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Preface

To the student

Welcome to the fifth edition of the most successful fundamentals text ever to be published for students of nursing across Australia and New Zealand. In this new edition we have maintained the core format of a fundamentals text that you have told us you enjoy and find easy to navigate, while taking a more active and overt approach to partnership with people and families in decisions about the delivery of nursing care.

In this edition, we welcome a number of academics and clinicians to the experienced writing team, and acknowledge their expert contemporary knowledge and contribution to perspectives on health and health care. We retain an emphasis on the very important basics – the fundamentals of care that are the building blocks on which professional nursing practice is built. The clinical skills sections have been updated to reflect current best practice and are designed to support your preparation for practical learning within the ever-changing and increasingly technological world in which health care is delivered. We also re-emphasise the importance of self-reflection and awareness as important personal fundamentals for delivering quality care to the increasingly diverse populations we work with.

There is a large body of international evidence supporting the position that the quality of nursing care not only influences the way people experience illness, but also impacts on initial and long-term outcomes, quality of life and morbidity. Nurse staffing, education, workload, skill-mix and the context of care are also important determinants of quality in nursing and contribute substantially to the cost of health care. As we move into a time where the cost of hospital-based acute services is becoming unsustainable for many countries, it is the intelligent, agile and creatively competent nurse working across all sectors – including in community and primary healthcare – who will make a difference to keeping people well and cared for, more often in their own homes in the future.

Accepting the invitation to join the editorial team for the fifth edition was an easy decision for me. Not only was I excited to join an experienced and clearly successful group of editors, writers and educators, the concept of emphasising the importance and at the same time, the complexity, of fundamental nursing care, is one that resonates with me. It has been my experience that those things which may seem simple and trivial to others can have the most profound impact on people’s experience of illness and health – cleaning teeth, washing hair, a kind word, a smile, a gentle touch. It has also been personally rewarding to think about, talk about and essentially reconnect with the fundamentals of nursing by working with authors, reviewers and editors on this edition. A seriously impressive bunch!

The editorial team sincerely want you to discover why seemingly routine activities, such as feeding, bathing, toileting, walking or turning patients, are so critically important to your nursing and nursing care. The moments during which you perform these tasks are crucial to forming respectful relationships and partnerships with your patients and their families, and can give powerful insights into the aspects of care, recovery and rehabilitation that are the most valued. As in previous editions, the Clinical examples and Critical reflection points throughout the text underscore how nursing knowledge and skill implemented in practice can mean the difference between effective uncomplicated recovery and independence and costly, life-threatening complications, functional decline and disability.

The fifth edition is presented to you in eight parts. First, we situate nursing within the environments of Australia and New Zealand. Concepts around partnership in care and keeping people safe are important inclusions to this section.

We introduce a new framing for clinical reasoning in Part 2, offering a scaffold for systematic and critically reflective approaches to your practice. What is your first step? Knowing how to gather appropriate information and data is critically important as this will likely be different for every patient and family. What do you do next? What does the research tell you? How does best practice apply within this context and how is it relevant to the needs of your patient and their family? Making appropriate judgements and decisions for the application of relevant, high-quality information to shared decisions about priorities and actions, and the evaluation of outcomes (from the patient’s perspective) are introduced as effective ways of thinking about and embracing the value and meaning of partnerships in care.

The theme of safe and effective partnership in care continues in the third part of the text, but this time it is viewed through the lens of professional responsibility and accountability. Regulation, communication and documentation are key elements of professional and ethical practice.
Parts 4 and 5 discuss human development across the lifespan. In addition to reviewing the theoretical and practical aspects of growth and development, disability, ageing, dying and death, nursing of the developing human is situated within the complex contextual environments that we all live in and share. Here, you are invited to reflect on your own culture and values as a means of discovering personal insight into how these might affect therapeutic relationships throughout your nursing career.

The next section moves into the scientific bases of nursing practice and how these relate to basic human needs – the fundamentals of nursing. Part 6 explores the science behind physical assessment, infection control, therapeutic medication and medication management, including their practical applications. Part 7 emphasises what is at the core of this text – basic human needs, such as breathing, fluid and electrolyte balance, eating and sleeping, and how nursing practice and shared nursing knowledge aims to support people who are temporarily or permanently unable to meet specific needs by themselves.

Finally, Part 8 examines nursing in different contexts. Partly because large sectors of the Australian and New Zealand populations have access to safe food, water, shelter and a stable society; partly because contemporary Western medicine has been successful in developing and delivering treatments for disease; and partly because our world is increasingly complex and pressured – there are growing numbers of people requiring maintenance health care because of chronic conditions, people surviving previously fatal diseases, children with complex congenital and genetic birth defects who will live long and productive lives, and an ever larger group experiencing the normal degenerative conditions of ageing. While the majority of nursing graduates remain likely to commence work in acute care settings, the work of nurses in the future will be very much in demand in other locations.

Ongoing change in health care is the norm. Nursing of the future will be situated in many contexts and we believe it is crucial for you to understand the dynamic and evolving nature of your practice. To remain competent, engaged, agile and effective, having an intelligent, inquiring approach to your own learning and sharing of knowledge with others is vital.

Everyone who has contributed to this text has done so because they want you to be the best nurse you can possibly be. On behalf of the editorial team, I wish you every success in your career in health.

Donna Waters
on behalf of the Editorial Team
Clinical reasoning process offers a systematic and critically reflective approach as the foundation of safe and effective nursing care.

Key terms are listed at the beginning of each chapter and defined within the text.

Learning outcomes identify the main content and foci of each chapter.
critical reflection points are placed at intervals throughout each chapter as a way of inviting students to reflect on what they are reading.

cross-cultural ethics

as highlighted by the t&c ct report discussed on p. 19, another perspective on ethical issues that emerges from the critical reflection points is that of cross-cultural ethics. cross-cultural ethics reflect the need for:

- a firm grounding in the principles of medicine, science and technology, and an understanding of how these principles are applied in different cultures and contexts
- an appreciation of the diverse cultural backgrounds and experiences of healthcare workers and patients
- an understanding of the ethical issues that arise when healthcare workers and patients come from different cultural backgrounds

these considerations are important because they help ensure that healthcare workers are able to provide care that is culturally sensitive and appropriate.

Critical reflection points

CRITICAL REFLECTION POINT

Who are the most disadvantaged groups in society and how might this affect their health outcomes?

CRITICAL REFLECTION POINT

Why is it important for nurses to have an understanding of the cultural and linguistic diversity of their patients and how might this impact on their care?

critical reflection points provide examples of the most up-to-date knowledge, evidence, and practice.

research highlights

provide examples of the most up-to-date knowledge, evidence, and practice.

Evolution Nursing: Nursing and the Healthcare Environment

Research highlights

Research projects

- Developing a partnership with patients to improve outcomes in the area of health literacy
- Investigating the effectiveness of a multi-disciplinary team in improving patient outcomes
- Examining the impact of nurses' leadership on patient satisfaction

Research abstract

This research project aims to explore the influence of nurses' leadership on patient satisfaction and the outcomes of patient care. The study will involve a mixed-methods approach, with data collected from patient surveys and interviews with healthcare professionals. The findings will provide insights into the role of nurses in improving patient outcomes and inform strategies for enhancing healthcare delivery.

Safety as one of the fundamentals of care

Patient safety is one of the most important aspects of healthcare delivery. However, improving patient safety is a complex and multifaceted challenge. The Institute for Healthcare Improvement (IHI) has identified several key strategies for improving patient safety, including the use of checklists, standardized approaches to medication administration, and the implementation of a just culture. In this chapter, we will explore some of these strategies and discuss their potential impacts on patient safety.

Evidence-based practice

Evidence-based practice (EBP) is a process of integrating the best available research evidence with clinical expertise and patient preferences to inform decision-making. EBP involves the systematic identification, evaluation, and application of research evidence to clinical practice. In healthcare, EBP is essential for ensuring that patients receive the highest quality of care. In this chapter, we will discuss the principles and practice of EBP and its role in improving patient outcomes.

Working with diversity

Working with diversity encourages students to consider culture, lifestyle, gender, and age-related issues and choices in the broadest possible way.

Evidence-based practice

Evidence-based practice (EBP) is a process of integrating the best available research evidence with clinical expertise and patient preferences to inform decision-making. EBP involves the systematic identification, evaluation, and application of research evidence to clinical practice. In healthcare, EBP is essential for ensuring that patients receive the highest quality of care. In this chapter, we will discuss the principles and practice of EBP and its role in improving patient outcomes.
Sample student nursing care plans provide worked examples of how nursing care planning is individualised, based on scientific rationales and research evidence.

Skills featuring the step-by-step approach and rationales:

**Therapeutic relationship and patient considerations**

- Reminds students that the person is central to care provision in the therapeutic relationship for each skill.
- Each skill features the trusted step-by-step approach with rationales to help students understand how and why a skill is performed.

**Critical decision points**

- Alert students to critical steps within a skill to ensure quality and safety in client care.
- Images support learning and demonstrate how to perform techniques.
### Key concepts

**Older people access health and welfare services that...**

- **Positive ageing** refers to maintaining a focus on the physical, psychological and psychosocial aspects of... requires actively embracing concepts of healthy... are community-based, subacute and rehabilitation... circumstances and health status influence the choice of... of daily living.

**Conclusion**

In summary, older adults are Australia’s largest group of clients who utilise healthcare, are vulnerable to a range of issues, and access health and welfare services that...nursing interventions for psychosocial concerns include... Many people experience an expanding role in nursing, demands and challenges of an nursing, people. This represents an...matured older adults have...effects on all organ systems of the body...Changes in size, taste, family responsibilities, financial circumstances and health influence the choices...people access health and welfare services that...the use of health and welfare services that...are community-based, subacute and rehabilitation...circumstances and health status influence the choice of...voluntary control from higher brain centres and...voluntary control from the spinal cord.

**Online resources**

| Online resources | contain useful web links to current information on best practice and evidence-based guidelines. |

**References**

provide an up-to-date list of evidence-based sources and journal articles.

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PART 2
FRAMING NURSING:
Critical processes in nursing practice

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Learning outcomes

Mastery of content will enable you to:

• understand the value of using a reflective and systematic approach to clinical reasoning
• discuss the ways in which a systematic approach to clinical reasoning enhances nursing knowledge and skill development
• discuss the ways in which nursing knowledge and skill development enhances the process of clinical reasoning
• explain how using a systematic approach to clinical reasoning contributes to the visibility of nursing practice
• explain the relationship between critical thinking and clinical reasoning within nursing practice
• discuss the six basic domains evident within all processes of clinical reasoning
• use critical questioning within each of the six basic domains of the clinical reasoning process.
Introduction

This chapter will introduce you to the process of clinical reasoning, which will support your development as a nurse and make the critical thinking that guides nursing practice more visible to yourself and to others. A major goal in introducing you to a systematic process of clinical reasoning from the beginning of your nursing career is to enable its conscious and automatic use – no matter where you are practising or your level of experience as a registered nurse. We believe that those who establish such a systematic approach to their learning and practice are significantly more likely to have access to their own thinking and be more able to share their thinking and practices with others (Huang et al 2014), therefore making the complex clinical decisions that form the basis of nursing practice evident to ourselves, our colleagues and to those we care for. Put quite simply, the extent to which we engage in the process of clinical reasoning determines our ability to learn, to share that learning and to use what we have learnt in our day-to-day practice. It also helps us practise competently and confidently. Engaging in a reflective process in practice helps us to avoid the traps of cognitive bias, associated with self-fulfilling prophecy, prejudices, avoidance, group think and other challenges to safe and effective nursing care (Lieberman et al 2014).

