:	A multidisciplinary team of senior clinicians and managers who ensure patients receive the highest possible quality of care.
Emergency nurse practitioner (ENP):	A nurse who has studied at a higher academic level and works to a medical model, with the attitude, skills, and knowledge to deliver holistic care and treatment within the prehospital, primary, and acute care settings with a level of autonomy for minor injuries/illness.
Epistaxis:	A nosebleed or haemorrhage from the nose, usually due to the rupture of small vessels overlying the anterior part of the cartilaginous nasal septum.
Erythema:	Redness of the skin caused by dilatation and congestion of the capillaries, often a sign of inflammation or infection.
Exudate:	A fluid that has exuded out of a tissue or its capillaries due to injury or inflammation.
Ligamentous:	Referring to a sheet or band of tough, fibrous tissue connecting bones or cartilages at a joint or supporting an organ.
Lymphangitis:	Inflammation of a lymphatic vessel.
Mechanism of injury:	The circumstance in which an injury occurs, for example sudden deceleration, wounding by a projectile, or crushing by a heavy object.
Musculoskeletal:	Referring to the system of muscles and tendons and ligaments and bones and joints and associated tissues that move the body and maintain its form.
Septal haematoma:	A mass of extravasated blood that is confined within the nasal septum.
Specialist paramedic (SP):	A paramedic who has undertaken, or is working towards, a postgraduate diploma in a subject relevant to their practice. They will have acquired and continue to demonstrate an enhanced knowledge base, complex decision-making skills, competence, and judgement in their area of specialist practice.
Tracking:	Line of least resistance taken by pus from abscess cavity to exterior surface/internal cavity/remote site.

Two-point discrimination:	Ability to discern that two nearby objects touching the skin are two distinct points, not one.
Urgent treatment centres (UTC):	Operating a minimum of 12 hours a day, 7 days a week, integrated with local urgent care services and offering accident and emergency care to patients who do not need hospital treatment by a wider range of multidisciplinary clinicians, with access to diagnostic facilities.

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Major incident management

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Contents

Fundamentals of Paramedic Practice: A Systems Approach, Second Edition. Edited by Sam Willis and Roger Dalrymple.

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Learning outcomes

On completion of this chapter the reader will be able to:

- Define the term major incident.
- Recognise how to declare a major incident.
- Discuss ways of managing the scene of a major incident.

Case study

On 22 May 2017, in the foyer of Manchester Arena, a suicide bomber detonated an improvised explosive device. The subsequent report stated: 'The bomb killed twenty-two people including many children. Over one hundred were physically injured and many more suffered psychological and emotional trauma. Paramedics treated many walking wounded in the city centre. Hospitals in Greater Manchester treated people with serious injuries, transported by the Ambulance Service, whilst others made their way to hospitals across the wider region' (Kerslake et al. 2018, p. 5).

Within 11 minutes the first ambulance arrived on scene. If you and your partner were this crew, would you know what to do?

Introduction

Ensuring preparedness for major incidents is an important component of a paramedic's professional responsibilities. Whilst major incidents do not occur frequently, their effects can place significant stress on responding agencies and the health system in general. For the purposes of this chapter a major incident is defined as 'any incident where the location, number, severity, or type of live casualties requires extraordinary resources' (Mackway-Jones 2012, p. 3). The notion of extraordinary resources is an important qualifier. This implies that the definition is not set by any specific threshold, but rather is relative to the resources normally available in an area. What is considered a major incident in a large city would be quite different to a major incident in a small rural town.

Major incidents have numerous causes, including, but not limited to, acts of terrorism, industry- and transport-related accidents, fires, floods, and other natural disasters, biological hazards, and communicable diseases. As major incidents escalate they can rapidly exhaust the capacity of responding agencies. As such, it is often not possible to provide the degree of patient care that would normally be available during smaller-scale events. Major incident management thus has two key elements: allowing the efficient management of available resources to prevent a reduction in patient care and, when this is not possible, ensuring that the limited resources are applied in such a way that they can achieve the greatest benefit for the greatest number of people.

Major incident management is a specialist field and specific training and practice through exercises and real events are needed to become **proficient** in the required skills. The nature of major incidents means that they could occur anywhere, with all available resources being required to manage the event. As such, all emergency service professionals should have a good understanding of the principles of major incident management and their role within their jurisdiction's major incident plans.

This chapter will review the techniques for safely managing an incident scene, including the requirements of effective command of on-scene resources and for establishing communications with higher tiers of the management structure. It will then consider the requirements of effective casualty management, including

triage, treatment, and transport considerations. Having considered on-scene management, attention will turn to broader incident management systems that may be used at the strategic, operational, and tactical levels of a response effort. Finally, emergency management arrangements will be covered, including the legislative arrangements for prevention, preparedness, response, and recovery (PPRR) as relevant to major incidents.

Managing the incident site: first ambulance on scene

On arrival at a major incident, the first paramedic crew adopts command and triage responsibilities for the incident. The paramedic who adopts triage responsibilities becomes the triage officer and commences the **Sieve** and **Sort process**. Information gained during triage – patient numbers, priorities, and mechanism of injury – needs to be communicated to the paramedic who adopts command responsibilities.

The primary and initial responsibility of the command officer is to communicate incident information to ambulance control through a preliminary assessment. This is a vital process, as information from the incident site is used to activate predetermined emergency plans and leads to the appropriate major incident response from ambulance services, hospitals, emergency services, and other key emergency management stakeholders.

Declaring a major incident: METHANE and SAM

In both Australia and the UK, the mnemonic **METHANE** is widely used across ambulance jurisdictions to provide a common communication model for passing information between incident site, major incident management centres, and other incident response organisations (JESIP 2016; Mackway-Jones 2012). Some services use ETHANE rather than the full METHANE model.

- Major incident
- Exact location
- Type of incident
- Hazards
- Access
- Number of casualties
- Emergency services

In addition to ascertaining and communicating information pertaining to the METHANE report, the commanding paramedic should adopt the responsibilities of the Bronze Commander for the prehospital care service provider. In achieving these responsibilities, the **commander** needs also to consider health service scene layout. Regardless of incident type, prehospital care service providers will require key locations to be established (as no two incidents are the same, incident layout will change according to the contextualised needs of the incident itself). These may include a forward control point, ambulance command post, ambulance loading point, ambulance parking and access point, body holding area, and casualty clearing station. The METHANE report stands for (Figure 26.1).

A second and much shorter mnemonic known as SAM can also be used to help the first crew on scene to reflect on what is occurring, before making the final decision to call it a major incident. The tool can be applied in any order, meaning that it can be used quickly (Figure 26.2):

- Situation unfolding
- Access
- Major incident declared

M	MAJOR INCIDENT	Has a major incident or standby been declared? (Yes/No - if no, then complete ETHANE message)	*Include the date and time of any declaration.*
E	EXACT LOCATION	What is the exact location or geographical area of the incident?	*Be as precise as possible, using a system that will be understood by all responders.*
T	TYPE OF INCIDENT	What kind of incident is it?	*For example, flooding, fire, utility failure or disease outbreak.*
H	HAZARDS	What hazards or potential hazards can be identified?	*Consider the likelihood of a hazard and the potential severity of any impact.*
A	ACCESS	What are the best routes for access and egress?	*Include information on inaccessible routes and rendezvous points (RVPs). Remember that services need to be able to leave the scene as well as access it.*
N	NUMBER OF CASUALTIES	How many casualties are there, and what condition are they in?	*Use an agreed classification system such as 'P1', 'P2', 'P3' and 'dead'.*
E	EMERGENCY SERVICES	Which, and how many, emergency responder assets and personnel are required or are already on-scene?	*Consider whether the assets of wider emergency responders, such as local authorities or the voluntary sector, may be required.*

Figure 26.1 METHANE model.

Practice insight

The situation can change rapidly, particularly in the early stages of a major incident. Regularly assessing the elements of the METHANE model will assist commanders in evaluating the situation and ensuring that higher levels of command have sufficient information. It is often more helpful to have early and frequent communication of this sort than it is to wait and confirm all details exactly.

The casualty clearing station serves as a secondary triage (Sort) and treatment area. This area must be safe and sheltered with adequate lighting, and have appropriate access to/from the triage area/scene and to/from the ambulance loading point. When a casualty clearing area is established, the different areas for patient priority (red/yellow/green) need to be identified and clearly marked.

Component of the SAM model	Description of each component
Situation Unfolding	Provide an accurate description of what you are seeing, identifying the type of incident,estimated number of casualties and resources required.
Access	Identify the best access into the site.
Mass casualty incident declared	At this final stage you can now confidently declare a major incident, having had chance to reflect on the situation using the SAM model.

Figure 26.2 SAM mnemonic for assessing and reporting on a major incident.

Practice insight

As more personnel arrive at the incident scene, it is critical that the commander reviews workloads and clearly allocates responsibilities. Deliberate resource allocation is necessary to ensure that there is no duplication of effort and that tasks are not missed. This is also important as the incident scales down. Too many extra resources can become a logistical burden for the commander, so should be stood down when appropriate.

Casualty management

Triage

During mass casualty and major incident events, triage is employed when the number of casualties exceeds the clinical and operational capacity of the responding paramedics to manage the needs of the incident. Triage itself, as with many prehospital care practices, was first established in a military environment, with the goal of treating less critical patients and returning them to battle before engaging in the treatment of the severely wounded. This practice promoted maintaining a battle- capable force whilst not wasting valuable resources on unsurvivable or **incapacitating** injuries where patients could not contribute to the ongoing war effort.

In modern clinical practice, the objective of the triage process in a multicasualty incident is to achieve the greatest good for the greatest number of casualties. This is in contrast to traditional healthcare arrangements, whereby the most critical casualties receive the highest level of care and have the greatest amount of resources assigned to their care. The triage process allows clinical choices to be made on the presumed survivability of the causality so as not to waste valuable clinical resources on irrecoverable injuries. In essence, it is about 'doing the most for the most'.

Today, both Australia and the UK employ **mass casualty** incident management systems based on Major Incident Medical Management and Support (MIMMS) practices. Within clinical practice, triage maintains a focus on rapid assessment (Sieve), a secondary physiological appraisal of the patient (Sort), and transporting the patient to the most appropriate hospital at the most appropriate time with consideration of resource availability.

During a major incident, responding paramedics are often confronted with a chaotic environment that requires rapid clinical decision-making. To establish order out of chaos, the triage Sieve process provides a fast, easy, safe, and consistent system that engages in life-saving first aid whilst clinically prioritising patients. Using patient mobility, respiration, and pulse rate, the clinician can establish the clinical priority of the patient, allocating a priority score of One (immediate), Two (urgent), or Three (delayed).

For those patients with the ability to walk, it is a reasonable assumption that the **pathophysiology** of their injuries is not life threatening and that they do not require urgent or immediate treatment. For those patients who cannot walk, the Sieve process uses the physiology of the body's compensatory mechanisms (respiratory rate and pulse rate) to inform treatment priority. For those patients who are not breathing, the practice is to engage airway opening. Patients who breathe on airway opening receive a score of One (immediate), whilst those who do not breathe are considered clinically dead. It is important to convey that the clinically dead patient does not receive active resuscitation, as this will detract valuable resources from patients with survivable injuries. After establishing the patient's breathing status, respiratory rate per minute is ascertained. Patients with a respiratory rate of less than 9 or higher than 30 receive a score of One (immediate). If the patient's respiratory rate falls between 10 and 29, then heart rate per minute is employed to give a final Sieve score. Those patients with a heart rate of 120 or more receive a score of One (immediate), whilst those who have a heart rate of 119 or less receive a score of Two (urgent).