Sound clinical reasoning does not happen by accident, nor does it occur by simply observing expert RNs practise (Levett-Jones et al 2010). Learning to think like a nurse requires deliberate practice and a structured approach to working through clinical problems. There is no surprise, then, that the process of clinical reasoning we outline below has several key domains that capture a systematic approach to: (1) gathering relevant information and data; (2) making appropriate judgements and decisions; (3) setting priorities and establishing goals; (4) preparing for and taking action; (5) evaluating impacts and outcomes; and (6) learning from the process to inform future practice. This process forms the first level of inquiry discussed in Chapter 7, and sets the foundation for all other levels of inquiry associated with the production and utilisation of nursing knowledge.

Previous editions of this book have used one specific framework (i.e. the Nursing Process, see Figure 4-1) to illustrate the clinical reasoning process (American Nurses Association 2010). From this edition onwards, however, we have decided to take a more inclusive and descriptive approach for ease of understanding and application. In addition, while the clinical reasoning process is depicted most commonly as a cycle (e.g. Levett-Jones 2013, Figure 4-2; Tanner 2006, Figure 4-3), we have decided to foreground the domains evident within those models, and background the notion of a cycle-like process. Within this chapter we take a generic, descriptive and inclusive approach, so that novices, such as yourselves, can understand how the range of available nursing models seek to achieve the same end, irrespective of specific language or depictions (Box 4-1). While there is indeed a logical process in the ordering of the domains that is cycle-like, we also know that everyday practice is inevitably more complex than starting at the beginning of the cycle, working through the domains of the cycle in a predetermined order and then closing the loop before moving on to the ‘next reasoning process’. Often, nurses need to focus simultaneously on several domains in relation to overlapping issues related to one patient. This chapter seeks to provide fundamental learning in relation to each domain that can be utilised across the range of clinical reasoning models.

So it does not matter which of the many clinical reasoning models you may be asked to use, or you decide you like best, as long as you understand that the basic domains remain constant. And, no matter which models you encounter, the fundamental knowledge, skills and attitudes associated with sound critical thinking will always lie at the heart of clinical reasoning (problem-solving, clinical judgement or diagnostic reasoning).

![Figure 4-1 The nursing process.](image)
**Figure 4-2 Clinical reasoning cycle.**

**Figure 4-3 Clinical judgement model.**
The importance of the clinical reasoning process for effective nursing practice

Our intention across this book overall is to help you build the fundamental knowledge and skills required for your development as a nurse. To do that, you need to engage effectively with the thinking/actions and learning associated with all six of the domains outlined and described across Chapters 4–7.

As you move through your nursing program you will come to realise that all of the chapters making up this book enhance your capacity to take a reflective and critical approach to the process of clinical reasoning. For example, several chapters focus on the accountabilities and responsibilities that need to be considered throughout the clinical reasoning process; these include those that are professional, ethical and legal in nature (e.g. Chapters 9–11). Other chapters provide you with an understanding of healthcare systems; the ways in which nurses, along with other healthcare professionals, work within these systems in general to achieve the best possible experiences and outcomes for patients and their families (e.g. Chapters 1–3, Chapter 8); and the roles and realities of working as nurses within specific healthcare contexts (Chapters 38–41). The knowledge and skills that will enhance your ability to take a person-centred approach in the care you provide to patients and families are outlined in Chapter 12 and across Chapters 14–22. The remaining chapters support your development in relation to specific clinical knowledge and skills. It is, however, the clinical reasoning process that focuses all of the above knowledge and skills, and sits at the heart of effective nursing practice.

There is a great deal of ongoing confusion around the definition, overlap among, and usage of the terms clinical thinking, clinical reasoning, clinical decision-making and clinical judgement (as well as other similar terms). For a thorough description of these constructs, see Alfaro-Lefevre (2013). In this fifth edition we have decided to take a slightly different approach to that of the first four editions. In an attempt to highlight critical thinking within the clinical context – that is, nursing care provided to patients – where the process of reasoning and action are intimately linked, we are using the term critical thinking in relation to the knowledge, skills and attitudes required for sound thinking, and we are using the term clinical reasoning to capture the systematic process demanded in the application of that thinking in the delivery of nursing care.

To begin, let us consider the process of reasoning in relation to one common area of our everyday lives: our dental health. You might, for example, go months without even consciously considering your teeth, how they feel and how they look. One day you may notice a slight pain in a molar and then find yourself actually looking more closely and thinking about what is going on in your mouth. You may see some discolouration and feel a build-up of plaque behind your teeth. You start to worry that your mouth looks unappealing and that you might have some real problems brewing. Then you go into your exam period and forget about your mouth and it might take six months to get back to even thinking about it – unless your toothache worsens to a point where you cannot avoid it. Maybe you get back to thinking about it and even decide that you need to go to the dentist; you make the appointment and then cancel it – no money! Your mother might comment on your dental hygiene, but she is just trying to have a go at you and she doesn’t know what you are going through or understand … It may take several months for you to seek out the advice of a dentist; and then several more months to act on that advice … Or you may never do anything. If you do take some of the advice, such as flossing every day, it may only last a couple of weeks because your teeth don’t look any different, so why bother?

Replace this dental example with ‘eating habits’, ‘exercise’, ‘hygiene’, ‘stress management’, or any of a myriad of areas related to your day-to-day decisions and actions and you will recognise the stop/start, approach/withdraw, cost/benefit type dynamics we all experience at times. You can see from the above example that the critical points in the process of reasoning relate to:

- what we pay attention to or ‘see’, and the extent to which we trust what we ‘see’
- how we make sense of what we ‘see’ (the story we tell ourselves)
- what we decide to do and why
- when we do it
- how we do it
- if we do it
- determining if it worked for us.
The chaotic and hit-or-miss nature of the approach most of us take in relation to some aspects of our personal lives is, however, simply not acceptable within the context of our nursing practice, where clinical reasoning determines patients’ experiences of care as well as minor and major health outcomes. For example, failure to recognise and rescue hospitalised patients at risk of clinical deterioration is related to poor clinical reasoning skills (Levett-Jones et al. 2010). We are responsible for providing safe, effective and appropriate nursing care to those we work with, and we have an obligation to ensure we do that to the best of our ability. Decisions concerning what we do and do not notice, and the actions we take (even the action of doing nothing) in response to that will determine both the experiences of care and outcomes achieved for patients. This is as true in relation to relatively ‘mundane or common’ aspects of nursing care (such as administering medications, oral hygiene or patient comfort) as it is for those that are viewed as more dramatic and associated with survival (such as cardiopulmonary resuscitation). One of the challenges nurses face is finding ways of providing care that covers the range of patient needs: from day-to-day care and support to care that is unequivocally life changing (or sustaining). The extensive work on patient safety and focus on patient satisfaction reflects the extent to which these distinctions are far more subjective, complex and interrelated than many think; and providing effective fundamental care can, and does, have a profound impact on patient experiences and outcomes (see Chapters 2 and 3).

Take, for example, a process triggered by an observation that a woman in your care on an acute unit is visibly upset after a visit by her husband. You could tell yourself that she is obviously missing her family and she will get over it, so decide to ignore her distress and stay away from her for an hour so she can calm down. You could tell yourself that she is lonely and work to cheer her up and spend as much time as you can with her, telling jokes and engaging her in superficial chatting. You could just choose to not think about it because it is probably something personal and none of your business. The truth is that you are making assumptions based on nothing you have verified beyond your own perspective/insight. An appropriate response to the observed distress involves a process of seeking additional information concerning the observed distress from the patient, seeking to understand the basis of the distress and the consequences of that distress for the patient, determining what you might do as a nurse in response to the distress, generating some strategies to support the patient and taking related actions, and keeping in touch with the patient to ensure that the actions you took have been helpful. The development of effective nursing practice, then, requires the use of a systematic process of clinical reasoning that maximises the use of all relevant information, leads to sound judgements and decisions, identifies appropriate goals and priorities, and leads to assessable outcome-based actions and learning.

0 CRITICAL REFLECTION POINT

Now that you have a better understanding of the domains of clinical reasoning, reflect on the following:

1. **What existing knowledge bases, skills and experiences can you draw upon to enhance the development of clinical reasoning within your practice?**

2. **Identify three strategies that you will use to support your development in this area.**

The process of clinical reasoning

As discussed in the introduction to this chapter, there are a myriad of conceptual models seeking to explicate the process of clinical reasoning; and you will undoubtedly encounter several of these in your studies and across various clinical settings. One thing that everyone does agree on, however, is that clinical reasoning (by any name) is crucial for effective nursing practice (Box 4-2). Australian and New Zealand students are commonly exposed to the nursing process as a problem-solving approach to practice (see Figure 4-1), the clinical reasoning cycle (see Figure 4-2) or Tanner’s clinical judgement model (see Figure 4-3). There is no surprise in this; however, the similarities and differences among such models/cycles can

**BOX 4-2 Developing clinical reasoning skills**

Developing clinical judgement – clinical reasoning skills – is one of the most important and challenging aspects of becoming a nurse. It’s important because people’s lives depend on it. It’s challenging because thinking in the clinical setting is often fraught with more anxiety and risks than any other situation … It entails things like knowing what to look for, how to recognise when a patient’s status is changing, and what to do about it. For beginners, this is particularly taxing because it requires an ability to recall facts, put them together into a meaningful whole, and apply the information to a current clinical situation (a situation which is often fluid and changing).
be confusing. Just remember that they are all underpinned by a logical structure for working through a thinking process and associated actions: ‘see something’, ‘make some interpretations or judgements concerning what is going on and what might be done about it’, ‘do something’ and ‘look to see if what was done achieved what it was intended to achieve’ (see Box 4-1). And finally: learn from the experience.

**CRITICAL REFLECTION POINT**

Go to your favourite search engine and insert ‘define clinical reasoning’. What will appear – along with the URLs for a myriad of relevant sites – are some images of clinical reasoning models, cycles, stages, etc. Open up some of these and examine the ways in which the particular person, professional group or organisation describes their particular approach.

1. **What similarities and differences do you see among the models you examine?**
2. **Do one or more of these resonate with you and the way you think about nursing?**
3. **Why do you think so many different approaches have evolved across time, professions and contexts?**
4. **What do you think is behind our decision to take a more generic and inclusive approach to discussing the process of clinical reasoning?**

The starting point of clinical reasoning involves the identification and bringing together of information/data triggered by an observation or insight. For example, the observation that a patient has a high blood pressure reading triggers the gathering of information relevant to that observation: history, previous readings, diagnosis, other assessments of the patient and so forth. This information can be in existence already, or may need to be generated. The goal within this domain is to have all of the information/data required to move into making judgements and decisions concerning the appropriate response or actions. This process is dependent on your ability to obtain clear information from the patient and/or family members, the knowledge you were given at handover or through reading the patient’s notes, and your existing knowledge of the area (e.g. normal range of blood pressure readings, factors that influence readings, etc), local policies and practice guidelines. You will also need to undertake a focused physical assessment of the patient (Chapters 23 and 24).

As the relevant information or data are obtained, the process moves on to making appropriate judgements and decisions concerning what these mean, and what actions may need to be taken. One possible, and very common, outcome at this point is the recognition of the need for more information, or different forms of information/data. There are of course other possible next steps, including the need to involve additional people in the process or the need to act quickly in response to one vital piece of information (e.g. the blood pressure falls well outside the normal range and the patient requires immediate assessment by the appropriate medical team). As a novice, one of the most common steps to be taken at this stage is identifying the best person to assist you in making sense of what is going on and what needs to happen next. Your ability to share your observations/data or information in a clear and concise manner will determine both the quality and quantity of support you receive from more experienced colleagues, as well as the timeliness of that support.

The decisions that are made concerning appropriate action then need to be prioritised and specific goals established. This involves considering options and determining what is likely to be most effective: for example, evidence from previous experience, local guidelines/data or research evidence (Chapter 7), what is possible and what is acceptable. Priorities and goals are of course linked to the impacts or outcomes that are sought through the actions to be taken. And, of course, action planning can uncover the need for either additional information/data or for input from others to gain additional judgements and potentially lead to different decisions.

Remember, the decision not to act is in itself an action. All actions should be preceded by appropriate preparation: this may include getting physical resources together and developing specific skills, or locating someone with those skills. And even if the patient and the family have been closely involved in the decision-making process, it always involves ensuring their input, understanding and agreement.