Practice insight

During the Sieve process, the paramedic does not engage in clinical treatment past airway opening (*rapid* application of haemorrhage control may be considered). The Sieve is designed to be clinically rapid whilst providing an assessment of the situation to determine appropriate resource allocations, decide on additional emergency response requirements, and assist in the development of the METHANE report.

Sort

After the completion of the initial Sieve, triage transitions into the second phase called Sort. This consists of a formal physiological appraisal of the patient that employs a modified **Triage Revised Trauma Score (**TRTS**)** (Champion et al. 1989). For each patient, the TRTS assesses blood pressure, Glasgow coma scale, and respiratory rate to assign a numerical score (Figure 26.3). The TRTS has been rigorously validated as an independent predictor of patient survivability and mortality (Lichtveld et al. 2008). Additionally, it empowers ambulance crews to make evidence-based decisions around the appropriateness of the destination hospital considering the severity of injury. These assessments are essential, as seriously injured patients have the greatest chance of survival at a multidisciplinary trauma centre (Lichtveld et al. 2008).

The TRTS derives a score of between 0 and 12, with the result of the score directly articulating into a revised patient priority. The Sort process should be considered as an evidence-based refinement of the patient's original priority derived from the Sieve. A patient's priority may change during the Sort or during standard ongoing patient reassessment. Those patients who receive a score of 10 or less are given a priority of One (immediate); those who receive a score of 11 get a priority Two (urgent); and those who receive a score of 12 are allocated to priority Three (delayed).

There is an additional fourth expectant priority (expectation of death), although it is not widely used by Australian or UK prehospital service providers. If the fourth priority is used, then a TRTS of between 1 and 3 should be employed as its definition (Carley and Mackway-Jones 2012).

Paediatric patients

The triage Sieve and Sort process is based on adult physiological parameters. Considering this, if the physiological parameters of the adult triage process are applied to the paediatric patient, the patient will receive a 'false high' triage priority. This is an important observation, as specialist paediatric medical resources can be further limited

Triage Sort - Trauma Revised Triage Score System and Priority Correlation

Physiological Variable	Measured Value	Score
Respiratory Rate (Per Min)	10–29	4
	>29	3
	6–9	2
	1–5	1
	0	0
	Respiratory Rate (Per Min) Score =	
Systolic Blood Pressure	≥ 90	4
	76–89	3
	50–75	2
	1–49	1
	0	0
	Systolic Blood Pressure Score =	
Glasgow Coma Scale	13–15	4
	9–12	3
	6–8	2
	4–5	1
	3	0
	Glasgow Coma Scale Score =	
Total Score TRTS (Resp Rate + Blood Pressure + GCS) =		
Priority	**TRTS Score**	
T1	**1–10**	
T2	**11**	
T3	**12**	
Dead	**0**	

Figure 26.3 The Triage Sort process. Adapted from Mackway-Jones (2012); Champion et al. (1989) Trauma Revised Triage Score.

by over-triaging. This can lead to greater degradation of medical resources and thus the capacity to deal with genuine high-priority paediatric patients (Mackway-Jones 2012). As a result of probable paediatric overprioritisation, MIMMS best practice now promotes use of a paediatric triage tape. This asserts that patient length is directly proportional to age, weight, and vital signs (Mackway-Jones 2012). When the tape is placed directly beside the paediatric patient, a modified triage score is deduced as a result of correlating patient length against the predetermined vital signs displayed on the paediatric triage tape.

Triage tags

Throughout the triage process, individual patient priority needs to be clearly displayed so as to communicate the patient triage assessment finding to all medical and rescue staff. Triage labelling generally takes the form of triage tags. These need to be highly visible, to display and allow for alteration in patient priority, and to be secured to the patient so as not to be lost during subsequent patient movement or transportation.

Treatment

Whilst considering resource availability and patient priority, treatment at the scene should be aimed at providing life-saving clinical interventions and patient stabilisation that allow for safe transportation whilst not exacerbating the patient injury profile. Overall, medical management will be optimal if treatment is kept at this standard – if too little is done, the patient will die unnecessarily; if too much is done, then time spent with that patient could lead to the needless death of other patients (Mackway-Jones 2012).

Transport

Whilst patient triage and treatment are important aspects of casualty management, so too are patient transport and hospital destination. Mass casualty management is as much about triage and treatment as it is about transporting the 'right patient, at the right time, to the right hospital'. Decisions relating to transport are complex and intertwined, with no one isolated factor influencing the decision-making process. Considerations such as patient injury profile, age, sex, triage priority, patient stabilisation for transport, and number of patients of each triage category that a hospital can accept all influence transport timing and the decision-making process. Take for example a paediatric patient: in most occasions it will be best to select a specialist paediatric receiving facility over an adult facility. Further, a patient who has a significant head injury should be transported to a tertiary neurological trauma centre, whilst patients with severe burns should be transported to a burns centre.

Practice insight

Patient transport priority and timing should align with patient triage and treatment priority. However, in clinical practice, treatment and stabilisation together with the complexities of the transport decision-making process may permit those of a lesser priority to be transported first. For example, patients who are a priority three can generally walk and be stabilised for transport relatively fast. Additionally, a bus/taxi could be employed to transport these patients with no implications for those of higher priority.

Incident management system

An incident management system is a set of principles and processes used when responding to all emergencies, from a single-crew response through to large and complex multiagency operations. Having a consistent approach to incident management is critical to ensure that response activities can scale up and down efficiently and effectively. A key component of all incident management systems is the way in which management responsibilities are divided. At a high level, these are separated into three key functions: command, control, and coordination. They may be explained using the example of a major road traffic crash.

- *Command* refers to the way directions are issued within organisations. At the crash scene, the highest-ranking paramedic will usually adopt the role of ambulance commander. This person will then issue instructions, through the chain of command, to the paramedic crews on the ground. This chain of command exists within each responding agency, so there will be a number of commanders in place for any single incident (e.g. police commander, fire commander).
- *Control* differs from command in that it refers to the overall management of the incident. The authority for control usually comes from legislation or is set by agreement via emergency plans. In our example, the police service has the legislative responsibility for managing traffic incidents. It adopts overall responsibility for the scene and for the activities of organisations working to resolve the incident.
- *Coordination* is concerned with the management of resources and information in support of the incident. In our road traffic crash example, coordination may initially be conducted through routine management systems, such as the allocation of paramedic crews across a number of current emergencies. In more significant and protracted events, coordination is often managed by a coordinating group or committee who meet to address strategic coordination issues. This is often the case during mass casualty incidents or disasters.

As an incident increases in size or complexity, it will be necessary to have more management personnel available. It is the responsibility of the incident controller to ensure that sufficient staff are in place and that the scale-up process is managed effectively. Having too many staff reporting to a single person will limit their ability to manage their role in the incident effectively. Similarly, having too few staff reporting to a single person results in inefficient communication as information is passed up and down the chain of command. The Australasian Inter-service Incident Management System (AIIMS), the dominant incident management system in Australia, recommends a ratio of 1 supervisor to 3–7 subordinates as a guide (Australasian Fire and Emergency Services Authorities Council [AFAC] 2017). Managing this process is referred to as maintaining an effective 'span of control' and is one of the key principles of the AIIMS system. Another related principle of AIIMS is 'unity of command', the idea that each person should report to a single superior officer. This principle eliminates any dual reporting relationships, simplifying communication and ensuring clarity when key tasks are allocated.

Incident management systems also provide guidance on the decision-making process. One example is the Joint Decision Model (JDM) that has been adopted by emergency services in the UK (Joint Emergency Services Interoperability Programme [JESIP] 2016). It may be applied to incidents of any scale. At its simplest, the JDM may be used as a mental checklist, assisting commanders at the scene to develop a robust action plan. In larger incidents it may be managed by a team of incident management specialists, each responsible for components of the decision-making process. One of the key steps in the JDM is the development of a working strategy. It is during this step that the commander articulates their intent for the management of the incident, including a desired end-state. It should clearly state the who, what, when, where, and why of the planned response. When done effectively, this helps to coordinate response activities by providing all personnel with a clear vision of what they need to achieve. The working strategy is then further developed to incorporate additional options or contingencies as required. A similar approach is adopted in the AIIMS system, which refers to the principle of 'management by objectives' (AFAC 2017). Commanders using this approach should clearly articulate the objectives they seek to achieve, and then assess operational progress and performance against them.

Practice insight

Incident management systems have evolved to include a large number of roles and responsibilities, procedures, and requirements. It is important to remember that these are tools to support an effective incident response, and that they should be applied flexibly to the specific needs of each incident. Incident managers must consider their activity in the context of the effect it has on the ground, and on the overall incident objectives, and then tailor management processes to achieve an effective outcome.

Table 26.1 Tiers of incident command.

UK terminology	Australian terminology	Responsibility
Gold Command (Strategic)	Regional Command (Strategic)	Set policy and resource parameters for incident response
Silver Command (Tactical)	Incident Command (Operational)	Develop and manage an overall plan for the incident
Bronze Command (Operational)	Sector or Division Command (Tactical)	Implement the incident plan based on area of responsibility (functional or geographical)

As an incident response scales up, management responsibilities will be separated into a number of tiers. This ensures that responsibilities are clearly defined, preventing confusion and duplication of effort. Whilst the specific terminology varies between jurisdictions (see Table 26.1), the same principles are widely applied. The top level of command is responsible for setting the overall response strategy, including determining the policy parameters for the response and which resources will be allocated to the incident response. This command tier is removed from the scene and will usually operate from the responding organisation's headquarters or a joint emergency service facility. The next tier, the silver or incident command level, has direct responsibility for the resolution of the incident and for the management of responding personnel. This tier of command will either be located at the incident scene or, in large-scale or protracted events, may also operate from a nearby emergency services facility. The final tier, the bronze or sector command, will be located on the incident ground and is responsible

Case study: Ravenshoe explosion

> On 9 June 2015 at approximately 12.05pm, an explosion occurred at the 'Serves You Right Café' in the Far North Queensland town of Ravenshoe. The explosion was allegedly caused by the collision of a utility vehicle with gas cylinders at the side and towards the rear of the café. The explosion resulted in at least 21 injuries at the scene. Of those injured, two individuals subsequently died in hospital. (Department of Health and Cairns Hospital and Health Service 2016, p. 10)

Ravenshoe was a small town, so there were limited resources available for the immediate response. This, combined with the large number of people requiring treatment, meant that it very quickly escalated to a major incident. Resources from the ambulance service, hospital and health service, and other emergency services had to work together to coordinate the influx of resources and ensure that the best possible care could be provided to the victims. The specialist nature of burns treatment meant that some victims were transferred by air as far as Brisbane, nearly 1700 km away. This shows how the effects and management of a major incident can extend well beyond the immediate scene.

The post-incident review highlighted a number of challenges that are typical of major incidents. For example, it noted that the true scale of the incident was not apparent until personnel arrived at the scene. It also described some of the challenges dealing with scarce resources, such as on-scene paramedics having to balance the requirements of triage and treatment on the one hand, against the need to command the incident effectively on the other (Department of Health and Cairns Hospital and Health Service 2016).

for implementing the response plan. There will be a number of bronze commanders responsible for different geographical areas or for different response functions.