In order to ensure the effectiveness of nursing practice we need to avoid assumptions that those actions we take will always achieve the intended goal or outcomes. Indeed, you may find that some actions have unexpected or detrimental effects. Nursing practice is complex; human beings are complex; and healthcare environments are complex. A particular practice might work well for one patient but not for another; and the reasons for this may be unclear. Some patients experience straightforward recovery from the same procedure that causes distress in others. ‘Closing the loop’ or assessing the outcomes of your actions or practice is fundamental to both the ongoing development of nursing practice and to your learning.

In summary, the process of clinical reasoning works equally well across contexts and throughout all stages of your development as a nurse. That is, the process remains constant, although in different contexts the focus of each
domain (e.g. what data are available, what actions are possible or acceptable) may vary dramatically. In addition, as you develop your knowledge and expertise, the nature of your engagement in the process will evolve: as a student nurse you will need to access the support of others as you work through the cycles; as a more experienced and knowledgeable nurse your judgements and decisions will become more autonomous.

**Developing your nursing knowledge and skills through the clinical reasoning process**

What both drives and emerges from the clinical reasoning process is nursing knowledge. As your nursing knowledge base develops, the meaning you give to situations changes and learning occurs. You then take this learning with you to the next situation and create new meanings and experiential knowledge. Conway and McMillan (2014) explain this concept well in Figure 4-4 and demonstrate this continual process of learning as an outcome of nursing experience.

However, experience is 'cheap', and, as Conway and McMillan (2014) argue, experiential knowledge is not merely accumulated as a result of working as a nurse or nursing student. Experiential knowledge is generated through ongoing learning that comes from critical and reflective approaches to making sense of, and building on, our existing knowledge. Learning, rather than merely experiencing, occurs when we apply concepts to practice, manage complex patient-care situations that trigger uncertainty, and are accountable for our clinical reasoning in practice. Becoming comfortable with questioning and justifying our clinical decisions based on evidence is crucial to developing as a professional (see Box 4-3).

The depth and extent of your nursing knowledge will influence your ability to think critically about and act effectively in different clinical situations. Consider the following Clinical example.

**BOX 4-3 Learning from practice**

- Was the clinical management of this patient supported by scientific rationales, research evidence and the patient’s responses to treatment?
- Were there plausible alternatives to the chosen interventions?
- To what extent were my clinical decisions influenced by personal assumptions and beliefs?
- What were the most important personal learning outcomes – including awareness of my personal strengths and weaknesses?
- What actions would I take if presented with a similar situation in the future, and why?

**CLINICAL EXAMPLE**

**Postoperative fever**

You are working on a surgical ward during a clinical placement and are asked by your buddy RN to take routine postoperative observations on a patient who is

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*Figure 4-4 The relationship between situation analysis, learning and professional practice.*

24-hours post-laparoscopic appendicectomy, and is to be discharged later in your shift. When you take his body temperature you find it is 38°C. You wonder whether this is significant and whether you need to do anything about it.

You discuss the finding with your buddy RN, who explains that a low-grade fever appearing soon after surgery (24–48 hours) is often part of the body’s inflammatory response. Other common causes of postoperative fever include atelectasis, pneumonia, wound infection, urinary tract infections or infected IV sites. Also, because your patient has had an appendicectomy, he should be observed for evidence of peritonitis. With this information in mind, you return to the patient to complete a focused body systems assessment in order to confirm or rule out these potential causes (see Chapter 24).

On assessment you find:

- **Primary survey and vital signs:** The patient looks well and appears to be in no acute discomfort or distress. Other vital signs are within normal limits: Respiratory rate 14/min, SpO2 98% on room air, pulse rate 70/min, blood pressure 120/70 mmHg. On the observation chart, the temperature pattern shows a low-grade fever since admission.
- **Chest:** The patient’s breathing is relaxed. Lungs are clear to auscultation.
- **Abdomen:** Soft, slight tenderness at wound sites. Bowel sounds present. No guarding.
- **Wounds:** Port sites are dry and intact.
- **Extremities:** IV in right hand without redness, oedema or tenderness.

Based on the focused assessment data, you rule out any of the possible complications identified earlier. While the patient’s temperature is elevated, there is no data to suggest a problem at this time. In collaboration with your buddy RN, you decide the appropriate course of action is to monitor the patient’s temperature more frequently before discharge. You explain your findings to the patient, and discuss how and why you will be monitoring his body temperature over this shift.

Later you and your buddy RN determine that there has been no change in temperature, that the patient and his family understand how to monitor for postoperative fever, and are aware of the potential complications. In reflecting on this experience and how it will influence the way you respond to similar situations in the future, you identify the new knowledge you have gained about how to analyse and respond to a patient with postoperative fever as well as further learning needs such as gaps in your knowledge about the possible complication of peritonitis. Finally, the experience of discussing your thinking ‘out loud’ and hearing the way the RN could explain her decision-making and actions helped you develop confidence in discussing nursing practice. You realise that increasing your ability to make your clinical reasoning visible is a critical component of effective nursing practice.

The **Clinical example** above makes clear that, safely and effectively moving through each domain of clinical reasoning depends on the nurse’s knowledge and critical thinking ability. Determining the most relevant data/information to collect and making appropriate judgements and decisions are difficult skills for beginning nurses, until they have developed enough knowledge and clinical experience to draw upon. Put simply, your ability to recognise abnormal data will be directly related to how much you already know about the problem. In the **Clinical example**, the RN with postoperative care experience was immediately able to consider the most likely causes of this patient’s elevated temperature: respiratory complication (atelectasis), surgical complication (peritonitis), or a normal variation in response to appendicitis and surgery. In order to confirm or refute these possible explanations, the experienced RN is able to quickly focus assessment and gather additional data. While you might be tempted to jump to a conclusion based on one piece of data (i.e. body temperature 38°C), you can begin to see how this could lead to errors in clinical reasoning. An elevated body temperature in a postoperative patient could have many causes, and without further assessment, a sound clinical judgement cannot be made.

Alfaro-LeFevre (2009:99) states that: ‘using sound clinical judgement means drawing valid conclusions and acting appropriately based on those conclusions (e.g. monitor more closely, begin independent treatment, or contact a more experienced professional to activate the chain of command)’. We can see in the example how, together with the RN, the decision was made to monitor the patient’s temperature more closely before discharge. However, had you clustered further abnormal data along with the patient’s temperature of 38°C, such as increasing abdominal tenderness with ‘guarding’, nausea and absent bowel sounds, this would have suggested the potential complication of peritonitis. In this situation the priorities would have been to notify the medical team and initiate fundamental nursing care and collaborative interventions to manage the complication.

Of course, taking action and determining outcomes in this relatively simple clinical example also required nursing knowledge and skill in a range of areas such as health assessment, medical–surgical nursing and patient teaching. In reality, clinical reasoning is rarely a straightforward or linear process and experienced nurses...
will move backwards and forwards between domains. However, they will always be able to balance priorities and focus on nursing care that achieves the best experiences and outcomes for the patient. Consider a more complex Clinical example below to see this process in action: where the RN draws on her nursing expertise to work through the same process of clinical reasoning we have been discussing, albeit at a more complex level, to save the patient’s life.

### CLINICAL EXAMPLE

**The overlooked symptom**

I came to work that morning and had two patients in our transplant intensive care unit. One was a 22-year-old man who had received a liver transplant about 48 hours earlier. When I was doing my morning head-to-toe check, I found that he was very sleepy, his eyes were closed, he was jaundiced and he wouldn’t respond when I talked to him. When he did try to talk to me, he mumbled incomprehensibly.

I knew these symptoms were a problem. As an experienced transplant nurse, I knew that when you give somebody a liver and it works, they’re not jaundiced and they’re alert. They’re perky, eating, talking and even walking the halls. This young man was doing none of that. So I checked all his vital signs, his blood pressure, pulse, temperature — everything was where it should have been at that point in time, two days post transplant. Although his urine output was okay, the urine was a dark amber colour — which was a concern. I did his morning lab work, and everything was fine. But I was still worried. As the shift progressed, he became more lethargic and sleepy. I did another set of blood work on him, and it started to document that life in his liver was deteriorating. His urine output was now a very thick sludge that was brown-coloured and basically unmeasurable as a liquid.

I paged the resident, who blew me off with some comment like, ‘I’m the doctor,’ and so I shouldn’t worry. I told him bluntly that I was worried and that I was going to talk to the chief resident again and got the same response.

‘Look,’ I told him, ‘I’m sorry, I’m going to call the chief or the surgeon because this is not good; we’re wasting time,’ and I hung up.

A few hours later, when I became more concerned because the patient was even more unresponsive, I paged the resident again and got the same response. ‘Look,’ I told him, ‘I’m sorry, I’m going to call the chief or the surgeon because this is not good; we’re wasting time,’ and I hung up.

Just as I got off the phone with the resident, the surgeon walked in. ‘Lou,’ I said, ‘look, this young guy’s in liver failure. His liver has failed.’

I presented all the data supporting this conclusion. I explained that he was going into a hepatic coma, becoming encephalopathic. He was filling up with poisons that his new transplanted liver was not able to detoxify. Because I had been a transplant nurse for over eight years, I determined this even without doing any neurological testing. I was right. Indeed, his new blood work reflected a failed liver. The other critical liver lab values also reflected that fact. So did his urine. The dark brown sludge in his urine, was bile that the liver was not utilising properly (usually you excrete your bile in your stool, which is why your stool is brown). The fact that his labs were normal in the morning was meaningless because they had rapidly changed over the course of the shift.

‘We have to put him back on the list to get a new liver,’ I told the surgeon. ‘We’re wasting time by not being proactive.’ The surgeon gave the patient a once-over and agreed that I was spot-on. We immediately relisted the young man. He got a transplant, not that night but the next. Forty-eight hours later, he was sitting up in bed, eating and chatting.

Six days later, he went home with his parents and younger brother.

The bottom line is that the process of clinical reasoning is the basis for your practice as a registered nurse. One of the most important goals of nursing education is to develop your critical reasoning skills so that you can make the transition from student to graduate RN capable of taking action based on sound clinical judgements. As Table 4-1 makes clear, as a beginner encountering new clinical situations, you need to be active in learning and

| TABLE 4-1 The difference between cue collection in experienced and novice nurses |
|---------------------------------|-----------------------------|
| Experienced nurses              | Novice nurses               |
| Select relevant and specific cues | Less focused in their selection; tend to ‘over-select cues’ |
| Select cues that are context dependent | Follow rules when collecting cues, ignoring context |
| Collect information on a range of factors in addition to the patient’s presenting symptoms | Concentrate on presenting symptoms only |
| Have a way of ‘being with a patient’ and instantly knowing the patient after scanning him/her; they know what to pay attention to and what questions to ask | Focus on task and technology rather than the patient, and often miss important cues |

seeking support through this transition. Fundamental to your success in becoming an effective clinical nurse is a commitment to lifelong learning and critical self-awareness. Learning to take a critical approach to your nursing practice will at times challenge your personal assumptions and beliefs. It involves making honest appraisals of your personal strengths and weaknesses. And it means knowing when and where you need to seek support to meet patient needs.

Critical thinking – knowledge, skills and attitudes for sound clinical reasoning

Contemporary neuroscience is providing a range of lenses through which to view the challenges we all face in engaging in sound critical thinking: that is, challenges associated with being a human being, working as, and with, other human beings, being human! Work within one area, cognitive bias, is particularly relevant to our ability to think critically and engage in the process of sound clinical reasoning. Put quite simply, our ‘beliefs, decisions, and actions can be influenced by the unconscious drivers of cognitive bias’ (Lieberman et al 2014, p 4). It appears that as human beings we need to accept this fact, understand the potential implications for our thinking and decision-making and find ways to minimise these in our day-to-day practice.