Emergency management

Whilst incident management focuses on the direct resolution of emergency situations, that will occur within a broader set of legislative and management arrangements. These arrangements typically outline how government, nongovernment, and private-sector entities work together to manage emergencies. These arrangements address the coordination of activity before, during, and after an emergency, including in the phases of PPRR. These are typically referred to as emergency management or disaster management arrangements, depending on your jurisdiction.

Within Australia, emergency management is the responsibility of state and territory governments, meaning that approaches to emergency management vary across the country (Australian Institute for Disaster Resilience 2014). Despite this, there many similarities between the various legislative arrangements. Most jurisdictions operate using a three-tier management structure, involving coordination groups at the local/municipal, district/regional, and state/territory levels. In the case of large, complex, or multiple incidents, these groups may be called on to coordinate the multiagency response and to manage strategic issues, including liaison with elected officials.

In the UK, emergency management is governed by the Civil Contingencies Act 2004 (Walker and Broderick 2006). Under this act, organisations with emergency management responsibilities come together in Local Resilience Forums. These groups are nonoperational, and focus purely on the coordination of risk assessment, planning, and preparedness. Whilst not outlined in the Act, Regional Resilience Forums are also in operation and address similar responsibilities over a larger area. Operationally, emergency management is handled through coordinating groups that operate at the strategic, tactical, and operational levels. The organisations participating in these groups will depend on the nature of the incident being managed.

Paramedic organisations play an important role in emergency management arrangements. As one of the key responders for many major incidents, it is important that paramedic organisations are involved in the development of emergency plans and testing of these plans through exercises. In a response setting, paramedics are often some of the first personnel on scene, and the information relayed from paramedics to the emergency management system can be an important part of assessing the situation to determine strategic response options.

Conclusion

Effective management of any major incident is a complex process that far exceeds the typical clinical requirements of routine prehospital care. For the healthcare professional, major incident management not only has implications for on-scene clinical cares, but also brings forth challenges in incident command, control, and coordination.

Clinically, the prehospital healthcare professional is required to abstain from traditional clinical interventions that detract from the ideology of 'doing the most, for the most'. This very practice can challenge healthcare professionals' own ethical principles and judgement.

Early reporting using tools such as METHANE or SAM is paramount to ensure a measured strategic and tactical response to any major incident. For ambulance services, hospitals, emergency services, and other key emergency management stakeholders, risk **mitigation**, emergency planning, and major incident management exercises are integral to ensuring that a robust, tested response can transpire when a major incident occurs.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. What is the definition of a major incident?
2. What does the acronym METHANE stand for?
3. Sieve the following patient: The patient cannot walk, they are breathing at a rate 8 breaths per minute, and they have a pulse of 100.
4. Sort the following patient: Glasgow Coma Scale = 13, respiratory rate (per/min) = 32, systolic blood pressure = 95.
5. What are the two goals of medical treatment during a mass casualty event?
6. In clinical practice all patients must be transported in the order of their triage priority – true or false?
7. Command relates to the overall control of an incident, and is established in plans or legislation – true or false?
8. Consider the Ravenshoe case study and construct a METHANE situation report based on the information that would be available on arrival.
9. Multiple bronze commanders can report to a single silver commander at a major incident – true or false?
10. What are the four phases of emergency management?

Glossary

Commander:	A person of authority, in command or control.
Incapacitating:	Making a person unable to function normally.
Mass casualty:	An incident that involves multiple injured individuals (casualties).
METHANE:	A recognised model for utilisation in a major incident, involving multiple services.
Mitigation:	Reducing the severity of something.
Pathophysiology:	Physiology of an abnormal or diseased organism; functional changes caused by a disease.
Proficient:	Possessing advanced skills and being competent at doing/using something.
Sieve process:	Prioritising patients involved in mass incidents.
Triage:	Prioritising a degree of urgency to patients' wounds/illnesses in order of treatment required.
Triage Revised Trauma Score (TRTS):	A physiological scoring system to triage patients.

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Low acuity

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Contents

Fundamentals of Paramedic Practice: A Systems Approach, Second Edition. Edited by Sam Willis and Roger Dalrymple.

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Learning outcomes

On completion of this chapter the reader will be able to:

- Understand the basic aspects of low acuity care.
- Understand how to approach and implement low acuity care.
- Identify equipment used by ambulance services to manage and treat low acuity patients.
- Understand what the holistic approach to community healthcare is for your patients and how low acuity care and community paramedicine are shaping the future of this industry.

Case study

You have just finished assessing your patient, Mrs Jones. Mrs Jones called you today as she wasn't feeling herself. After assessing Mrs Jones you don't find anything clinically wrong, but you do notice aspects of activities of daily living (ADL) around the house and from your history taking, that warrants you to dig a little deeper and ask a few more questions about why Mrs Jones called you today. Mrs Jones informs you that she is starting to struggle with keeping the house clean, her arthritis in her hands is now making it harder to cook and make meals, and she is also having trouble remembering which of her medications she needs to take and at what time she needs to take them each day. While you are with Mrs Jones, her daughter calls and Mrs Jones passes her phone to you to speak with her daughter. The daughter confirms Mrs Jones's history about her issues at home and with her medications. The daughter then informs you that she will come and see her mum later today. Her daughter also tells you that her mum is due for her bi-monthly visit to her doctor, who is aware from their last visit that Mrs Jones is starting to struggle with ADL and that these would be reviewed again at their next visit. You determine that Mrs Jones doesn't need to visit an emergency department today, but that she would benefit from seeing her local doctor/medical practitioner as she is due for her bi-monthly check-up. You contact Mrs Jones's local practitioner by telephone, provide an IMIST-AMBO handover based on your assessment findings this morning, and arrange an appointment for Mrs Jones to go down with her daughter later that afternoon.

Introduction

This chapter will focus on low acuity care in the field of paramedicine. In Chapter 20 we discussed patient assessment skills, focusing on a systematic way to approach and treat conscious and unconscious patients. We will begin this chapter by focusing on the basic aspects of what low acuity care actually is. From here you will be introduced to assessing low acuity patients, building on the assessment skills learnt in Chapter 20 and adding in specific assessment techniques, depending on the needs of your patient. In this chapter we will discuss the impact that low acuity care can have on the patient, the health system, and economic costs, and how all this fits into the overall holistic approach to community healthcare.

Low acuity care is a speciality in its own right, with many ambulance services internationally adopting their own models to fit their own needs. This chapter has not been designed to make you into a low acuity specialist.

It has been designed to show what low acuity assessment skills and history-taking techniques you can use in your current practice to expand on and improve your patient care delivery. Who knows? You may find this aspect of paramedicine so interesting that seeking out a career in community paramedicine or a dedicated low acuity paramedic response team becomes your next or future paramedicine career move.

What is low acuity care?

Low acuity care strips away the lights and sirens of ambulance work and focuses back on the medicine side of prehospital care. Low acuity patients do not always end up in a hospital emergency department. Some patients may stay at home and some patients may be taken to their local medical practitioner, or even referred to specialist areas such as diabetes management, age care assessment, or mental health assessment teams. An easy way to summarise is that with low acuity patient care, you are trying to identify the most appropriate location within the healthcare system for your patient's needs.

For example, after you have assessed your patient, you determine that they do not need to visit an emergency department, but would benefit from seeing their local doctor/medical practitioner. You contact this patient's local practitioner, provide an IMIST-AMBO handover (see Chapter 20) via telephone, and arrange an appointment for her. In some cases, some medical practitioners may even offer to see the patient immediately and get you to drop the patient off to them without making an appointment. Ambulance services adopting this approach relieve some of the demand on already stretched hospital emergency departments. At the same time, they have the beneficial effect of reconnecting patients with their local medical centres and general practitioners (GPs).In the UK, a recent change in legislation (Human Medicines Regulations 2012) now allows specifically trained community/low acuity/advanced-level paramedics to prescribe antibiotics in the same way as doctors, dentists, pharmacists, and some senior nurses and therapeutic radiographers already do (Campbell 2018). This change in thinking or holistic approach to healthcare is designed to help relieve the burden on emergency departments and lower their operating costs, allowing funds to be redirected to other important areas of health research or funding within other community health programmes.

Other key areas in which low acuity care is benefiting the community and applying a holistic approach to health include:

- Frequent user management
- Post-discharge management
- Integration with medical centres

Frequent user management

Frequent users are patients who call ambulance services on a regular basis: two, three, and more times a week (and in some cases, every day or more). Every time a paramedic crew is dispatched to these patients, it means one less crew that can respond to other emergencies. A low acuity paramedic would assess these patients not only from a medical perspective, but from a causative perspective too. Identifying one or both of these issues can lead to a rapid decrease in callouts by paramedics and better health outcomes for the patient. Common examples of areas to look out for when attending a frequent patient callout are:

- Falls and why are they happening
- Medication compliance
- Social welfare/living conditions

Falls can be an indicator of a much bigger medical problem, but equally they can sometimes be avoided by actions as simple as looking around the patient's house to identify trip hazards which can be removed. You might be surprised by how a simple task like reducing trip hazards in the location of a repetitive falls patient can have a demonstrable impact on their improved mobility at home and a consequent reduction in ambulance callouts. However, it is extremely important to conduct a full neurological assessment on all patients who suffer a fall to help rule out any potential or indicator of a bigger medical problem.

Medication compliance can cause several problems for a patient. Depending on why the patient called you today, lack of medical compliance could be the primary cause. You will need to look at your patient's medications and see why they are taking them, to assess whether that is related to today's presentation or if not taking them has unmasked something else, something new. Noncompliance reasons can be as simple as not being able to afford the medication, dementia, the patient being too busy and forgetting to refill the script, or taking the medication outside the recommended dosage time (for example, once a week or fortnightly rather than every day). The patient may also not have the ability to get to the pharmacy, either because of disability or lack of transport and distance.

Social welfare/living conditions can also play a big part in frequent callouts. Loneliness or simply liking the attention provided by attending paramedics can be a major factor. Your patient's living conditions can also play a major part in their health and well-being. Unhygienic homes, living amongst filth and/or vermin, or living on the street are all common scenarios you will see as paramedics. Identifying and directing care pathways or support services for these patients both benefit the patient and reduce the potential economic impact on the healthcare system at the same time.

Post-discharge management

Post-discharge management is aimed at identifying specific patients that show or have a high probability of readmission 30 days after discharge (Calams 2018). The implementation of such a strategy in the Alameda Community Paramedicine Programme in California has reduced hospital readmissions by 75% since 2015 (Calams 2018). The key aspect to the success of post-discharge management is to ensure that a strong relationship is built between hospitals and medical facilities. This approach will ensure a strong link in the approach to holistic community healthcare.

Integration with medical centres

Most people, when asked, would assume that a patient transported away in an ambulance is on their way to hospital. However, examples from community paramedicine programmes now operating in Canada, the USA, Australia, and the UK show that this is not always the case. Instead, working closely with medical centres and clinical consultation services, each of these programmes provides pathways of direction to the most appropriate part of the healthcare system, to meet each patient's needs.

GPs play a major role in community healthcare, with their clinics generally located in a central part of their community. Successful low acuity and community paramedicine programmes have a strong collaborative relationship with these clinics. With more and more ambulance services reporting instances of hospital ramping and emergency departments at or beyond capacity, medical centres, clinical consultation lines, and GP clinics provide an excellent alternative for patients. This also follows the low acuity mantra of patient care by 'providing the most appropriate part of the health system to meet our patient's needs'.

As you can see from those examples, low acuity care involves more than simply identifying a medical diagnosis. Successful low acuity paramedicine work is integrated across a range of community healthcare organisations, reflecting a holistic approach to community healthcare. Low acuity care is central to the developing role of the paramedic, providing a significant step forward in how we deliver patient care and bringing a positive economic impact to the healthcare system.

How to approach low acuity care patient assessment

Low acuity care really puts the 'medicine' inside 'paramedicine'. With low acuity patients, we spend more time gathering history, assessing their presenting conditions, and then trying to compile all that information in a clinical decision-making process that provides the best possible patient care journey and outcome for that patient. In Chapter 20, Paramedic Assessment Skills, we discussed the role that primary and secondary surveys play when managing patients and using a systematic approach to their care. In low acuity assessment, we will again take that systematic approach and expand on it according to each patient's presenting condition (see Table 27.1).

Table 27.1 Patient assessment and history-taking process.

Patient assessment term	Meaning
Chief complaint (CC)/**presenting symptoms** (PS) This is the first information you gather from your patient (where possible) and should help direct further information gathering to assist with your treatment and future questioning.	• Why are we here today? • The primary and immediate problem your patient tells you in their own voice • If there are multiple complaints, triage them from most serious to least serious
History of presenting illness (HPI) Use this information to help delve deeper into why your patient has called you today. Use your medical detective skills.	• What are the details of the current symptoms/complaints today? • Any other history of a previous/similar issue today or recently? • Have they tried any treatment prior to your arrival (drugs, rest, heat etc.) and has it worked? • Is this condition causing any functional disability and, if so, how bad is it?
Past medical history (PMH) Use this information to provide your patient's current and background health history Some of this information may be relevant to the current PS and HPI	• Patient's past medical history • Patient's drug allergies • Patient's current prescribed medications • Female patients – any menstrual or reproductive issues?
Social history (SH) Use this information to further build on your patient's current and previous health history Some of this information may be relevant to the current PS, HPI, and PH A bigger clinical picture of your patient's CC may start to develop	• Occupation (some occupations have associated conditions related to them) • Any history of smoking, if so how much? • Alcohol intake, yes/no, how much, how regular? • Any history of illicit drug taking, if so what, how often? • Sexual history/partner, married, same sex, heterosexual sex, other • Recent overseas travel, if so where and when?

Table 27.1 (*Continued*)

Patient assessment term	Meaning
Family history (FH) May or may not be relevant to PS or HPI However, if PS shows first signs of FH symptoms, this is a **red flag** and should be treated accordingly	• Diseases in the family – first-degree level, e.g. father had a heart attack when he was 39 or mother suffers from diabetes etc.
Systems review (SR) Here you review the various body systems specific to your patient's PS and HPI This includes asking about other systems or disorders to ensure you do not miss any important diseases or symptoms	Reviewing the various systems within the body: • Cardiovascular • Respiratory • Gastrointestinal • Genitourinary • Breasts (women) • Haematological • Musculoskeletal • Endocrine • Neurological • Skin

When gathering the patient history, there are two ways in which we can systematically collect this information, subjective and objective.

S – Subjective

The patient provides the information to us. Examples include:

- Chief complaint (CC)
- Presenting symptoms (PS)
- History of presenting illness (HPI)
- Past history, social history, and family history (PH, SH, FH)
- Systems review (SR)

O – Objective

The paramedic observes or assesses the patient to gain the information. Examples include:

- Vital signs
- Type of pain or result during a physical examination such as palpation
- What you hear when you listen for:
  - Chest sounds
    - Normal (vesicular)
    - Bronchial turbulent
    - Adventitious sounds like wheezing or crackles
    - Any pleural friction rub
    - Absent – you hear nothing at all
    - Whether left is equal to right and what the intensity of the breath sounds is
  - Heart sounds
    - Whether you hear S1 and S2

    - Extra heart sounds (S3 and S4)
    - Additional sounds such as snaps, prosthetic, or clicks
    - Murmurs or rubs
  - Abdominal sounds
    - Present or absent
    - Intensity of sounds:
      - Loud/high pitched
      - Rushing
      - Friction rub, which gives a creaking or grating noise when auscultated
- What you see when you read:
  - Medication list/chart
  - Medical history, discharge information sheet, or other medical practice patient medical record

Performing a systems review

The systems review (SR) is a detailed review of the systems or PS you have identified during your initial patient assessment history taking. It is also important to ask any questions related to other systems not identified in the PS and HPI, to ensure you do not miss any other diseases or disorders that could be connected. It is important to remember that not all the questions are required for every patient. For example, questioning a 21-year-old patient with a broken leg may require fewer questions than for a 87-year-old presenting an exacerbation to their **chronic obstructive pulmonary disease** (COPD). Table 27.2 provides you with a list of questions you can use in your SR to assist with your patient assessment. When you are assessing your patients, you need to decide just how detailed your SR should be.

Table 27.2 Questions for performing a systems review (SR).

If you see a Red Flag next to any of the suggested SR questions, it indicates a possible dangerous, urgent problem. 🚩

General questions to ask your patient
- Have you noticed shivering or sweating at night or have you had a high temperature? 🚩
- Have you unintentionally lost weight recently? 🚩
- Have there been changes in your appetite?
- Have there been changes in your pattern of sleep?
- Have you felt that your mood has changed?

Cardiovascular system
- Have you had any pain or pressure in your chest? If so, does this occur during exertion? (Angina) 🚩
- Are you short of breath on exertion? (Dyspnoea) If so, how much exertion is necessary? How many flights of stairs can you climb before you start to become short of breath?
- Have you ever been woken at night by severe shortness of breath? (Paroxysmal nocturnal dyspnoea) 🚩
- Can you lie flat without feeling breathless? (Orthopnoea)
- Have you had swelling of your ankles? (Peripheral oedema) Or varicose veins?
- Have you noticed your heart racing or beating irregularly?
- Do you have pain in your calves on walking? (Claudication)
- Do you have cold or blue hands or feet? (Peripheral cyanosis)
- Have you had rheumatic fever, a heart attack or high blood pressure?
- Also ask about specific cardiovascular risk factors:
  - Has your cholesterol level been checked recently? If so, has it been treated or left untreated?
  - Have you been diagnosed with diabetes mellitus? If so, for how long?
  - Do you smoke? If so, for how long, how many cigarettes?
  - Do you have a family history of cardiovascular disease? If so, which family members and at what age?

Table 27.2 (*Continued*)

Respiratory system
- Are you short of breath at rest?
- Have you had any cough?
- Do you cough up anything? (Productive cough)
- Have you coughed up blood? (Haemoptysis, carcinoma of the lung)
- Do you snore loudly or fall asleep during the day unexpectedly? (Possible obstructive sleep apnoea)
- Do you ever have wheezing when you are short of breath? (Bronchospasm)
- Do you have night sweats?
- Have you had pneumonia or tuberculosis?
- Have you had a recent chest X-ray?

Gastrointestinal system
- Have you had a sore tongue or mouth ulcers?
- Are you troubled by indigestion? If so, what do you mean by indigestion?
- Have you had any difficulty swallowing? (Dysphagia: oesophageal malignancy)
- Has your appetite or weight changed? If so, how has it changed?
- Have you had episodes of burning discomfort in the chest that rises up towards the neck? (Heartburn)
- Have you been taking antacids or over-the-counter indigestion medicines?
- Have you been taking laxatives or tablets for diarrhoea?
- Have you had pain or discomfort in your belly (tummy)?
- Have you had any bloating or visible swelling of your belly?
- Has your bowel habit changed recently?
- How many bowel motions do you usually pass per day?
- Have you lost control of your bowels or had accidents? (Faecal incontinence)
- Have you seen blood in your motions or on wiping? (Haematochezia)
- Have you vomited blood or had black bowel motions? (Melaena)
- Do you take laxatives or use enemas?
- Have your eyes or skin ever been yellow? (Jaundice)
- Have you noticed dark urine and pale stools?
- Have you had hepatitis, peptic ulceration, colitis, or bowel cancer?
- Tell me about your diet recently.

Genitourinary system with sexual health
- Do you have burning or pain on passing urine? (Dysuria)
- Is your urine stream as good as it used to be?
- Is there a delay before you start to pass urine? (Hesitancy)
- Is there dribbling at the end when you pass urine?
- Do you have to get up at night to pass urine? (Nocturia)
- Are you passing larger or smaller amounts of urine?
- Have you noticed leaking of urine? (Incontinence)
- Has your urine colour changed? Is your urine dark?
- Have you seen blood in your urine? (Haematuria)
- Have you had a urinary tract infection or kidney stones?
- Do you have any problems with your sex life?
- Have you noticed any rashes or lumps on your genitals? (Male)
- Have you had a sexually transmitted infection?
- Do you have difficulty maintaining an erection? (Male)
- Have you had penile discharge or skin lesions? (Male)
- Have you ever felt lumps in your testes? (Male)
- Are your periods regular? At what age did you begin to menstruate (menarche)? (Female)
- Do you have excessive pain (dysmenorrhoea) or bleeding (menorrhagia) with your periods? (Female)
- Do you have bleeding after sex? (Female)
- Have you had any miscarriages? (Female)
- Have you had high blood pressure or diabetes in pregnancy? (Female)

(*Continued*)

Table 27.2 (*Continued*)

Breasts (female)

- Have you had any bleeding or discharge from your breasts?
- Have you felt any lumps in or around your breasts?
- Have you had a recent mammogram, ultrasound, or breast examination?

Haematological system

- Do you bruise easily?
- Have you had bleeding from your gums? (Bleeding disorder or leukaemia)
- Have you had fevers, or shivers and shakes (rigours)?
- Do you have difficulty stopping a small cut from bleeding?
- Have you noticed any lumps under your arms, or in your neck or groyne? (Lymphadenopathy)
- Have you had blood clots in your legs (venous thrombosis) or lungs (pulmonary embolism)?
- Have you had anaemia?

Musculoskeletal system

- Do you have painful or swollen joints? If so, what joints are affected?
- Do you suffer from morning stiffness? If so, how long does it last?
- Are your joints ever hot, red, or swollen?
- Have you had frequent muscle pains or cramps?
- Have you had a skin rash recently?
- Do you have any back or neck pain?
- Have your eyes been dry or red?
- Is your mouth often dry? (Sjögren's syndrome)
- Have you been diagnosed as having rheumatoid arthritis or gout?
- Do your fingers ever become painful and go white, then blue, then red in the cold? (Raynaud's phenomenon)
- How much do your joint problems interfere with normal activities?

Endocrine system

- Have you noticed any swelling in your neck? (Goitre)
- Do your hands tremble? (Tremor)
- Do you prefer hot or cold weather?
- Have you had a thyroid problem or diabetes?
- Have you noticed increased sweating?
- Have you been troubled by fatigue?
- Have you noticed any change in your appearance, hair, skin, or voice?
- Have you noticed a change in your hat, glove, or shoe size? (Acromegaly)
- Have you been unusually thirsty lately? (Uncontrolled diabetes)
- Have you been passing large amounts of urine? (Polyuria)

Neurological system

- Do you get headaches? How often/how intense? (Potential for more serious problem)
- Have you had memory problems or trouble concentrating?
- Have you had fainting episodes, fits, or blackouts?
- Do you have double vision? (Diplopia) Or other trouble seeing or hearing?
- Are you dizzy? Does the world seem to turn around? (Vertigo)
- Have you had weakness, numbness, or clumsiness in your arms or legs, or trouble with your balance or walking?
- Have you had a stroke or serious head injury? (See Chapter 17, Nervous System Assessment, on why this is so important)
- Have you had difficulty sleeping?
- Do you feel sad or depressed or have problems with your nerves?
- Have you ever considered suicide?