Recent work in the area of cognitive bias identified above generated four categories into which the 150-odd biases evident within the literature on cognitive bias may be organised and a range of strategies for mitigating these (Box 4-4). It is a mistake to believe that those of us who have experienced the benefits of higher education and those of us who have accrued a lot of expertise are immune to bias; as it is to believe that the more ‘intelligent’ we are the less likely we are to be biased (Lieberman et al 2014). However, the more we work in teams, where information is shared and multiple perspectives are taken into consideration as a matter of course, the more ‘bias-proof’ we make our decisions. So teamwork is not simply about different members of the team having different knowledge and skill-sets associated with different aspects of the work of the team; it is also about having multiple sets of eyes and perspectives in play across all of the team’s work (Chapter 8).

Critical thinking is, then, a skill that demands a good deal of self-insight and willingness to challenge our own thinking, as well as that of others. Although critical thinking has many definitions (Huang et al 2014), there are common factors identified in the literature on critical thinking processes, all of which result in a change in belief or course of action (Riddell 2007):

- reflection
- identification and appraisal of assumptions
- inquiry, interpretation and analysis, and reasoning and judgement
- consideration of context.

BOX 4-4 Ways to reduce the impact of bias on critical thinking and clinical reasoning

As you develop your understanding of cognitive bias and the forms it takes, you will be able to identify a range of strategies to help you minimise the impact of these unconscious biases on your thinking and actions. Here are some that are a useful starting point:

- Seek out the opinions of independent others before making decisions
- Engage with colleagues who you know have different ideas or perspectives in order to challenge your own thinking
- Ask yourself, ‘What would I do if this patient was my grandmother/sister/brother etc?’ in situations where you are making decisions
- Get to know your colleagues and discuss your shared goals and values to maximise your sense of interconnectedness around practice
- After making complex decisions, take some time out and revisit your decision before taking action
- Develop a reflective approach to your practice in order to evaluate critically your actions and the associated outcomes
- Find a clinical supervisor or other more experienced colleagues who can help you think through your practice decisions
- Contribute to a culture where identifying own errors or performance challenges is accepted practice and the level of defensiveness surrounding these processes is low
- Practise becoming more of an objective observer of your own practice and that of your colleagues
- Seek out as much information or data as possible to inform decisions and actions
- Develop the high-level knowledge and skills required to ensure the above, including: critical thinking, critical reflection, high challenge/high support conversations.

Taken together, critical thinking is essentially the activity of questioning what is usually taken for granted (Parker 2014). A critical thinker identifies and challenges assumptions, considers what is important in a situation, imagines and explores alternatives, applies reason and logic, and thus makes informed decisions (Alfaro-LeFevre 2013). Critical thinking involves the application of nursing knowledge and experience to identify patient problems and to direct clinical judgements and actions that result in positive patient outcomes (Benner et al 2008).

As a nursing student, critical thinking begins when you start to seriously question what it is you do as a nurse, why you do what you do and how you might do it differently. Critical thinking presupposes a certain basic level of intellectual humility (i.e. acknowledging one’s own ignorance); an understanding of one’s values and possible biases; a commitment to think clearly, precisely and accurately; and the confidence to act on the basis of a well-argued position. When an RN directs critical thinking towards understanding and helping patients to find solutions to their health problems, the process is purposeful and goal oriented. Evaluation of the impact and outcomes achieved allows us to examine the extent to which our critical thinking achieved those goals.

As outlined above, the process of clinical reasoning is systematic and consistent across context and level of development of the nurse using it; however, context and level of expertise does affect the focus of each domain and the nature of the nurse’s engagement within each domain. A student nurse, for example, will require input from a range of people and external resources when seeking to work within each domain; and an experienced RN will inevitably move through the process more quickly than a student nurse (see Box 4-5). And as you saw above, the complexity of the situation at hand will determine whether the process is relatively straightforward – with a logical beginning and end point – or whether it is complex and dynamic.

The contemporary nursing practice environment is characterised by rapid change (Chapter 1). Even new graduates are involved with increasingly complex decisions because of greater acuity and complexity of patient care. Undergraduate nursing programs are designed to develop students’ core critical thinking skills such as those identified by the American Philosophical Association (Table 4-2). Huang and colleagues (2014) suggest potential milestones for the development of critical thinking (Table 4-3). It is clear that sound clinical thinking skills and knowledge, and a positive attitude to the development of these, will determine the effectiveness of clinical reasoning, and the minimisation of error and mismanagement of patient care. The development of such skills demands ongoing commitment and engagement in lifelong learning.

The crucial issue, whatever the context or knowledge base of the nurse involved, is the commitment of that nurse to actively engage in critical thinking throughout the clinical reasoning process. To arrive at more accurate conclusions, you will need to address critical questions as you work through each domain rather than make assumptions about patient problems and initiate interventions that have not been adequately considered. Box 4-6 provides some broad critical questions that provide a good starting place when working through the basic domains of a clinical reasoning process.

**BOX 4-5 Novices and experts – bridging the gap**

Clinical decision-making is a skill that is acquired with experience. The expert has learnt to deal with complexity, be receptive to nuance, to recognise urgency, to predict outcomes, to make decisions based on incomplete information, and to accept that an action may prove to be incorrect but was the ‘most right’ one to make at the time. They also have insight into their own thinking processes and personality, are better able to contain negative emotions and weigh up the opinions of others, and know how to get the team to work effectively.

Novices often feel compelled to make the right decision and want to gather all the information according to ‘the rules’ they have been taught before making the decision. They have a limited knowledge base and are uncomfortable with uncertainty and the negative emotion it may impart. They may have little experience in performing the task that is consequent to their decision, so rationalise against the decision. They are more likely to be influenced by the opinion of others, and to defer to others’ ‘expertise’, even if they suspect it is wrong.

Bridging the gap requires both the experts and novices to be aware of these differences. Novices need to recognise their limitations, and understand that they are in training and are not expected to perform like an expert.

Experts need to be aware that the thinking processes of novices are not equivalent to their own and that the information being conveyed by telephone is not the same as being there.

CRITICAL REFLECTION POINT

Now that you have been introduced to some basic ideas concerning brain-based imperatives and their potential impact on thinking and behaviour, re-read and reflect on Table 4-3. How does a neuroscience lens help us make sense of the knowledge, skills and attitudes of a ‘novice’ versus a ‘master’?

Conclusion

Sound clinical reasoning processes are the foundation of effective nursing care. Even if it is not at the level of conscious awareness, each clinical action we take as a nurse is the result of a reasoning process. Unless this is made visible and supported during your development as a registered nurse, faulty thinking and decision-making have obvious implications for patient safety and outcomes. We have argued that while there are several frameworks, models or cycles that use slightly different language or descriptions of clinical reasoning, they all seek to capture the same processes: gathering information, making decisions, setting goals, taking action and evaluating the outcomes achieved. Critical thinking is a skill that sits at the heart of sound clinical reasoning processes – and, like all skills, it can be improved and developed through deliberate practice and reflection.

TABLE 4-2 Critical thinking skills proposed by the American Philosophical Association

<table>
<thead>
<tr>
<th>Skill</th>
<th>Sub-skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Interpretation</td>
<td>Categorisation</td>
</tr>
<tr>
<td></td>
<td>Decoding significance</td>
</tr>
<tr>
<td></td>
<td>Clarifying meaning</td>
</tr>
<tr>
<td>2. Analysis</td>
<td>Examining ideas</td>
</tr>
<tr>
<td></td>
<td>Identifying arguments</td>
</tr>
<tr>
<td>3. Evaluation</td>
<td>Assessing claims</td>
</tr>
<tr>
<td></td>
<td>Assessing arguments</td>
</tr>
<tr>
<td>4. Inference</td>
<td>Querying evidence</td>
</tr>
<tr>
<td></td>
<td>Conjuring alternatives</td>
</tr>
<tr>
<td></td>
<td>Drawing conclusions</td>
</tr>
<tr>
<td>5. Explanation</td>
<td>Stating results</td>
</tr>
<tr>
<td></td>
<td>Justifying procedures</td>
</tr>
<tr>
<td></td>
<td>Presenting arguments</td>
</tr>
<tr>
<td>6. Self-regulation</td>
<td>Self-examination</td>
</tr>
<tr>
<td></td>
<td>Self-correction</td>
</tr>
</tbody>
</table>


TABLE 4-3 Potential milestones for development of critical thinking knowledge, skills and attitudes

<table>
<thead>
<tr>
<th>Stage</th>
<th>Knowledge</th>
<th>Skills</th>
<th>Attitudes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novice</td>
<td>Emphasises content over process. Lacks knowledge of critical thinking skills.</td>
<td>Has rudimentary ability to compare and contrast information.</td>
<td>Is not self-reflective.</td>
</tr>
<tr>
<td>Master</td>
<td>Modulates content, process and context well. Has intricate knowledge of critical thinking skills. Knows the critical thinking skills related to error.</td>
<td>Flexibly integrates and applies critical thinking to patient care. Uses adaptive expertise (toggles between Systems 1 &amp; 2 thinking). Uses metacognition routinely. Is able to teach and articulate own thinking process.</td>
<td>Considers arguments on both sides as well as ‘grey areas’. Appreciates need to develop critical thinking skills to improve patient outcomes. Embodies intellectual humility. Accepts uncertainty. Sees self as lifelong learner.</td>
</tr>
</tbody>
</table>

* Rules we make up in our lives either to avoid making complex trade-offs or to remove the need to continuously reassess everyday choices.

# ‘System 1’ is fast, instinctive and emotional; ‘System 2’ is slower, more deliberative and more logical.

BOX 4-6 Broad questions associated with each of the basic domains within the clinical reasoning process

Gathering relevant information and data
• What information/data exist and can be accessed?
• What additional information/data are needed?
• How reliable are the information/data?
• How confident am I in obtaining relevant information and do I need input from others?

Making appropriate judgements and decisions
• What do the information/data mean?
• What actions are indicated?
• Are the required actions acceptable or possible?
• How confident am I in making these judgements and decisions and do I need input from others?

Setting priorities and establishing goals
• What needs to happen and when?
• How are these goals to be achieved?
• What are the expected outcomes and timeframes?
• How confident am I in setting priorities and establishing goals and do I need input from others?

Preparing for and taking action
• What knowledge/skills do the actions demand?
• What resources are required?
• How will appropriate people become involved?
• How confident am I in my ability to take these actions and do I need input from others?

Evaluating impacts and outcomes
• What has been achieved?
• What is still to be achieved?
• Where do we go from here?
• How confident am I in evaluating the impacts and outcomes and do I need input from others?

Learning from the process to inform future practice
• How might input from others assist me or enhance my learning?
• What have we learnt that can inform future practice – related to the current patient/situation or in general?

RESEARCH HIGHLIGHT

Research focus
The complexity and challenges of contemporary health care mean that critical thinking skills are more important than ever for all healthcare professionals. The centrality of critical thinking is clearly reflected in competency frameworks across the health professions; although many clinicians achieve critical thinking through experience and observation rather than explicit instruction, others never master this skill.

Research abstract
The purpose of the work described here was to bring together experts from across medicine and nursing in order to develop a range of strategies that would support the explicit teaching of clinical thinking across medical and nursing curricula. Participants were selected from North American Medical Schools and met the criteria of a) demonstrated commitment to curricular innovation; b) consideration of the cognitive sciences in curriculum development; and c) quality of the team members. The authors state that the decision to include nursing colleagues in this process was based on the significant contribution of nursing to the literature on critical thinking. Data were derived for this summary from small-group discussion notes, videotape review of large group conference events, and preliminary consensus documents circulated among the participants.

Evidence-based practice
Overall strategies to support the development of critical thinking skills:
• Slowing down the pace of the learning process to enable students to digest and apply knowledge.
• Actively engaging the learner in tasks that require problems to be solved.
• Compelling students to justify how they arrive at decisions.
• Making thinking explicit.
• Requiring self-reflection on the part of the learner.