Table 27.2 (*Continued*)

Skin • Have you had a rash or itching? (Pruritus) • Have you had similar rashes in the past? • When did the problem start? • Has the rash changed or become more widespread over time? • Have you had any recent illnesses or travelled anywhere? • Have you had asthma or allergic rhinitis? (Atopy) • What work do you do? (Contact dermatitis) • Have you noticed moles that have changed? • Has there been a change in your hair or nails? • Have you had lumps or frequent infections in your skin?

Source: Adapted from Talley and O'Connor (2014).

You are not going to become a perfect history taker overnight. This skill alone will require lots of practice, across multiple patient types and conditions. Ensure you allow your patient to tell their story, in their own words. If you are not happy with a response they give you or it does not seem clear enough, ask them to repeat their answer. You need to be able to understand your patient correctly to provide the most appropriate treatment and care. Also, do not forget to focus on the HPI, as that will provide you with vital clues on just what you need to manage and treat your patient.

Low acuity assessment requires very detailed questioning and history taking with your patients. Being this thorough and detailed enables you to identify not only the best treatment and management plan, but the most appropriate ongoing care facility within the patient care journey. This could be a local medical centre, GP, or hospital, depending on your low acuity assessment findings for your patient.

Other physical assessment clues to assist the diagnosis

Along with verbal history taking, part of the systematic patient assessment discussed in Chapter 20 involved a head-to-toe (HTT) examination during the secondary survey. At first glance, many of your patients may look generally OK, given their current PS and HPI. However, during your SR questioning and HTT, they may say something to you that points to other underlying medical conditions. Although the patient might not think these issues have anything to do with why they called you today, there is a very strong chance that these other underlying conditions are connected with their PS and HPI. On a side note, the HTT may also point out a question from the SR that you did not think it was really necessary to ask. If this is the case, go back and ask that question of your patient, and any further connecting SR questions you may also have missed based on this revised SR assessment.

Let us now have a look at some physical conditions a patient could present with that are connected with other underlying conditions or diseases and could share some secrets.

Fingers

Fingers can provide valuable clues during your patient assessment. They can help you identify cardiovascular disease, iron deficiency, immunodeficiency, and even cancer, to name just a few conditions. Table 27.3 outlines some nail signs in systemic disease.

Table 27.3 Systemic disease signs you can identify from nails.

Presenting nail sign	Causes and links to other disease states
Finger clubbing	Lung cancer, congenital heart disease, cirrhosis, endocarditis
Spoon-shaped (koilonychia)	Iron-deficiency anaemia
Separation of the nail from the nail bed (onycholysis)	Infection, hyperthyroidism, trauma psoriasis
Yellow nails	Pleural effusion, rheumatoid arthritis, immunodeficiency, sinusitis, tuberculosis
Half-and-half nails	Chronic kidney disease
Splinter haemorrhages	Endocarditis, rheumatoid arthritis, antiphospholipid syndrome, trauma

Source: Adapted from Talley and O'Connor (2014); Tintinalli et al. (2016).

Table 27.4 Systemic disease signs you can identify from the face and mouth.

Presenting sign	Causes and links to other disease states
Xanthelasma	Intracutaneous yellow cholesterol deposits around the eyes, which can be normal or may indicate hyperlipidaemia
High-arched palate	Occurs in Marfan's syndrome and is associated with congenital heart disease
Leucoplakia	White colouring and thickening of the mucosa of the tongue and mouth, often premalignant, with most conditions starting from sore teeth, smoking, spirits, sepsis, or syphilis, although sometimes no cause can be identified
Thyrotoxicosis	Associated with excess thyroid hormone production; signs can include thyroid stare, onycholysis, weight loss, and anxiety

Source: Adapted from Talley and O'Connor (2014).

Face and mouth

What is key to remember when you look in your patient's mouth and throat is that this is the gateway of entry to your patient's gut and lungs of your patient. So remember to look for the following signs (and in some cases smells), some of which are discussed further in Table 27.4:

- Xanthelasma
- High arched palate
- Leucoplakia
- Peridental inflammation
- Gingivitis
- Poor dentition
- Tongue fissures
- Oral dancers
- Thyrotoxicosis
- **Fetor heparicus**

Table 27.5 Systemic disease signs you can identify from other areas of the body.

Presenting sign	Causes and links to other disease states
Swan neck deformity	Classic sign of rheumatoid arthritis
Barrel chest	When the anteroposterior diameter is increased compared with the lateral diameter, an indication of hyperinflation of the lungs
Kyphosis and **scoliosis**	Exaggerated forward curvature of the spine, with lateral bowing, which can lead to major back pain and restrictive respiratory insufficiency
Pigeon chest	Common chest shape seen in patients suffering from Marfan's syndrome

Source: Adapted from Talley and O'Connor (2014).

Other areas of the body

Table 27.5 shows only a select few physical presenting appearances you may come across. Even before you begin your patient assessment, seeing your patient present like this may give you an idea of other underlying conditions they may be suffering from. There are many reference publications available that go into significant detail and depth about assessment of physical signs. It is highly recommended that you familiarise yourself with these publications to enhance your understanding and knowledge in this area. These tables are designed to give you an introduction only, showing just a small sample of multiple disease states, conditions, and appearances.

Gathering further clinical information from patients

With the advances in technology and increased education now associated with paramedic training, testing previously done in the hospital setting is now appearing in the prehospital setting. Areas like ultrasound, point-of-care testing (POCT), suturing/wound management, and telemedicine are completely transforming the way we treat, assess, and manage our patients. Whilst some of these areas require specialist training to master, others are straightforward.

Ultrasound

Ultrasound has been used in medicine for years, but only recently has it become small and portable enough to be used in the prehospital environment. The advantages it brings to patient care in the prehospital environment include:

- Assessment and rapid triage of trauma and critically ill patients.
- Focused examinations to identify any free fluid in the pericardial, thoracic, and abdominal cavities.
- Identifying veins for intravenous cannulation when this cannot be achieved via visual inspection alone.

The main use for ultrasound prehospital is mainly associated with Focused Assessment with Sonography for Trauma (FAST). This method greatly improves on the percussive technique, by providing a more detailed and physical pictorial representation of exactly what is happening in that part of the body.

Other uses for ultrasound in low acuity assessment around the world today include for identifying vascular access on patients that are either shut down, excessively overweight, or difficult to identify and access visually. Some ambulance services have even trained both low acuity and high acuity paramedics in using ultrasound on obstetric patients, chest ultrasound for **acute heart failure** versus COPD, pericardial effusion/tamponade, pulmonary embolism, cardiac arrest, and verification of the correct placement for endotracheal tube placement (Sun et al. 2014).

With community paramedics and low acuity paramedics spending more time with their patients and performing higher levels of patient assessment, the introduction of ultrasound to their toolkit greatly increases their ability to provide high levels of patient assessment and care. Identifying the right location for the patient can now be made so much more easily, with ultrasound providing a further insight into a patient's presenting condition.

Point-of-care testing

POCT is something that paramedics have been doing for a number of years. Measuring blood glucose levels (BGLs) for hypoglycaemia/hyperglycaemia (Chapter 23) is a key part of a standard basic patient assessment. However, there are many other forms of POCT that are now being used by paramedics to improve and assist with patient care and management. Devices now available and used by paramedics enable them to test for **arterial blood gas**, **lactate**, **haematocrit**, **haemoglobin**, and basic chemistry, all within the same test (Collopy 2014). Not every patient you attend will require this level of POCT, and for a patient just requiring a simple BGL test you would probably only use your BGL machine. However, for patients presenting with more complex conditions such as sepsis, respiratory, or cardiac conditions, POCT is a valuable asset not only to enable you to identify the best care and management for your patient, but also to provide you with the information you need to identify the best location for your patient to be transported to.

POCT devices do have some drawbacks. Some devices require you to refrigerate the cartridges and then get them out and wait until they are at room temperature before use. Some produce lots of data from a single cartridge and others require multiple cartridges. The overall cost of devices and cartridges can be high, if implemented across an entire organisation. However, these issues aside, POCT provides a significant value-added benefit to all patients within the low acuity assessment space.

Suturing and wound management

Suturing and wound management has become a significant part of low acuity care within paramedicine. Basic suturing and wound management is something military medics have been performing for a number of years. However, this same level of care has only recently been included into ambulance service protocols.

If you consider the number of uncomplicated wounds you will encounter as paramedics that could require suturing, staples, or skin adhesive, it makes significant financial sense (with a lower impact on hospital emergency rooms and medical centres) and is good patient care practice to provide these services to patients in the prehospital environment.

The overall practice and protocols of this procedure differ from ambulance service to ambulance service, but the general consensus is that it should be attempted for all uncomplicated acute lacerations that do not involve a joint, certain areas of the face, or other areas requiring advanced suturing within a hospital or specialist environment.

Telemedicine

Technology has played a major role in the advancement of prehospital delivery to patients. Devices are becoming smaller, lighter, and more affordable than ever before, enabling more and more ambulances to equip paramedics with life-saving devices.

Telemedicine, via the use of mobile computing devices, mobile phones, and tablets, provides extended reach to paramedics in general duties, and both low acuity and high acuity roles. With the increased training now required to become a paramedic, plus the further two or three years' training required to specialise in areas like community paramedicine, or as a flight paramedic or critical paramedic, mostly at postgraduate level, telemedicine is providing an additional level of support to these highly skilled paramedics.

Sometimes the paramedic is the only medically trained clinician patients see. This could be due to distance/remote location, low social economic areas, or medical centre opening hours. During the assessment, the paramedic may reach a point at which further medical consultation may be needed to finalise this call, or seek assistance with further medication administration or advanced treatment skill. The inclusion of telemedicine in this case allows the paramedic to bring the doctor to the same location as the patient via their mobile device, so that the doctor can authorise the paramedic to complete a specific task or speak directly to the patient following an IMIST-AMBO handover from the treating paramedic.

It is not only voice and video that can be used in this way. Much of the advanced equipment used by paramedics has the ability to provide real-time telemetry readouts, either to a consulting doctor or to the receiving hospital whilst the paramedic treats their patient. This information can be used to help the paramedic with treatment if required, or even direct the paramedic to a different specialist or to call in additional services, if the patient's condition lies outside the ability of the chosen facility or consulting doctor. In many ways it is like having a complete medical team in your back pocket.

These are just some examples of how technology has changed and is changing the way we approach patient care. Low acuity patient assessment is a very detailed process, which enables specially trained paramedics to identify the best treatment, care, management, and receiving facility location for their patients. These examples are only the beginning of what is yet to come in this field. With technology changing every day, who knows what the future holds in this space?

Conclusion

Low acuity paramedicine is an exciting new field of paramedic practice that significantly broadens the scope of what paramedics do. More time is spent assessing your patients and with the advances in technology, greater insights are afforded into your patient's PS and HPI, enabling you to identify a more accurate provisional diagnosis. From here you are able both to directly affect your patient's clinical journey and to manage resource demand and financial impact on the healthcare system, by identifying the most appropriate location and service for your patient.