Reference
enhanced over time through focus and practice. Critical thinking, and therefore clinical reasoning, is susceptible to cognitive bias, and individuals and organisations need to develop appropriate strategies to minimise its impact. Chapters 5 and 6 provide in-depth discussion of a range of factors and issues associated with each domain of the clinical reasoning process; and, Chapter 7 explores the utilisation of the knowledge gained through the reasoning process.

Key concepts

- Each of us engages in a reasoning process in our everyday lives. In a nursing practice context, this is called clinical reasoning and demands a critical approach to ensure patient safety.

- Although you will no doubt encounter many different frameworks or models to explain clinical reasoning, the process involves six basic domains: 1) gathering relevant information and data; 2) making appropriate judgements and decisions; 3) setting priorities and establishing goals; 4) preparing for and taking action; 5) evaluating impacts and outcomes; and 6) learning from the process to inform future practice.

- Asking critical questions at each domain of clinical reasoning helps us to become more aware of our assumptions and cognitive biases, leading to better clinical decisions.

- A commitment to developing as a reflective practitioner – being critical and learning from practice – is the essence of good nursing.

Online resources

Foundation for Critical Thinking – an online model for learning the elements and standards of critical thinking: www.criticalthinking.org/ctmodel/logic-model1.html

David Rock provides a comprehensive starting place for anyone seeking to journey into the area of ‘neuroscience meets cognition and human behaviour’: www.davidrock.net/resources/

References


PART 6
PRACTISING NURSING:
Scientific basis of nursing practice

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Monitoring vital signs: using a primary survey approach for patient assessment

Anthony Schoenwald and Clint Douglas

Learning outcomes

Mastery of content will enable you to:

• apply the primary survey (ABCDE approach) as the foundation of any patient assessment.
• describe normal parameters for vital signs based on the physiology of respiratory and cardiovascular systems and body temperature regulation.
• measure and document vital signs accurately using appropriate equipment.
• begin to make clinical judgements and decisions about the meaning of assessment data, including the need to escalate care appropriately.
CHAPTER 23  MONITORING VITAL SIGNS: USING A PRIMARY SURVEY APPROACH FOR PATIENT ASSESSMENT

Introduction

Assessment of airway, breathing, circulation and disability (neurological state) is the crucial first element of clinical assessment in every patient encounter (Considine & Currey 2015). A structured and systematic primary survey (ABCDE approach) provides essential information about patient status in the order of clinical importance, allowing you to identify and correct threats to patient safety before moving on to a focused assessment (discussed in the next chapter). This chapter is organised around the primary survey relevant to general acute care settings (Box 23-1), focusing on basic airway assessment, respirations, oxygen saturation, pulse, blood pressure, level of consciousness, and body temperature (Adam et al 2010, Clarke & Ketchell 2011, Price et al 2016). Collectively, these parameters are known as the vital signs, the ongoing monitoring of which is a primary nursing responsibility.

The importance of nursing assessment for patient safety

Sudden or gradual changes in vital signs can indicate life-threatening clinical states requiring urgent intervention and escalation of care (Cardona-Morrell et al 2015). Although more research is needed on the effectiveness of routine vital signs for early recognition of adverse events in general ward patients (Zeitz & McCutcheon 2006, Storm-Versloot et al 2014), the importance of vital signs to confirm serious illness and predict poor patient outcomes during hospitalisation is well established (Cardona-Morrell et al 2015).

Bleyer and colleagues’ (2011) study of over 1 million vital signs collected from patients over the course of their hospitalisation is one of the largest studies available. You can see in Figure 23-1 the line graphs that show the prevalence of vital signs recorded, which peak around the normal adult ranges as expected. What is interesting here are the bar graphs, which show the proportion (%) of patients who died during hospitalisation with a vital sign recorded in that range. For example, you can see that a normal adult respiratory rate (< 20/min) was associated with a very low mortality. However, as respiratory rates increased outside of the normal range, patient mortality increased in a linear way: 10% of patients died with a respiratory rate of 28 to < 32 breaths/min, 16% with 32 to < 36 breaths/min, 20% with 36 to < 40 breaths/min, and 25% with 40 to < 44 breaths/min (Bleyer et al 2011). Respiratory rate is one of the most neglected vital signs, yet one of the earliest indicators that patients are at risk of clinical deterioration (Cretikos et al 2008).

Having two or more critically abnormal vital signs is also strongly associated with death. Bleyer and colleagues (2011:1387) used the same data set to examine patient outcomes with multiple critical vital signs defined as ‘a systolic blood pressure < 85 mmHg, heart rate > 120 bpm, temperature < 35°C or > 38.9°C, oxygen saturation < 91%, respiratory rate ≤ 12 or ≥ 24, and level of consciousness recorded as anything but alert’. You can see in Table 23-1 that increased simultaneous presence of abnormal vital signs, together with increased age, was strongly associated with higher mortality. Almost 1 in 4 patients died (23.6%) with a trio of critically abnormal vital signs.

The importance of nursing assessment for patient safety cannot be overstated. The bedside RN carries the highest level of responsibility for the accurate measurement and interpretation of clinical data (Considine & Currey 2015). Using the primary survey framework discussed in this chapter can help you organise and communicate clinical findings to others. To improve the recognition of patients at risk of clinical deterioration, most acute care settings in Australia and New Zealand have adopted standardised charts for vital sign monitoring that follow...
Figure 23-1 Prevalence of admissions in which a vital sign in the given range occurred and proportion of individuals in that given vital sign range who expired (%).

TABLE 23-1  In-hospital mortality (%) associated with the simultaneous occurrence of critical vital signs

<table>
<thead>
<tr>
<th>Number of simultaneous critical vital signs</th>
<th>All ages</th>
<th>Age &gt; 60 years</th>
<th>Age &gt; 70 years</th>
<th>Age &gt; 80 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.24 (44)</td>
<td>0.40 (32)</td>
<td>0.62 (26)</td>
<td>0.92 (15)</td>
</tr>
<tr>
<td>1</td>
<td>0.92 (174)</td>
<td>1.47 (134)</td>
<td>1.96 (100)</td>
<td>2.09 (44)</td>
</tr>
<tr>
<td>2</td>
<td>6.95 (295)</td>
<td>9.84 (213)</td>
<td>11.5 (148)</td>
<td>13.0 (80)</td>
</tr>
<tr>
<td>3</td>
<td>23.6 (186)</td>
<td>33.1 (128)</td>
<td>42.0 (99)</td>
<td>42.9 (48)</td>
</tr>
<tr>
<td>4 or more</td>
<td>42.4 (61)</td>
<td>57.7 (41)</td>
<td>63.0 (29)</td>
<td>52.4 (11)</td>
</tr>
</tbody>
</table>

The number of patients who expired is noted in parentheses.


an ABCDE approach (Figure 23-2). The primary survey is also aligned with rapid response systems, which vary across organisations, but also follow an ABCDE approach (Figure 23-3). Rapid response teams are called when ward staff identify patients at risk of clinical deterioration to provide timely assessment and management. However, activation of rapid response systems and rescue of deteriorating patients are primarily dependent on the patient assessment and escalation of care decisions made by ward nurses (Considine & Currey 2015).

Airway
Anatomy and physiology
The primary survey begins with a priority airway assessment. The airway supports free exchange of air between the external environment and the lungs. Essentially, the structures involved are the oral cavity, nasal passages, pharynx, larynx, trachea and the left and right main bronchi. Any type of obstruction to one or more of these structures will reduce the diameter of the airway leading to decreased flow of air. Examples include pathological (asthma, infection, abnormal lesions, immunological responses) and/or mechanical obstruction (secretions, airway trauma, foreign objects, aspiration of gastric contents, obstructive sleep apnoea). You may observe coughing and increased respiratory rate and effort. Inadequate compensation will lead to decreased oxygen delivery to tissues (hypoxia) and/or inadequate elimination of carbon dioxide.

Basic airway assessment
Basic airway assessment must be a priority before any other assessment because an ineffective airway can be life-threatening within minutes and should be treated immediately (Adam et al 2010). Look at your patient and observe for chest movement. If the patient can talk normally and is conscious and alert, the airway is patent (Adam et al 2010). If an oxygen mask is already in place, it is possible to observe humidification of the plastic mask by the patient’s expirations. Listen closely for air entry and feel respirations with your hand.

Any noisy respirations, such as obstruction from secretions, will need immediate intervention, such as suctioning. Assess the patient’s ability to cough. If warranted, look in the mouth for obvious foreign bodies that could be removed (Figure 23-4). Partial obstruction may be present if you detect snoring (occlusion of the pharynx by the tongue or palate), stridor (obstruction above the level of the larynx), wheezing (obstruction of the lower airway), gurgling sounds (liquid or semi-solid material) or a hoarse voice (Adam et al 2010, Price et al 2016). The patient with a compromised airway may be very anxious, sitting up and drooling. Look, listen and feel for signs of respiratory distress in adults and children (Figures 23-5 and 23-6). Remember, the patient will appear distressed unless a complete obstruction leads to unconsciousness and respiratory arrest (Price et al 2016).

Breathing
Physiology and regulation
Knowledge of the structure and function of the respiratory system facilitates accurate assessment of breathing. Human survival depends on the ability of oxygen (O₂) to reach body cells and for carbon dioxide (CO₂) to be removed from the cells. Respiration is the mechanism the body uses to exchange gases between the atmosphere and the blood and between the blood and the cells. Effective respiration requires ventilation (the movement of gases into and out of the lungs), diffusion (the movement of oxygen and carbon dioxide between the alveoli and the red blood cells) and perfusion (the distribution of red blood cells to and from the pulmonary capillaries).
Figure 23-2 Hospital observation chart using the ABCDE approach.

Clinical Excellence Commission 2013 The NSW Health Standard Observation Charts Between the Flags: Keeping patients safe.
## Chapter 23: Monitoring Vital Signs: Using a Primary Survey Approach for Patient Assessment

### General Observation Chart

<table>
<thead>
<tr>
<th>Observation</th>
<th>Standard Adult Observation Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory Rate</td>
<td>Ns/2</td>
</tr>
<tr>
<td>Heart Rate</td>
<td>Ns/2</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>Ns/2</td>
</tr>
<tr>
<td>Oxygen Saturation</td>
<td>Ns/2</td>
</tr>
<tr>
<td>Other</td>
<td>Ns/2</td>
</tr>
</tbody>
</table>

**Yellow Zone Response**

1. Initiate appropriate clinical care
2. Document an A-G assessment, reason for escalation, treatment, and outcome in your patient’s health care record
3. Inform the attending medical officer that a call was made as soon as it is practicable
4. Reassess your patient and escalate according to your local CERS if the call is not attended within 30 minutes

**Red Zone Response**

1. Initiate appropriate clinical care
2. Document an A-G assessment, reason for escalation, treatment, and outcome in your patient’s health care record
3. Inform the attending medical officer that a call was made as soon as it is practicable
4. Reassess your patient and escalate according to your local CERS if the call is not attended within 30 minutes

**Considerations for Patient’s Deterioration**

- Sepsis, a new arrhythmia, hypovolaemia/hypotension, pulmonary embolus/DVT

**ALTERATIONS TO CALLING CRITERIA**

- Any alterations must be signed by a medical officer and confirmed by the attending medical officer

**Sample Proofs © Elsevier Australia**
The respiratory centre in the brainstem regulates the involuntary control of respirations. Adults normally breathe in a smooth, uninterrupted pattern 12–20 times per minute. The respiratory drive is regulated by carbon dioxide, oxygen and hydrogen ions (pH) in the arterial blood. The most important factor in the control of ventilation is the level of CO₂ in arterial blood. An elevation in the CO₂ level (hypercapnoea) or hypoxia causes the respiratory control system in the brain to increase the rate and depth of breathing, which removes excess CO₂ by increasing exhalation. Some patients with chronic lung disease have ongoing hypercapnoea and are known as CO₂ retainers. For patients with hypoxaemia (reduced levels of arterial oxygen) in association with chronic lung disease, controlled oxygen therapy is used (see Chapter 35).