The key to low acuity patient assessment is the ability to identify the right place for your patient, instead of the traditional or patient-perceived, home-to-hospital approach. The ability to do this can only be achieved via high-level patient assessment skills, detailed knowledge of how your healthcare system operates, and integration with medical centres and local doctors in your area. Although training for low acuity specialist paramedics is associated with additional study, you need to remember that it is built on the standard care approach and systematic protocols you learn from day one as a student paramedic. This same underpinning knowledge is the launching point for low acuity paramedic practice in assessing and managing low acuity patients.

Activities

Now review your learning by completing the learning activities in this chapter. The answers to these appear at the end of the book. Further self-test activities can be found at **www.wileyfundamentalseries.com/paramedic.**

Test your knowledge

1. Name three areas of frequent user management where low acuity care can provide assistance.
2. Do paramedics spend more or less time with patients when performing low acuity assessments?
3. During your head-to-toe examination you notice your patient has a high arched palate and pigeon chest. These are classic signs of which syndromes or diseases?
4. During your head-to-toe examination you notice your patient has finger clubbing. List the diseases/conditions that are associated with finger clubbing.
5. As you examine your patient you notice that he has a barrel chest. What is this is an indication of?
6. What problems can Kyposis and Scollosis can lead to?
7. Name three examples of advanced technology now being used by paramedics in both high acuity and low acuity assessments.
8. What is the condition thyrotoxicosis associated with?

Activity 27.1

With your partner or a family member at home, practise doing a complete patient assessment on them, as discussed in Tables 27.1 and 27.2.

- As there are multiple systems in Table 27.2 (systems review), take turns practising a different system each time.
- The age of your patient can be either your age or the actual age of your partner/patient.

Activity 27.2

With your partner or a family member at home, practise doing a more complex complete patient assessment on them, as discussed in Tables 27.1 and 27.2.

- This time your patient is suffering from chronic obstructive pulmonary disorder and is 72 years old.
- Get the person playing the patient to provide feedback on your assessment once you've completed it.

Activity 27.3

With consenting peers or a family member, practise the following objective skills to gain a patient history:

- Vital signs – pulse, blood pressure, respiration rate, temperature
- Chest sounds – refer to Chapter 19 if you need a refresh on auscultation locations and placement for chest sounds.
- Heart sounds – refer to Chapter 16 if you need a refresh on auscultation locations and placement for heart sounds.
- Abdominal sounds – refer to Chapter 18 if you need a refresh on auscultation locations and placement for abdominal sounds.

Activity 27.4

You are completing a cardiac systems review (SR) for your patient when they provide a positive response to the following questions:

- Have you had any pain or pressure in your chest? If so, does it occur during exertion?
- Have you ever been woken at night by severe shortness of breath?

What is a positive answer to both of these questions during a cardiac SR considered to be, and what does it indicate?

Glossary

Acute heart failure:	A wide spectrum of illness, ranging from a gradual increase in leg swelling, shortness of breath, or decreased exercise tolerance to the abrupt onset of pulmonary oedema.
Arterial blood gas:	Measures the partial pressure of oxygen, carbon dioxide, and pH in the arterial blood.

Chronic obstructive pulmonary disease (COPD):	Characterised by persistent airflow limitation that is generally progressive and associated with an abnormal inflammatory response to noxious particles or gases. COPD has two main forms: *chronic bronchitis*, defined in clinical terms; and *emphysema*, defined in terms of anatomic pathology.
Fetor hepaticus:	Occurs when the breath has a strong, musty smell. It is also referred to as the 'breath of the dead', due to its association with severe liver disease.
Haematocrit:	The ratio of the volume of red blood cells to blood volume. High or low haematocrit is an indicator of disease.
Haemoglobin:	A protein that transports oxygen in the red blood cells throughout the body.
Kyphosis:	When the spine has an excessive outward curvature, which also causes the appearance of an arched back.
Lactate:	In critical illness, an oxygen debt develops when oxygen delivery is inadequate to meet tissue oxygen demand and compensatory mechanisms are exhausted. This results in global tissue hypoxia, anaerobic metabolism, and lactate production.
Scoliosis:	A neuromuscular condition which causes a three-dimensional change to the spine's alignment. The spinal curve can be between 15° and more than 50° and can occur at different points of the spine.

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Answers to activities

Chapter 1

Test your knowledge

1. a. Professional parameters (e.g. legal and ethical aspects).
   b. Professional behaviours (e.g. discipline-related knowledge and skills).
   c. Professional responsibilities (e.g. responsibility to clients, oneself, employers, and the public).
2. Professional identity, socialisation, and professional culture.
3. Both.
4. a. No case to answer.
   b. Minor breaches of conduct.
   c. Significant breaches of conduct.
   d. Serious breaches of conduct.
   e. Major breaches of conduct.

Activity 1.1

Whilst it may seem that this is a conversation intended to be humorous, and therefore harmless, it is implying that John thinks it is acceptable to commit fraud. Honesty, integrity, and trustworthiness are integral to professionalism.

Activity 1.2

False – Students are assessed by clinical mentors and other colleagues with whom they work in practice. Self and peer assessment, objective structured clinical examinations (OSCEs), direct observation by academic tutors, critical incident reports, and learner-maintained portfolios are some of the ways in which triangulation of assessment can be achieved. Such triangulation is important to reduce the subjectivity of a particular assessor. Any single measure alone is not sufficient.

Fundamentals of Paramedic Practice: A Systems Approach, Second Edition. Edited by Sam Willis and Roger Dalrymple.

Companion website: www.wileyfundamentalseries.com/paramedic

Chapter 2

Test your knowledge

1. An independent body of individuals that self-regulate in accordance with prevailing legislation, regulations, evidence, and societal expectations.
2. Quality and safety in healthcare; research and evidence-based practice; regulation and law.
3. Practice is any role, whether remunerated or not, in which the individual uses their skills and knowledge as a practitioner in their regulated health profession. Practice is not restricted to the provision of direct clinical care. It also includes using professional knowledge in a direct nonclinical relationship with patients or clients, working in management, administration, education, research, advisory, regulatory, or policy development roles, and any other roles that have an impact on the safe, effective delivery of health services in the health profession.
4. Self-regulation, assessment by peers, standardised curricula, discretionary decision-making supported by the profession.
5. Conduct where the registered health practitioner has:
   - practised their profession whilst intoxicated by alcohol or drugs, or
   - engaged in sexual misconduct in connection with the practice of their profession, or
   - placed the public at risk of substantial harm in their practice of the profession because the practitioner has an impairment, or
   - placed the public at risk of harm because they have practised the profession in a way that constitutes a significant departure from accepted professional standards.

Activity 2.2

1. True.
2. True.
3. True.
4. False – clinical incompetence.
5. False.

Chapter 3

Test your knowledge

1. Those factors within the paramedic's working environment which affect patient care by influencing the ambulance crew, either directly or indirectly.
2. Fatigue, crew/team working, stress, situational awareness, hazardous attitudes.
3. a. Palpitations.
   b. Rapid breathing.
   c. Chest tightness.
   d. Sweating.
   e. Unnecessary shouting.
   f. Use of bad language that would not normally be used.
4. Work overload, crew conflict, poor communication, lack of promotional opportunities, attending distressing scenes.

5. Lack of preparation for the shift, e.g. not getting enough rest before for the shift; an inability to adapt to shift work, e.g. not taking sufficient nourishment before the shift; not having enough rest between shifts as well as job demands placed on the paramedic during the shift. In addition, the paramedic may also have to drive long distances to and from work; might undertake several shifts in a row; might have a student working alongside them for the shift, thus placing additional demands on energy; as well as the possibility of having to undertake alternative roles between calls.
6. Attitudes held by the paramedic that can cause risk to the patient, such as being anti-authority, complacency, machismo, impulsiveness, and resignation.

Activity 3.1

1. The task: recording a 12-lead ECG.
2. Organisational factors: no training provided for a new piece of equipment.
3. Environmental factors: at this time, Jim does not have the luxury of an ambulance saloon in which to conduct his assessment. He and his patient are out in the street.
4. Tools and technology: new cardiac monitor.

Activity 3.2

1. The task will not change; Jim still needs to undertake a 12-lead ECG if this is indicated by the history.
2. The organisation should ensure that staff are adequately trained to perform their duties. This is not an issue that Jim can solve today, by himself. However, he does have a duty to make his employer aware if he is not adequately trained.
3. Jim cannot control the weather! All he can do is request back-up and provide an adequate rationale for his request.
4. On this occasion Jim would have been safer to swap the new device for an older cardiac monitor with which he was familiar until such time as he had completed his training.

Chapter 4

Test your knowledge

1. Ability to make a decision.
2. Consent.
3. To provide protection and powers to individuals (aged 16 years and over) who may lack capacity to make certain decisions, and also for people working with, or caring for, them.
4. Capacity may be reduced for such reasons as:
   - Dementia.
   - Learning disabilities.
   - Mental health problems.
   - Stroke and brain injuries.
   - Temporary impairment due to medication, intoxication, injury or illness.
5. Effects of reduced capacity include reduced ability to:
   - Understand information relevant to a decision.
   - Retain that information.
   - Use or weigh that information as part of the process of making the decision.
   - Communicate the decision (whether by talking, using sign language, or any other means).

Chapter 5

Test your knowledge

1. Mental and social well-being; not merely the absence of mental illness.
2. A range of diagnosed clinical conditions.
3. Neurotic and psychotic.
4. Organic and functional
5. Autonomic, behavioural, cognitive (physical, action, thoughts).
6. **Anxiety**: a general term for several disorders that cause nervousness, fear, apprehension, and worrying. These disorders affect how a person feels and behaves, and can manifest real physical symptoms. Mild anxiety is vague and unsettling, while severe anxiety can be extremely debilitating, having a serious impact on daily life.
   Depression: a mental condition characterised by persistent low mood and lethargy, accompanied by feelings of inadequacy and guilt, and disturbance of appetite and sleep.
   Bi-polar disorder: a mental condition which causes episodes of severe mood swings ranging from 'high' or manic to 'low' or severe depression, lasting for a few weeks at a time, between which there are long periods of mental stability.
   Schizophrenia: a brain disorder affecting the way a person acts, thinks, and sees the world. People with schizophrenia have an altered perception of reality (often a significant loss of contact with reality). They may hear or see things that don't exist, speak in strange or confusing ways, believe that others are trying to harm them, or feel like they're being constantly watched.
   Dementia: a chronic mental disorder caused by brain disease or injury and marked by memory disorders, personality changes, and impaired reasoning.
7. a. Treat the person with respect and dignity.
   b. Assess risk of harm to person or others. If someone is not at immediate risk of being hurt, call for additional support from the police.
   c. Maintain privacy.
   d. Be non-judgmental.
   e. Remember the person may be embarrassed by their situation.
   f. Accept the person's reality. It might seem strange to you, but it is very real for them.
   g. Be honest. If you don't know/understand, say so.
   h. Do not be confrontational.
   i. Be calm and reassuring.
   j. Speak slowly and clearly; make sure the patient has understood.
8. The reception, care, and treatment of mentally disordered patients.

Chapter 6

Test your knowledge

1. The imparting or exchanging of information by speaking, writing, or using some other medium.
2. Other paramedics and emergency service staff, managers, patients, relatives, friends and carers of patients, hospital staff, other emergency service staff (e.g. police, staff of the wider NHS, and private sector).
3. Verbal and nonverbal.
4. A lack of respect for effective communication; a lack of understanding of how to communicate effectively; other human factors.
5. Breakdown in relationships; poor decision-making; harm to patients and others.

Chapter 7

Test your knowledge

1. The scientific and systematic study of society.
2. Learning to see yourself and others within the context of history and the social environment and considering the influence of individual agents in shaping society.
3. Depending upon your background and context, relevant answers include family, culture, religion, workplace, community resources, educational experiences, professional and medical associations, the media, the economic micro- and macro-environments, and global institutions such as the World Health Organization or the United Nations.
4. Social interaction can lead to stigmatisation and social rationing where individuals are perceived to have agency or responsibility for a health condition – e.g. if societal norms promote the view that a smoker has encouraged their own asthma or other smoking-related condition by their own actions, this may influence the quality of relationship we establish with the patient and thus affect the quality of care provided.
5. Medicalisation can affect how people view personal responsibility for a condition, and how they view the individual affected by the condition. For example, a person labelled with the term schizophrenia may isolate themselves and tacitly accept the erroneous social stigma that people with this condition are dangerous and unpredictable. This will further restrict the individual's social network.

Chapter 8

Test your knowledge

1. Yes – when consent is implied.
2. The term 'duty of care' means that there is an obligation from an individual to take care of, and prevent harm from occurring by, another individual.
3. Doing what is best for the patient.
4. Justice, autonomy, beneficence, non-maleficence.

Activity 8.1

1. Implied and informed.
2. In active terms by gestures (e.g. extending an arm for blood pressure cuff).
3. The nature of the treatment, the risks and benefits associated with the treatment, information about alternatives.

Chapter 9

Test your knowledge

1. Leadership is focused on motivating, engaging, and influencing people. Management is more concerned with planning, budgeting, and controlling resources.
2. One who shows the way.
3. Switching your leadership style or approach according to the follower in question and the task in hand.
4. Autocratic, *laissez-faire,* participative, coaching, affiliative.

Chapter 10

Test your knowledge

1. An individual over the age of 18 'who is or may be in need of community care services by reason of mental or other disability, age or illness; and who is or may be unable to take care of him or herself, or unable to protect him or herself against significant harm or exploration' (Department of Health, 2000).
2. Abuse is a violation of an individual's human and civil rights by any other person/s. Abuse may consist of a single act or repeated acts. It may be physical, verbal, or psychological. It may be an act of neglect or an omission to act (Department of Health, 2000).
3. Abuse is complex, due to many inter-related factors. Often, due to the dynamics of the victim/perpetrator relationship, there is more than one type of abuse happening at once. It is therefore important for the practitioner to be aware of situations that may predispose to abuse, and to note any unusual behaviours, whether overtly passive, fearful, or disturbing, alongside those specific presenting signs listed within the chapter.
4. Service users have the right to make choices and decisions which can and should involve taking positive risks for happiness and independence. However, there is a balance to be struck between enabling people to have choice and control over their lives and ensuring that they are free from harm, exploitation, and mistreatment. Safeguarding is a framework to guide professionals when considering the risk of harm to a vulnerable person.

Activity 10.1

Issues of trust and love, and guilt or fear. The person may not recognise what is happening as abuse. They may perceive that they are getting something in return, e.g. companionship in exchange for money, or they may be afraid of harm, punishment, or abandonment. They may feel powerless, or be isolated from anyone else and dependent on the abuser.

Activity 10.2

People we know can make us feel that we can trust them and that they are doing things for us. They can get closer to use so that they understand our routines, habits, beliefs and preferences which means it can be easier to manipulate us.

Chapter 12

Test your knowledge

1. A component placed at the start of a word – e.g. peri-.
2. A component placed at the end of a word – e.g. -itis.
3. Inflammation.
4. The heart.

Activity 12.1

1. Swift/accelerated beating of the heart.
2. Inflammation of the stomach.

3. Bad breathing.
4. The heart's circulation.

Chapter 13

Test your knowledge

1. Research produces evidence through systematic investigation and scientific evaluation. This can be evidence for best practice, but also evidence towards the answers for other questions about the world.
2. Think about words that identify the issue you are interested in or select key words from your research question. Identify synonyms (words meaning the same thing). Use Boolean operators (particularly AND, OR) to turn your search terms into a search strategy.
3. The allocation to treatment/control group is by chance in a randomised controlled trial. Each participant has the same chance of being allocated to a treatment or control group as any other participant. This is called randomisation and it is done to avoid systematic differences between treatment and control groups.

Activity 13.1

The main differences are in the type of data (information) collected and in the methods (techniques) used to collect this data. Quantitative research will produce numerical data for the purpose of measurement. Qualitative research seeks understanding through words or observation data.

Chapter 14

Test your knowledge

1. Hypertension (high blood pressure), bradycardia (slow heart), altered respirations.
2. Swelling, loss of movement, irregularity, pain, deformity, unnatural movement, crepitus, tenderness, bruising.
3. Flail segment.
4. Pneumothorax is air in the pleural space that has not yet built up. Tension pneumothorax is when that air has built up and starts to compress the other side, including the heart, causing a life-threatening situation.
5. Neck of femur.
6. Crush injuries.

Chapter 15

Test your knowledge

1. Atrial depolarisation.
2. Ventrical depolarisation.
3. Ventrical repolarisation.
4. Conditions in which the electrical activity of the heart is irregular.
5. Interruption of the left branch bundle, depriving the ventricle of its intrinsic conducing pathway.

Activity 15.1

1. 25 mm/s.
2. One small square (40 ms) and one large square (200 ms).
3. Count how many large squares there are between two points (in this case, the peak of an R wave) and divide it by 600; i.e. four large squares between two R waves would indicate a rate of 150 beats per minute (bpm).

Activity 15.2

1. Unstable angina pectoris (UAP).
2. ST-elevation myocardial infarction (STEMI).
3. Non-ST-elevation myocardial infarction (NSTEMI).

Activity 15.3

The ventricle is left without its own intrinsic conduction pathway, causing a delay in left ventricular contraction.

Chapter 16

Test your knowledge

1. In the centre of the chest between the lungs and above the diaphragm.
2. MAP is defined as the average arterial pressure throughout the cardiac cycle.
3. Stenosis is the abnormal narrowing of a channel or opening.
4. Capnography is the noninvasive method for monitoring expired carbon dioxide at the end of the tidal volume.
5. The pulse is a rhythmic representation of blood flow from the contraction of the left ventricle and can be palpated at various points in the body.
6. A condition in which the heart is unable to pump efficiently or at a fast enough rate to eject blood from its chambers.

Chapter 17

Test your knowledge

1. False – olfactory.
2. 12.
3. 31.
4. Eyes opening, motor response, verbal response.

Chapter 18

Test your knowledge

1. Method 1: Divide into quadrants:
   a. Right upper quadrant: liver, gall bladder, common bile duct and cystic ducts, head of pancreas and pancreatic duct, small bowel (parts of duodenum, ileum, jejunum), colon (hepatic flexure), right kidney.

b. Left upper quadrant: stomach, spleen, tail of pancreas, small bowel (mostly jejunum), colon (splenic flexure), left kidney.
c. Right lower quadrant: terminal ileum, caecum, appendix, ascending colon, right ovary (females).
d. Left lower quadrant: small bowel (mostly ileum), descending colon, sigmoid colon, left ovary (females).

Method 2: Divide into nine regions:

a. Right hypochondrium: right lobe of the liver, gall bladder, hepatic flexure of the colon, and part of the right kidney.
b. Epigastrium: stomach, left lobe of the liver, pancreas, duodenum, superior part of the kidneys (including adrenals), oesophagus, transverse colon.
c. Left hypochondrium: splenic end of the stomach, spleen and extremity of pancreas, splenic flexure of the colon, and part of the left kidney.
d. Right lumbar: ascending colon, part of the right kidney, and some convolutions of the small intestines.
e. Umbilical: transverse colon, part of the great omentum and mesentery, transverse part of the duodenum, some sections of jejunum and ileum, and part of both kidneys and ureters.
f. Left lumbar: descending colon, part of the omentum, part of the left kidney, and some convolutions of the small intestines.
g. Right iliac (inguinal): caecum, appendix, ovary and fallopian tube in females.
h. Hypogastrium: convolutions of the small intestines, the bladder in children (adults if distended), the uterus during pregnancy, right and left ovary and fallopian tubes in females, vas deferens in males.
i. Left iliac (inguinal): sigmoid flexure of the colon, ovary and fallopian tube in females.

2. **a.** Visceral pain originates from within an organ. It is most often poorly localised, centralised to the midline, and referred to other regions that are also supplied by that same division of the splanchnic system (that is, anywhere from upper chest down to lower abdomen). Discomfort tends to begin gradually as a dull, vague, mostly central, aching pain. It may be accompanied by autonomic response to pain, such as tachycardia, tachypnoea, nausea and vomiting, diaphoresis, and pallor. Relieving factors will depend on the underlying cause.
b. Parietal pain originates from stimulation of somatic nociceptors within the parietal peritoneum. In contrast to visceral pain, parietal pain is sharp, localised, often more severe, and tends not to be referred unless there is accompanying underlying visceral pain. Patients will often sit still, have shallow breathing, and guard the painful region. This type of pain may also have the same associated autonomic responses as visceral pain, although they may tend to be more pronounced in severe parietal pain.

3. The 'acute abdomen' refers to any nontraumatic, sudden, severe abdominal pain of unclear aetiology and for which an urgent operation may be necessary.
Conditions include (but are not limited to) acute cholecystitis, appendicitis, bowel obstruction, cancer, and acute vascular conditions (leading to gut ischaemia or bleeding).
History will likely include descriptions of gradually worsening pain, or perhaps a very sudden onset of immediately severe pain. Careful note of the evolution of pain to include different regions may guide diagnosis. A higher level of suspicion should be reserved for the elderly, the immunocompromised, children, and women of childbearing age.
There are often systemic signs of shock, such as tachycardia, tachypnoea, diaphoresis, hypotension, pallor, and decreased conscious state, and thus treatment of the acute abdomen focuses on immediate resuscitation, analgesia, and prompt transport to a hospital capable of providing emergency laparotomy.

4. Differential diagnoses (more likely in, or specific to, females) could include pelvic inflammatory disease, or urinary tract infection. Obstetric and gynaecological issues to consider would include menstrual cycle pain (especially 'mittelschmerz', a German term meaning 'middle pain', which is pain experienced by many females midway through their menstrual cycle), ectopic pregnancy, acute salpingitis (inflammation of the fallopian tubes), ruptured/haemorrhagic cyst, or ovarian torsion.

Chapter 19

Test your knowledge

1. The respiratory system:
   - Provides a surface area for gas exchange from air and circulating blood.
   - Moves inspired and expired air to and from the exchange surfaces of the lungs along the respiratory passageways.
   - Provides protection from dehydration, temperature changes, and invasion by pathogens.
   - Produces sounds for speaking, singing, and other forms of communication.
   - Detects odours through olfactory receptors in the nasal cavity.
2. Low tissue oxygen levels.
3. Causes lung cancer, allows build up of tar, and causes permanent destructive changes in the airwways.
4. A rapid assessment of anything that is likely to kill your patient, including a rapid assessment of the airway, breathing and circulation.
5. Mental health conditions such as anxiety, respiratory diseases such as asthma, trauma.

Chapter 20

Test your knowledge

1. SOCRATES = S (Site); O (Onset); C (Character and severity); R (Radiation); A (Aggravation and relieving factors; T (Timing); E (Exacerbating factors and associated symptoms); S (Social effects of the symptom or illness).
2. AVPU = A (Alert); V (Verbal); P (Pain); U (Unresponsive).