**Mechanics of breathing**

Although breathing is normally passive, muscular work is involved in moving the lungs and chest wall. Inspiration is an active process. During inspiration the respiratory
centres sends impulses along the phrenic nerve, causing the diaphragm to contract. Abdominal organs move downwards, increasing the volume of the chest cavity to move air into the lungs. The diaphragm moves approximately 1 cm, and the ribs retract upwards from the body’s midline approximately 1.2–2.5 cm. During a normal, relaxed breath, an adult inhales approximately 500 mL of air. This amount is referred to as the tidal volume. During expiration, the diaphragm relaxes and the abdominal organs return to their original positions. The lung and chest wall return to a relaxed position (Figure 23-7). Normal breathing should be effortless.

**Respirations**

The accurate assessment of **respirations** depends on recognition of normal thoracic and abdominal movements (Skill 23-1). During quiet breathing, the chest wall gently rises and falls. Contraction of the intercostal muscles between the ribs or contraction of the muscles in the neck and shoulders, the accessory muscles of breathing, is not visible. During normal quiet breathing, diaphragmatic movement causes the abdominal cavity to rise and fall slowly. Prior to assessing respiratory rate, observe for difficulty breathing, accessory muscle use, asymmetrical chest movement and central cyanosis, which appears as a blue tinge to mucous membranes and lips (Clarke & Ketchell 2011).

**Figure 23-7  Mechanics of breathing.**

*Potter PA, Perry AG 2013 Fundamentals of nursing, 8th edn. Mosby, St Louis.*

**Respiration measurement** can best be done before assessing the pulse with your hand on the patient’s wrist as it rests over the chest or abdomen. This approach allows assessment of respiratory rate, pattern and depth without drawing the patient’s attention to the assessment. If the patient is aware, they may unintentionally alter their rate and depth of breathing. Observe a full inspiration and expiration.

**SKILL 23-1**

**Assessing respirations**

**Delegation considerations**

Respiration measurement can be delegated to enrolled nurses who are informed of:

- patient history or risk of increased or decreased respiratory rate or irregular respirations
- frequency of respirations measurement
- the reportable levels for the patient
- the need to report any abnormalities.

**Equipment**

- Watch with second hand or a digital display
- Pen, observation chart

**Therapeutic relationship and patient considerations**

- Confirms patient identity
- Gains patient consent
- Initiates communication by introductions and clarification of patient’s immediate needs and problems
- Identifies how the skill will affect the patient
- Discusses procedure with the patient to clarify understanding
- Provides reassurance
- Assesses patient knowledge and expectations and ensures patient understanding
- Where necessary, provides further clarification
- Explains actions and potential discomfort at all stages of procedure
### STEPS

<table>
<thead>
<tr>
<th>STEPS</th>
<th>RATIONALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Determine the frequency of monitoring respirations:</td>
<td>Certain conditions place patient at risk of alterations in ventilation detected by changes in respiratory rate, depth and rhythm.</td>
</tr>
<tr>
<td>a. Consider previous medical conditions for respiratory alterations.</td>
<td>Physical signs and symptoms may indicate alterations in respiratory status related to ventilation.</td>
</tr>
<tr>
<td>b. Assess for signs and symptoms of respiratory alterations such as bluish or cyanotic appearance of nail beds, lips, mucous membranes and skin; restlessness, irritability, confusion, reduced level of consciousness; pain during inspiration; laboured or difficult breathing; adventitious breath sounds (see Chapter 24), inability to breathe spontaneously; thick, frothy, blood-tinged or copious sputum produced on coughing, use of accessory muscles to breathe, grunting sounds.</td>
<td>SpO₂ less than 90% is clinically significant and often accompanied by changes in respiratory rate, depth and rhythm.</td>
</tr>
<tr>
<td>c. Pulse oximetry (SpO₂). Acceptable SpO₂ &gt; 95% on room air. 88–92% may be acceptable for patients with chronic obstructive pulmonary disease.</td>
<td></td>
</tr>
<tr>
<td>2. Determine previous baseline respiratory rate (if available) from patient’s record.</td>
<td>Assess for change in condition. Provides comparison with future respiratory measurements.</td>
</tr>
<tr>
<td>3. Be sure patient is in comfortable position, preferably sitting or lying with the head of the bed elevated 45–60 degrees.</td>
<td>Sitting erect promotes full ventilation.</td>
</tr>
<tr>
<td>4. Perform hand hygiene.</td>
<td>Prevents transmission of microorganisms.</td>
</tr>
<tr>
<td>5. Draw curtains or close door to the patient’s room prior to exposing the patient.</td>
<td>To ensure privacy during assessment procedure.</td>
</tr>
<tr>
<td>6. Be sure patient’s chest is visible. If necessary, move bedclothes or gown.</td>
<td>Ensures clear view of chest wall and abdominal movements.</td>
</tr>
<tr>
<td>7. Place patient’s arm in relaxed position across the abdomen or lower chest, or place nurse’s hand directly over patient’s upper abdomen (see illustration).</td>
<td>A similar position used during pulse assessment allows respiratory rate assessment to be inconspicuous. Patient’s or nurse’s hand rises and falls during respiratory cycle.</td>
</tr>
<tr>
<td>8. Observe complete respiratory cycle (one inspiration and one expiration).</td>
<td>Rate is accurately determined only after nurse has viewed respiratory cycle.</td>
</tr>
</tbody>
</table>
CHAPTER 23 MONITORING VITAL SIGNS: USING A PRIMARY SURVEY APPROACH FOR PATIENT ASSESSMENT

9. After cycle is observed, look at watch’s second hand and begin to count rate: when second hand hits number on dial, begin timeframe, counting 1 with first full respiratory cycle.

   **Rationale:** Timing begins with count of 1. Respirations occur more slowly than pulse; thus timing does not begin with 0.

10. If rhythm is regular, count number of respirations in 30 seconds and multiply by 2. If rhythm is irregular, < 12 or > 20, count for 1 full minute.

   **Rationale:** Respiratory rate is equivalent to number of respirations per minute. Suspected irregularities require assessment for at least 1 minute.

**Critical decision point:** Respiratory rate < 12 or > 20 requires further assessment (see Chapter 24) and may require immediate intervention.

11. Note depth of respirations, subjectively assessed by observing degree of chest wall movement while counting rate. Can also objectively assess depth by palpating chest wall excursion or auscultating the posterior thorax after rate has been counted. Depth is described as shallow, normal or deep.

   **Rationale:** Character of chest movement may reveal specific disease state restricting volume of air from moving into and out of the lungs.

11. Note rhythm of respirations. Normal breathing is regular and uninterrupted.

   **Rationale:** Character of ventilations can reveal specific types of alterations.

**Critical decision point:** Occasional periods of apnoea, the cessation of respiration for several seconds, are a symptom of underlying disease in the adult and should be reported. An irregular respiratory rate and short apnoic spells are usual in a newborn.

12. Replace bedclothes and patient’s gown.

   **Rationale:** Restores comfort and promotes sense of wellbeing.

13. Perform hand hygiene.

   **Rationale:** Reduces transmission of microorganisms.

14. Discuss findings with patient as needed.

   **Rationale:** Promotes participation in care and understanding of health status.

15. If respirations are assessed for the first time, establish rate, rhythm and depth as baseline if within normal range.

   **Rationale:** Used to compare future respiratory assessment.

16. Compare respirations with patient’s previous baseline and normal rate, rhythm and depth.

   **Rationale:** Allows assessment for changes in patient’s condition and for presence of respiratory alterations.

**RECORDING AND REPORTING**

- Record respiratory rate and character in nursing notes and observation chart. Indicate type and amount of oxygen therapy if used by patient during assessment.
- Report abnormal findings to nurse in charge or medical practitioner.
expiration when counting ventilation or respiration rate. The respiratory rate varies with age (Table 23-2).

**Depth**

The depth of respiration is measured by observing the degree of excursion or movement in the chest wall. Respirations are described as **deep**, **normal** or **shallow**. A deep respiration involves a full expansion of the lungs with full exhalation. Respirations are shallow when only a small quantity of air passes through the lungs and this may be difficult to visualise. You may have to feel the chest rise and fall, or listen with a stethoscope over the central airways, if you observe that respirations are unusually shallow. Table 23-3 summarises types of respiratory alterations.

**TABLE 23-2 Acceptable respiratory rates by age group**

<table>
<thead>
<tr>
<th>Age group</th>
<th>Rate (breaths per minute)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newborn</td>
<td>30–60</td>
</tr>
<tr>
<td>Infant (6 months)</td>
<td>30–50</td>
</tr>
<tr>
<td>Toddler (2 years)</td>
<td>25–32</td>
</tr>
<tr>
<td>Child</td>
<td>20–30</td>
</tr>
<tr>
<td>Adolescent</td>
<td>16–19</td>
</tr>
<tr>
<td>Adult</td>
<td>12–20</td>
</tr>
</tbody>
</table>

**Pattern**

Determine breathing pattern by observing the chest or abdomen. Diaphragmatic breathing results from the contraction and relaxation of the diaphragm and is best observed by watching abdominal movements. Men and children usually demonstrate diaphragmatic breathing. Women tend to use thoracic muscles to breathe; movements are observed in the upper chest. Laboured respirations usually involve the accessory neck muscles. When a foreign body or tracheal trauma interferes with the movement of air into the lungs, the intercostal spaces retract during inspiration. A longer expiration phase is evident when the outward flow of air is obstructed (e.g. in asthma).

With normal breathing, a regular interval occurs after each respiratory cycle. Infants tend to breathe less regularly. The young child may breathe slowly for a few seconds and then suddenly breathe more rapidly. While assessing respirations, estimate the time interval after each respiratory cycle. Respiration is **regular** or **irregular** in pattern.

**Respiratory sounds**

An integral part of respiratory assessment is listening to the sounds of breathing. **Snoring**, **stridor**, **wheezing** and **inspiratory grunt** are indicators of a respiratory obstruction. Snoring occurs when parts of the upper airway lose tone and partially block the airway. In some circumstances, this may result in full obstruction such as in obstructive sleep apnoea. Stridor is an inspiratory wheeze or crowing sound occurring with upper airway obstruction (e.g. croup, inhalation of foreign objects, laryngeal oedema after extubation). Wheezing is a high-pitched musical sound occurring when there is a partial obstruction in smaller airways and bronchioles (e.g. bronchiolitis and asthma). Absence of wheezing can only be confirmed by auscultation with a stethoscope (see Chapter 24).

Respiratory monitoring devices that aid your assessment include the apnoea monitor and pulse oximeter. Apnoea monitoring is used frequently with infants in the hospital and at home to observe for prolonged apnoeic events. Leads attached to the infant’s chest wall sense movement; the absence of chest wall movement is interpreted by the monitor as apnoea and triggers an alarm.

**Oxygen saturation**

Arterial oxygenation (**oxygen saturation**) can be non-invasively measured using a pulse oximeter (Skill 23-2). Blood flows through the pulmonary capillaries where oxygen attaches to red blood cells. After oxygen diffuses from the alveoli into the pulmonary blood, most of the oxygen attaches to haemoglobin molecules in red blood
**Measuring oxygen saturation (SpO₂)**

**Delegation considerations**
Oxygen saturation measurement can be delegated to enrolled nurses, who are informed of:
- the need to notify the registered nurse immediately of any reading lower than SpO₂ of 95%
- appropriate sensor site, probe and patient position for measurement of oxygen saturation
- frequency of oxygen saturation measurements
- factors that can falsely lower SpO₂ (see Box 23-2).

**Equipment**
- Oximeter
- Oximeter probe appropriate for patient and recommended by manufacturer
- Pen, observation chart

**STEPS**

<table>
<thead>
<tr>
<th>STEPS</th>
<th>RATIONALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Determine the frequency of monitoring oxygen saturation:</td>
<td>Certain conditions place patients at risk of decreased oxygen saturation: acute or chronic compromised respiratory function, recovery from general anaesthesia or conscious sedation or traumatic injury to chest wall with or without collapse of underlying lung tissue, ventilator dependence, changes in supplemental oxygen therapy.</td>
</tr>
<tr>
<td>a. Consider previous medical conditions for alteration of oxygen saturation.</td>
<td>Physical signs and symptoms may indicate abnormal oxygen saturation.</td>
</tr>
<tr>
<td>b. Assess for signs and symptoms of alterations in oxygen saturation such as altered respiratory rate, depth or rhythm; adventitious breath sounds (see Chapter 24); cyanotic appearance of nail beds, lips, mucous membranes and skin; restlessness, irritability, confusion; reduced level of consciousness; laboured or difficulty breathing.</td>
<td>Allows for accurate assessment of oxygen saturation variations. Peripheral vasoconstriction related to hypothermia can interfere with SpO₂ determination.</td>
</tr>
<tr>
<td>2. Assess for factors that normally influence measurement of SpO₂, such as oxygen therapy, haemoglobin level and temperature.</td>
<td>Baseline information provides basis for comparison and helps in assessment of current status and evaluation of interventions.</td>
</tr>
<tr>
<td>3. Determine previous baseline SpO₂ (if available) from patient’s record.</td>
<td>Promotes patient cooperation and understanding.</td>
</tr>
<tr>
<td>4. Explain purpose of procedure to patient and how oxygen saturation will be measured.</td>
<td></td>
</tr>
</tbody>
</table>

**Therapeutic relationship and patient considerations**
- Confirms patient identity
- Gains patient consent
- Initiates communication by introductions and clarification of patient’s immediate needs and problems
- Identifies how the skill will affect the patient
- Discusses procedure with the patient to clarify understanding
- Provides reassurance
- Assesses patient knowledge and expectations and ensures patient understanding
- Where necessary, provides further clarification
- Explains actions and potential discomfort at all stages of procedure
5. Assess site most appropriate for sensor probe placement (e.g., digit, earlobe) (see Box 23-3). Site must have adequate local circulation and be free of moisture.

6. Perform hand hygiene. Reduces transmission of microorganisms.

7. Position patient comfortably. If finger is chosen as monitoring site, support lower arm. Ensures probe positioning and decreases movement that interferes with SpO2 determination.

8. If finger is to be used, remove any fingernail polish with acetone from digit to be assessed. If earlobe is to be used, remove any earrings. Wash site, swab with alcohol and air-dry. Ensures accurate readings. Opaque coatings decrease light transmission; nail polish containing blue pigment can absorb light emissions and falsely alter saturation.

9. Attach sensor probe to monitoring site. Explain to patient that clip-on probe feels like a clothes peg on the finger but should not hurt. Pressure of sensor probe’s spring tension on a peripheral digit or earlobe may be unexpected.

10. Once the sensor probe is attached ask the patient to remain still during the assessment. Moving the finger during the assessment can affect the sensor probe’s ability to reach a constant value (pulse, SpO2) and will affect accurate monitoring of the patient. Critical decision point: Do not attach probe to finger, ear or bridge of nose if area is oedematous or skin integrity is compromised. Do not attach probe to fingers that are hypothermic. Select ear or bridge of nose if adult patient has history of peripheral vascular disease. Earlobe and bridge of nose sensors are not used for infants and toddlers because of skin fragility. Disposable adhesive probes contain latex and should not be used if patient has latex allergy.

11. Turn on oximeter by activating power. Observe pulse waveform/intensity display and audible beep. Correlate oximeter pulse rate with patient’s radial pulse. Differences require re-evaluation of oximeter probe placement and may require reassessment of pulse rates. Pulse waveform/intensity display enables detection of valid pulse or presence of interfering signal. Pitch of audible beep is proportional to SpO2 value. Double-checking pulse rate ensures oximeter accuracy. Oximeter pulse rate, patient’s radial pulse and apical pulse rate should be the same.

12. Leave probe in place until oximeter readout reaches constant value and pulse display reaches full strength during each cardiac cycle. Read SpO2 on digital display. Inform patient that oximeter will sound alarm if the probe falls off or if patient moves the probe. Reading may take 10–30 seconds, depending on site selected.

13. If continuous SpO2 monitoring is planned, verify SpO2 alarm limits. Limits for SpO2 and pulse rate should be determined as indicated by patient’s condition. Verify that alarms are on. Assess skin integrity under sensor probe and relocate sensor probe at least every 4 hours (every 2 hours for a spring-tension probe). Alarms must be set at appropriate limits and volumes to avoid frightening patients and visitors. Spring tension of sensor probe or sensitivity to disposable sensor probe adhesive can cause skin irritation and lead to disruption of skin integrity.

14. Discuss findings with patient as needed. Promotes participation in care and understanding of health status.

15. If intermittent or spot-checking SpO2 measurements are planned, remove probe and turn oximeter power off. Clean probe following manufacturer’s instructions and store in appropriate location. Batteries can be depleted if oximeter is left on. Sensor probes are expensive and vulnerable to damage.
16. Help patient return to comfortable position. 
Restores comfort and promotes sense of wellbeing.

17. Perform hand hygiene. 
Reduces transmission of microorganisms.

18. Compare SpO2 readings with patient baseline and acceptable values. 
Comparison reveals presence of abnormality.

19. Correlate SpO2 with SaO2 obtained from arterial blood gas measurements (see Chapter 35) if available. 
Documents reliability of non-invasive assessment.

20. Correlate SpO2 reading with data obtained from respiratory rate, depth and rhythm assessment. 
Measurements assessing ventilation, perfusion and diffusion are interrelated.

RECORDING AND REPORTING

- Record SpO2 value on patient progress notes and observation chart, indicating type and amount of oxygen therapy used by patient during assessment. Also record any signs and symptoms of oxygen desaturation in progress notes. Measurement of SpO2 after administration of specific therapies should be documented in narrative form in progress notes.
- Report abnormal findings to nurse in charge or medical practitioner.

Cells. Red blood cells carry the oxygenated haemoglobin molecules through the left side of the heart and out to the peripheral capillaries, where the oxygen detaches.

The percentage of haemoglobin bound with oxygen in the arteries is the percentage of saturation of haemoglobin (or SaO2). For a healthy adult breathing room air it is usually between 95% and 100%. SaO2 is affected by factors that interfere with ventilation and perfusion (see Chapter 40). Always interpret the measurement in relation to the patient’s oxygen requirement and record the amount of supplemental oxygen being delivered (e.g. a patient who needs supplemental oxygen to maintain oxygen saturation > 90% is hypoxaemic). The pulse oximeter (Figure 23-8) emits light wavelengths that are absorbed by the oxygenated and deoxygenated haemoglobin molecules. The light reflected from the haemoglobin molecules is processed by the oximeter, which calculates peripheral oxygen saturation (SpO2). SpO2 is a reliable estimate of SaO2 when it is over 90%, but is less accurate at saturations below 80%. The measurement of SpO2 is affected by factors that affect light transmission or peripheral arterial pulsations (Box 23-2). Selecting the appropriate probe is important for reducing measurement error (Box 23-3). Movement is the most common cause of inaccurate readings.

**Figure 23-8** Pulse oximeter with probe.

BOX 23-2 Factors affecting determination of peripheral oxygen saturation (SpO₂)

**Interference with light transmission**
- Outside light sources can interfere with the oximeter’s ability to process reflected light.
- Carbon monoxide (caused by smoke inhalation or poisoning) artificially elevates SpO₂ by absorbing light similar to oxygen.
- Movement can interfere with the oximeter’s ability to process reflected light.
- Jaundice may interfere with the oximeter’s ability to process reflected light.
- Intravascular dyes (methylene blue) absorb light similar to deoxyhaemoglobin and artificially lower saturation.

**Reduction of arterial pulsations**
- Peripheral vascular disease (Raynaud’s disease, atherosclerosis) can reduce pulse volume.
- Hypothermia at assessment site decreases peripheral blood flow.
- Pharmacological vasoconstrictors (adrenaline, phenylephrine, dopamine) will decrease peripheral pulse volume.
- Low cardiac output and hypotension decrease blood flow to peripheral arteries.
- Peripheral oedema can obscure arterial pulsation.

BOX 23-3 Characteristics of pulse oximeter sensor probes and sites

**Reusable probe**
- Digit probe
- Easy to apply, conforms to various sizes
- Yields strong correlation with SaO₂

**Earlobe**
- Clip-on is smaller and lighter though more positional than digit probe
- Greater accuracy at lower saturations
- Good when uncontrollable movements (e.g. hand tremors) are present
- Least affected by decreased blood flow

**Disposable sensor pad**
- Can be applied to a variety of sites: earlobe of adult, nose bridge, palm or sole of infant
- Less restrictive for continuous SpO₂ monitoring
- Expensive
- Contains latex
- Risk that skin under adhesive may become moist and harbour pathogens
- Available in variety of sizes; can be matched to infant weight

CLINICAL EXAMPLE

Mrs Winter, a 65-year-old woman, has been admitted to the ward following a stroke 5 days previously, which has left her with a mild but improving right-sided weakness, some dysarthria (disordered speech) and dysphagia (difficulty swallowing). She has also been diagnosed with a chest infection that was believed to be improving with antibiotic therapy. Mrs Winter is known to have chronic obstructive pulmonary disease (COPD) and to sometimes experience angina on exertion.

At afternoon handover, she is reported to have become confused and restless in the last 2 hours. The nurses found it difficult to record vital signs, but oxygen saturations were low and therefore oxygen therapy has been applied with a simple face mask. The ICU outreach nurse has been called to see the patient, but has not arrived yet. You are taking over the patient’s care and so begin an ABCDE assessment:

**AIRWAY:** You see that the patient is partly sitting up, although leaning to one side. She does not answer when you speak to her, but does open her eyes when you touch her on the shoulder. You can hear and feel air entry but there is a rattling sound when she breathes. You ask her to try and cough to clear her throat, but it makes no difference to the rattling sound and she does not seem to clear anything from her airway. You try to reposition her in a more upright position and check to see if there is any material at the back of her mouth. Using a Yankeur sucker, you suction thick yellowish-green secretions, and her breathing seems to become less laboured.

**BREATHING:** You can see the chest moving symmetrically and the respiratory rate is 26 breaths/minute. The patient is still receiving oxygen via a face mask at 8L/min, and the pulse oximeter shows an oxygen saturation of 88% (very low given that she is receiving high-concentration oxygen). Auscultation of the chest reveals breath sounds (and therefore air entry) in both lungs. There are coarse crackles and some expiratory wheeze in the right upper zone, with reduced sounds of air entry in the right lower zone as compared with the left.

CHAPTER 23
MONITORING VITAL SIGNS: USING A PRIMARY SURVEY APPROACH FOR PATIENT ASSESSMENT

BOX 23-4 Respiratory rate: summary of evidence and recommendations

- Respiratory rate is the vital sign least often recorded and most frequently completely omitted from hospital documentation.
- A raised respiratory rate is a strong and specific predictor of serious adverse events such as cardiac arrest and unplanned intensive care unit admission.
- Pulse oximetry measurement is not a replacement for respiratory rate measurement.
- All staff should be educated to measure the respiratory rate as an easy and specific assessment for critical illness, and should be given guidance on appropriate action to be taken when abnormally high respiratory rates are recorded.

(Box 23-4). Pulse oximetry only gives us half the story about a patient's oxygenation and ventilation: it determines oxygen saturation and can detect hypoxemia, but it is not an indicator of adequate ventilation (ability to exhale CO2).