Chapter 21

Test your knowledge

1. 37–42 weeks.
2. Two – latent phase: the period of irregular contractions which build in intensity and that prepare the cervix to dilate and permit the passage of the foetus out of the uterus; active phase: the beginning of active child delivery.
3. Three.
4. Shoulder dystocia.

Activity 21.1

1. 2 cm long, tubular, firm, and muscly; located at the back of the vagina.
2. The period of irregular contractions which build in intensity and prepare the cervix to dilate and permit the passage of the foetus out of the uterus.
3. When effacement occurs.
4. 12–24 hours.

5. She should remain mobile, resting when necessary, and is likely to be advised to stay at home. She may be advised to soak in a warm bath and/or take some paracetamol. She may experience a show of waters passing vaginally during this phase of labour, but they may not occur until the birth happens. If her waters break (amniotic fluid that the foetus floats in, contained by membranes), she should be seen by her midwife, who will need to know what colour the waters are.

Activity 21.2

1. A rare complication of the second stage of labour, whereby one of the foetal shoulders gets trapped behind the maternal symphysis pubis, or against the sacral promontory.
2. It will only be when the woman is pushing that it becomes apparent that it is a bottom or legs that are being born first.

Activity 21.3

Postpartum haemorrhage is usually due to brisk bleeding from a uterus that has lost muscular tone following the birth of the infant and whilst waiting for, during, or after the birth of the placenta.

Activity 21.4

To stop the uterine contractions from squashing the cord against the maternal cervix, which will cut the oxygen supply to the foetus. This is best achieved via the 'call to prayer' or bottom-in-the-air position.

Chapter 22

Test your knowledge

1. True.
2. True.
3. True.
4. False.
5. True.
6. True.
7. True.
8. False.
9. False.
10. True.

Chapter 23

Test your knowledge

1. Cellulitis, literally meaning inflammation of the cells.
2. Anaphylaxis is defined as a severe, systemic hypersensitivity reaction whereby a patient may suffer life-threatening symptoms. Humans have the ability to create antibodies – these are proteins that trigger a response to foreign matter in the body. Normally, antibodies help fight off infection and illness by identifying

foreign matter (antigen) and initiating an immune response to protect the body from harm. In anaphylaxis, these antibodies detect an antigen, but instead of responding to a dangerous infection, they overreact to an everyday substance to which the patient has been exposed. An immune reaction is triggered, making the patient quite unwell.

3.

Body system	DKA	HHS
Neurological	Lethargy, malaise, fatigue, confusion, coma	Lethargy, confusion, altered conscious state, coma
Respiratory	Kussmaul respirations, fruity acetone breath	Tachypnoea
Cardiovascular	Tachycardia, hypotension, dysrhythmias	Tachycardia, pronounced hypotension, dysrhythmias
Integumentary	Flushed skin, dry mucous membranes, poor skin turgor	Flushed skin, severely dry mucosal membranes, poor skin turgor
Renal	Polydipsia, polyuria, ketonuria	Polydipsia, polyuria, glycosuria
Gastrointestinal	Nausea, vomiting, abdominal cramps	Less severe symptoms than DKA
Serum levels	BGL >14.0 mmol/l	BGL <50 mmol/l; Osmolarity >330 mOsm/kg

4. Septic shock is defined as sepsis, where there is an alteration to circulatory, cellular, or metabolic abnormalities that put the patient at increased risk of mortality.

5. **a.** Manage ABCs as required, inserting a nasopharyngeal tube.
b. Provide reassurance to the patient during the recovery phase.
c. Protect patient from harm, for example by placing a blanket under the head during the seizure.
d. Administer medications to stop the seizure in line with local guidelines.
e. Reverse other obvious causes of seizure, for example low blood sugar.
f. Provide oxygen therapy.
g. Treat any obvious injuries.
h. Transport to hospital.

6. An ischaemic stroke is caused by a blockage, whereas a haemorrhagic stroke is caused by a bleed.

7. **a.** Pain management – the patient has inappropriate medication to manage their pain; they have used up all of their pain medication; or their pain has changed or intensified.
b. Nausea and vomiting – often as the organs cease to function effectively, patients will experience nausea and vomiting that cause significant distress.
c. Dehydration – due to nausea and vomiting, or simply decreased appetite and increased sleeping, patients are unable to take in appropriate fluids.
d. Weakness and/or falls – as a result of any combination of causes, patients are no longer able to complete their activities of daily living at home due to weakness, e.g. toileting, hygiene, eating, mobility.
e. Breathing difficulty – patients may experience an exacerbation of respiratory issues, or develop an infection on top of their underlying illness, which affects their breathing and can cause significant anxiety.
f. Confusion – more common in neurological diagnoses, patients may become increasingly confused or agitated at home, making care difficult for families.
g. Fear and anxiety – the patient may have initially decided to remain at home until the end of their life, but as their condition progressed, they become fearful of what may occur and feel safer in a hospital or care facility.

8. a. Unconsciousness.
   b. Pallor and diaphoresis (sweating).
   c. Confusion and alterations to conscious state.
   d. Agitation.
   e. Seizures.
   f. Tremors and/or ataxia.
   g. Slurred speech.
9. a. Sudden changes in core body temperature ('febrile convulsions' in children).
   b. Alterations to glucose or electrolyte levels in the bloodstream (typically low glucose levels).
   c. Space-occupying lesions (tumours in the brain).
   d. Use of certain drugs.
   e. Alcohol withdrawal.
   f. Head trauma.
10. A drug that causes blood vessels to constrict, consequently raising blood pressure.

Chapter 24

Test your knowledge

1. a. True.
   b. False.
   c. True.
   d. False.
   e. True.
2. Increased demand for specialist services, increased callouts to ambulance services, increased use of hospital beds.

Chapter 25

Test your knowledge

1. Mechanism of injury is the 'how, what, when, why' of the injury in question, considering the direction, magnitude, and duration of force. Establishing these details is an essential part of the paramedic's history-taking process.
2. The characteristics of a *Look, Feel, Move* assessment are:

Look:
- Compare with the unaffected side.
- Bleeding, swelling, bruising.
- Wounds, scars.
- Look from all angles/aspects.
- Foreign bodies.
- Deformity, wasting.
- Colour – cyanosis, pallor, erythema.
- Tracking, lymphangitis.

Feel:
- Start palpating in the proximal joint away from the site of pain.
- Feel one area at a time, using a single finger.
- Identify the anatomical landmarks in a systematic manner.
- Relate surface anatomy to underlying structures and try to identify specific areas of tenderness.

- Observe for facial expressions and gestures, as well as verbal expressions of pain.
- Skin temperature.
- Crepitus.
- Check sensation (two-point discrimination).
- Feel for distal pulses/capillary refill time (CRT).

Move:

- Know how the joint is supposed to move.
- Compare range of movement to the unaffected side.
- Active movement – the patient performs the movement, without assistance and using their own power.
- Passive movement – movement of the limb is performed on the patient by the clinician.
- Resisted movement – in testing resisted movement, the joints do not move and the integrity of the musculotendon is tested, e.g. the straight leg raise testing the extensor mechanism in the knee.

3. The Ottawa Ankle Rules were developed and clinically tested by Stiell et al. (1994) to show that application of the rules led to a decrease in the use of ankle radiography, waiting times, and costs, without patient dissatisfaction or missed fractures. Using the Ottawa Ankle Rules as an aid to examination will allow for safe diagnosis and appropriate treatment of ankle injury.
4. Stage treatment:
   - Cooling – Cool the affected body area for a minimum of 20 minutes, ideally with cool running water.
   - Analgesia – Burns are very painful and it is important to administer appropriate analgesics as soon as possible.
   - Assessment - Assess the burn thoroughly. Does the burn require further assessment or treatment? If so, be guided by your local referral guidelines.
   - Cover – Cover the burn with cling film and cover the cling film with a wet dressing to keep the affected area cool. You may have to continue cooling en route to hospital using 0.9% sodium chloride.
   - Consideration – Consider complications such as ABCs, hypothermia, IV fluid challenge, nonaccidental injury.
   - Review – Continually review and assess.
5. You should contact your local MIU to confirm what they are able to offer in the way of services, but below are some common grounds:
   - Musculoskeletal and ligamentous injury.
   - Mild head injury (GCS 15).
   - Eye injury.
   - Burns.
   - Foreign body removal.
   - Bites and stings.
   - Wound care.
   - Limb fractures.
   - X-ray facility.
6. The five wound-closure methods available in the prehospital setting are:
   - Tissue/skin adhesive.
   - Staples.
   - Steristrips.
   - Sutures.
   - Skin link.
7. The five considerations during a nose injury assessment are:
   - Is the airway compromised?
   - Is there a septal haematoma?
   - Is there a severe epistaxis?
   - Is there severe displacement?
   - Are there associated fractures to the face?

Activity 25.2

1. This is a subcutaneous collection of blood giving rise to a fluctuant swelling.
2. This is a wound with a fine path made by a pointed object, for example railing spike, knife, or nail.
3. This is a breach in the skin, with surrounding bruising.

Activity 25.4

1. Falls.
2. Yes.
3. Ottawa Ankle Rules.

Chapter 26

Test your knowledge

1. Any incident where the location, number, severity, or type of live casualties requires extraordinary resources.
2.
   - Major incident.
   - Exact location.
   - Type of incident.
   - Hazards.
   - Access.
   - Number of casualties.
   - Emergency services.
3. The patient is a Priority 1. As the patient cannot walk, they are immediately ruled out of the Priority 3 category. The patient is breathing and therefore they cannot be assigned as deceased. The patient is breathing at a rate of 8, a respiratory rate that immediately assigns the patient to a Priority 1 regardless of pulse rate.
4. Priority 2.
5. Performing life-saving clinical interventions; providing stabilisation of the patient to allow for safe transportation.
6. False. Transport timing should align with the patient triage and treatment priority. However, in clinical practice, treatment and stabilisation together with the complexities of the transport decision-making process may permit those of a lesser priority to be transported first.
7. False. Command relates to the internal direction of personnel within an organisation.
8.
   - Major incident declared – Yes.
   - Exact location – Serves You Right Café, Ravenshoe.
   - Type of incident – Vehicle collision with premises resulting in explosion.
   - Hazards present – Potential issues include fire, structural damage to building, unstable vehicle, gas leak, electrical hazards.
   - Access and egress – Vehicular access via main street, helicopter access via nearby school oval.
   - Number and type of casualties – 21 people injured.
   - Emergency services:
     - On scene – Police, fire, ambulance, medical.
     - Required – Additional ambulances, aeromedical transfer.
9. True. There may be multiple bronze commanders allocated to different geographical areas within an incident scene, or allocated to specialist functions. These bronze commanders will report to a single silver commander.
10. Prevention, preparedness, response, and recovery (PPRR).

Chapter 27

Test your knowledge

1. Falls, medication compliance, social welfare/living conditions.
2. More.
3. Marfan's syndrome and is also associated with congenital heart disease.
4. Lung cancer, congenital heart disease, cirrhosis, endocarditis.
5. Hyperinflation of the lungs.
6. Major back pain and restrictive respiratory insufficiency.
7. Ultrasound, point-of-care testing, telemedicine.
8. Excess thyroid hormone production and has a classic thyroid stare appearance.

Activity 27.4

A red flag. It denotes the possibility that this symptom could mean a diagnosis of an urgent or dangerous problem with the patient that requires your immediate attention and care.

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Note: page numbers in *italics* refer to figures and those in **bold** to tables.

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