Circulation
Physiology and regulation

The pulse is the palpable bounding of blood flow noted at various points on the body. It is an indicator of the fluid wave created by ventricular contraction and therefore of the adequacy of circulatory status (circulation). Electrical impulses originating from the sinoatrial node travel through heart muscle to stimulate cardiac contraction. Approximately 60–70 mL of blood enters the aorta with each ventricular contraction, known as the stroke volume (SV). With each stroke volume ejection, the walls of the aorta distend, creating a pulse wave that travels rapidly towards the distal ends of the arteries. When a pulse wave reaches a peripheral artery, it can be felt by palpating the artery lightly against underlying bone or muscle. The number of pulsing sensations occurring in 1 minute is the pulse rate. The volume of blood pumped by the heart during 1 minute is the cardiac output (CO). The heart's ability to meet the demands of the body's tissue for nutrients is determined by palpating a peripheral pulse or by using a stethoscope to listen to heart sounds (apical heart rate).

While several arteries can be assessed for pulse rate (Skill 23-3), the radial artery is usually the most practical site at which to palpate the pulse (Figure 23-9). Other peripheral pulses, such as the brachial or femoral arteries, are assessed when surgery or treatment has impaired blood flow to a body part, there are clinical indications of impaired peripheral blood flow, or when a focused cardiovascular physical examination is conducted (Table 23-4). When CO declines significantly, peripheral pulses weaken and are difficult to palpate. The carotid site is the best in this situation because the heart will continue delivering blood through the carotid artery to the brain as long as possible.

In normal adults, heart rates average 60 to 100 beats per minute. Bradycardia is a heart rate less than 60 per minute and tachycardia is greater than 100 per minute (Talley & O’Connor 2014). If the radial pulse is abnormal, irregular or unattainable because of a dressing, a cast or patient-prescribed medication affecting the heartbeat, the apical pulse is assessed. The brachial or apical pulses are the best sites for assessing an infant's or young child's pulse, because other peripheral pulses are deep and difficult to palpate accurately.
### STEPS

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.</td>
<td>Discuss findings with patient as needed.</td>
</tr>
<tr>
<td>9.</td>
<td>If temperature is assessed for the first time, establish temperature as baseline if it is within normal range.</td>
</tr>
<tr>
<td>10.</td>
<td>Compare temperature reading with patient’s previous baseline and acceptable temperature range for patient’s age group.</td>
</tr>
</tbody>
</table>

### RATIONALE

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.</td>
<td>Promotes participation in care and understanding of health status.</td>
</tr>
<tr>
<td>9.</td>
<td>Used to compare future temperature measurements.</td>
</tr>
<tr>
<td>10.</td>
<td>Normal body temperature fluctuates within narrow range; comparison reveals presence of abnormality. Improper placement or movement of thermometer can cause inaccuracies. Second measurement confirms initial findings of abnormal body temperature.</td>
</tr>
</tbody>
</table>

### RECORDING AND REPORTING

- Record temperature in observation chart.
- Report abnormal findings to nurse in charge or medical practitioner.

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**Figure 23-17** Electronic thermometer. Blue probe is for oral or axillary use. Red probe is for rectal use.


**Figure 23-18** Tympatic thermometer with probe cover being inserted into auditory canal.

Stabilised, the ear pulled straight back (children) or up and back (adults), and within 2–5 seconds of placement of the speculum in the auditory canal a reading appears on the display unit. A sound signals when the peak temperature reading has been measured.

A recent inclusion to body temperature measurement is the infrared non-touch thermometer (Figure 23-19). Temperature can be ascertained by holding the thermometer near the patient's head and activating the device.

Disposable, single-use thermometers are thin strips of plastic with a temperature sensor at one end. The sensor consists of a matrix of dot-like indentations that contain chemicals which melt and change colour at different temperatures. They are used for oral or axillary temperatures, particularly with children (Figure 23-20). Single-use thermometers are inserted the same way as any oral or axillary thermometer. The thermometer is removed after 3 minutes and read after waiting about 10 seconds for the colour change to stabilise.

Another form of disposable thermometer is a temperature-sensitive patch or tape. Applied to the forehead or abdomen, the patch changes colour at different temperatures. Both forms of disposable thermometers are useful for screening patients, especially infants, for altered
Fever

Fever (or pyrexia) occurs as a part of the inflammatory response caused by trauma, surgery, infection, immune responses and tissue damage. For example, in the immediate postoperative period it is common for a patient to develop a fever as part of the normal inflammatory response to surgery. During fever, white blood cell production is stimulated and there is a decrease in the concentration of iron in the blood plasma, suppressing bacterial growth. Fever also stimulates the production of antiviral interferon.

Fever is a host defence response, a febrile response, to invasion from exogenous pyrogens, including microbial pathogens such as bacteria, viruses, mycobacteria and fungi as well as non-microbial antigens such as inflammatory agents and drugs. During the febrile response, the set point in the thermoregulatory centre is reset to maintain a higher level of body temperature. This higher temperature is maintained through increased heat production, especially through peripheral vasoconstriction and behavioural measures such as covering oneself with blankets in response to chills even though the body temperature is elevated.

The febrile response is a coordinated series of events to defend the body against these invading organisms through the intentional elevation of the body's core temperature – a mean 1°C increase in body temperature (for that specific measurement site). Fever is an adaptive response, even though it places substantial demands on the body through...
increased metabolic demands. Fever has an upper limit ranging from 41°C to 42°C. Most infections produce fevers between 38.5°C and 40.5°C, and an average fever of 39.5°C.

Three phases of fever

The cold phase begins as the hypothalamic set point is reset to a higher level (Figure 23-21). This phase lasts approximately 10–40 minutes, during which all heat-producing mechanisms are activated and there is a rapid, steady rise in temperature. Heat production increases oxygen demands by 3–5 times normal resting levels, contributing to a hypermetabolic state. In this state there are associated increases in heart and respiratory rates and thirst. Vasoconstriction causes the skin to look pale with cyanotic nail beds, and to feel cool and dry. During this period, the person experiences chills and rigors, and feels cold even though the body temperature is rising.

During the hot phase the body has reached a new set point and maintains the body temperature at this new higher temperature. The length of this phase depends on the time it takes to eradicate the pyrogenic cytokines responsible for the raised set point. Higher temperatures in this phase are maintained through a balance in heat production and heat loss. Skin is flushed and warm and the individual feels hot. Basal metabolic rate remains high, so tachycardia and thirst continue. Other symptoms associated with this phase include drowsiness, headache, photophobia, reduced activity and appetite, feelings of weakness and/or restlessness and sometimes convulsions. This phase ends when the underlying cause of fever has been treated and/or eliminated by the body, resulting in a decrease in set point to normal.

The defervescence phase or the ‘breaking’ of the fever occurs when there is a sudden decline in circulating pyrogenic cytokines and resetting of the hypothalamic set point back to normal. Heat-loss mechanisms take over and heat production is inhibited. The skin feels warm and is flushed due to vasodilation and sweating, which can exacerbate existing dehydration. Finally, the temperature returns to normal and the patient becomes afebrile.

Benefits and costs of fever

Fever is beneficial in a normal healthy person in the home setting, but seriously ill children and adults can become severely compromised by the additional physiological strain of fever. For every 1°C above normal temperature there are associated physiological changes. There is an associated increase in oxygen consumption of 10–12% and an insensible fluid loss of 20%. Increased fluid loss associated with reduced intake leads to dehydration, the most common and dangerous side effect of fever. During the cold stage, blood pressure increases and glomerular filtration rates decrease; this reverses during the hot phase. Increased urine output assists in the removal of the additional metabolic wastes from the catabolic febrile state.

When fever is prolonged, the risk of dehydration increases and anorexia, secondary to generalised weakness and malaise, is common. Psychological effects include apathy, confusion, delirium and withdrawal from people and activities. These physiological and psychological effects of fever are important considerations for nurses and those caring for febrile children and adults. Fever should be reduced in those who are placed at risk due to the additional physiological burden from the febrile response. This includes children and adults who are seriously ill, and those who have cardiorespiratory, neurological or metabolic disorders or are malnourished, dehydrated or have epileptic lesions and may not tolerate the additional physiological demands during fever. In children, fever may trigger convulsions in those with a seizure disorder or a predisposition to febrile convulsions.

Hypothermia

Heat loss during prolonged exposure to cold overwhelms the body’s ability to produce heat, causing hypothermia or temperature less than 35°C (Talley & O’Connor 2014). In hypothermia the body at first increases metabolic rate (to increase heat production), increases vasoconstriction (to decrease heat loss), shunts blood from the peripheral vascular bed to the core (to reduce heat loss) and increases shivering (to increase heat production). Hypothermia is classified by core temperature measurements (Box 23-11). Some people are more prone to hypothermia than others (Box 23-12). Hypothermia may also be intentionally induced during surgical procedures, to reduce metabolic demand and the body’s need for oxygen.

Hypothermia usually develops gradually and may go unnoticed for several hours. When skin temperature drops to 35°C, the person suffers uncontrolled shivering, loss of memory, depression and poor judgement. As the body temperature falls below 34.4°C, cyanosis occurs,
and heart and respiratory rates and blood pressure fall. If hypothermia progresses, cardiac dysrhythmias, loss of consciousness and unresponsiveness to painful stimuli occurs. In cases of severe hypothermia, a person may demonstrate clinical signs similar to death (e.g. lack of response to stimuli and extremely slow respirations and pulse). The assessment of core temperature is critical when hypothermia is suspected. A special low-reading thermometer may be required, because standard devices often do not register below 35°C.

BOX 23-12 Patients at risk of hypothermia

Neonates
Can lose as much as 4.5°C immediately after delivery, as a result of heat evaporation. They also have a larger surface-to-mass ratio and a small amount of subcutaneous tissue.

Older patients
Often have a decrease in level of thyroxine and therefore a decreased ability to increase metabolic rate and heat production. Have a decreased ability in vasomotor response, including decreased ability to produce heat through shivering.

Patients with alcohol problems
Alcohol increases peripheral vasodilation (increases heat loss), and long-term use may affect the hypothalamic response to cold.

Surgical patients
Patients can lose as much as 0.3°C per hour by loss of heat through an open cavity in a theatre where the ambient temperature is less than the body temperature. Anaesthetics block the activity of shivering and decrease the body’s ability to produce heat.

Mrs Winter is acutely unwell and at high risk of further deterioration. Following the ABCDE approach, you take a body temperature and begin a head-to-toe scan for other important assessment data:

EXPOSURE
The tympanic body temperature reading at the ICU is 38.9°C and she feels hot and sweaty to touch. You are worried that taken together, the trends in vital signs suggest her chest infection is worsening and she is developing sepsis. Her skin is flushed. There are no wounds, dressings or drains. But you note an IV cannula in the left arm. The ICU outreach nurse arrives and you are able to hand over your assessment and initial interventions using the ABCDE framework.

Conclusion
This chapter has introduced you to the ABCDE approach, which forms the foundation of patient assessment in any setting. It provides a simple framework so that clinical problems can be identified and addressed in priority order. Even during complex and stressful situations such as acute patient deterioration, taking time out to work through each step of the ABCDE approach will help you make sense of the situation and guide initial interventions. When patient problems are identified, a focused assessment will be triggered. The next chapter builds on the primary survey by explaining how to perform a focused body systems assessment.

Key concepts
- The ABCDE approach to assessment is a simple, structured process to improve the early recognition of clinical deterioration. It is the first element of patient assessment in any setting. The core skills during each step are to look, listen, feel and measure.
- Airway patency is the first priority. Look, listen and feel for any airway obstruction.
- Breathing focuses on assessment of respirations, work of breathing, and measurement of oxygen saturation.
- Circulation focuses on feeling the pulse, checking peripheral perfusion, and measuring blood pressure. Assess urine output if possible.
- Disability (level of consciousness) is quickly assessed from the outset using the AVPU scale. Simple questions can be used to evaluate mental status and speech. Ask about pain.
- Exposure includes measurement of body temperature and a general head-to-toe scan to identify any obvious problems. Assess skin colour, wounds, dressings or drains, invasive lines. Note ability to stand and move. Determine last bowel movement.

Online resources
This site describes the ABCDE assessment framework in action and contains learning modules and chapters on recognising patient deterioration. Links to the material are available through the NSW Health Education and Training Institute (HETI). University students have access through ClinConnect.

References