Lewis’s
medical–surgical nursing

Assessment and Management
of Clinical Problems

Australia and New Zealand Edition

EDITED BY

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Preface

The fourth Australian and New Zealand (ANZ) edition of *Lewis’s Medical–Surgical Nursing: Assessment and Management of Clinical Problems* builds on the combined strengths of the third ANZ edition and the ninth US edition. It has been written to address the needs of ANZ students and educators. Professors Di Brown and Helen Edwards, and Drs Lesley Seaton and Tom Buckley, led a team of nurse clinicians and academic contributors from across ANZ to develop this cutting-edge text.

The fourth edition has been thoroughly revised and incorporates the most recent nursing knowledge in an engaging and reader-friendly format. More than a textbook, this is a comprehensive resource containing essential information that students need in order to prepare for lectures, classroom activities, examinations, clinical assignments and the professional care of patients. In addition to its accessible writing style and quality illustrations, the text provides special features—such as evidence-based practice boxes, review questions and clinical reasoning exercises—to facilitate student learning. Recurring topics include patient teaching guides, gerontological advice, management of chronic diseases, multidisciplinary care, cultural and ethnic considerations, nutrition, community- and home-based care, and nursing research.

The use of the nursing process as an organising framework for nursing practice has been retained and new content has been added to reflect rapid changes in practice. Contributors have been selected for their expertise in specific areas, and clinical specialists have thoroughly reviewed each chapter to ensure accuracy, currency and regional relevance. From the outset, the text firmly establishes the ANZ sociocultural context and includes, for example, a chapter on current patient safety priorities in ANZ (Ch 2), current information on rural and remote area nursing (Ch 7), as well as a framework for the management of chronic and complex conditions (Ch 66). In addition, this edition includes chapters on contemporary health issues such as obesity (Ch 37) and emergency and disaster nursing (Ch 65).

Organisation

The content is organised into 12 sections. Section 1 (Chs 1–7) introduces key healthcare concepts within Australia and New Zealand. Sections 2–12 (Chs 8–66) present nursing assessment and nursing management of medical and surgical patient problems both within acute care settings and within the community. The focus of each section is across the whole trajectory of healthcare, including health promotion, risk assessment, management of acute and chronic conditions, and the various nursing roles and responsibilities, as well as the roles of the whole multidisciplinary healthcare team. The various body systems are grouped to reflect their interrelated functions. Each section is organised around two central themes: assessment and management. Chapters dealing with assessment of a body system include a discussion of the following:

1. a brief review of anatomy and physiology, focusing on information that will promote an understanding of nursing care
2. health history and non-invasive physical assessment skills to expand the knowledge base on which decisions are made
3. common diagnostic studies, expected results and related nursing responsibilities to provide easily accessible information.

Management chapters focus on the pathophysiology, signs and symptoms, diagnostic study results, multidisciplinary care and nursing management of various diseases and disorders. The sections on nursing management are organised into assessment, identification of priority care problems, planning, implementation and evaluation. To emphasise the importance of patient care in various clinical settings, nursing implementation of all major health problems is organised by the following levels of care:

1. health promotion
2. acute intervention
3. ambulatory and community/home care.

Classic features

- **Critical thinking, clinical judgement and clinical reasoning** (introduced in Ch 2) provide a framework to enable students to think about patient situations effectively. The use of multiple case studies at the end of each section enables students to practise prioritising care between a number of different patients. The multiple case studies and the individual ones in the assessment and management chapters are structured so that students need to use their clinical reasoning and judgement skills to plan and outline care priorities. Key delegation decisions are included to enable the student to begin to more clearly understand the responsibilities of the registered nurse.

- **National patient safety goals** for both New Zealand and Australia are introduced in the new Chapter 2 of the text, which are then addressed in more detail in relevant chapters throughout the text. Important patient safety information such as drug interactions are highlighted within specific chapters.

- **Key epidemiological information** is provided to enable students to understand the incidence and prevalence of the various conditions in the Australian and New Zealand context.

- **Priority care problems** outlined in each of the management chapters illustrate the multidisciplinary nature of contemporary healthcare.

- **Multidisciplinary care** is further highlighted in special multidisciplinary care sections in all management chapters and more than 80 multidisciplinary care boxes and tables throughout the text.

- **The whole trajectory of care is included.** Chapters include prevention and health promotion, through the
acute care phase into rehabilitation and chronic disease management where appropriate. These chapters have been thoroughly updated to reflect current nursing practice and include defining characteristics, expected patient outcomes, specific nursing interventions with rationales and multidisciplinary care. The book is structured to enable students of nursing to gain a comprehensive understanding of the nursing role and the differences (and similarities) in nursing and other healthcare roles and functions. The information and structure of the chapters increases students’ understanding about the multidisciplinary nature of current healthcare practice and the roles that nurses play.

- **Patient and carer education** is an ongoing theme throughout the text. Coverage includes more than 80 patient teaching guides throughout the text.
- **Gerontological differences** are included in each chapter where the differences in assessment and the effects of ageing are detailed. Chapter 56 provides a thorough explanation about delirium, dementia and depression in older adults who are admitted to an acute care setting.
- **Nutrition** is highlighted throughout the book and includes a separate chapter (Ch 36). Nutritional therapy boxes and tables summarise nutritional interventions for patients with various health problems.
- **Complementary and alternative therapies** boxes in various chapters summarise what nurses need to know about non-traditional therapies, such as herbal remedies and acupuncture.
- **Nursing research** boxes included throughout the text demonstrate how clinical research and evidence can be used to enhance clinical knowledge and nursing practice.
- **Culturally competent care** is covered in Chapter 3, and cultural information is integrated into other chapters highlighting the risk factors and other important issues related to the epidemiological incidence of various conditions and the associated nursing care as it relates to different groups in the community.
- **Rural and remote area nursing** is covered in Chapter 7 and is referenced throughout the text to highlight the importance of this field of nursing in Australia and New Zealand.
- **Current issues in healthcare**, such as management of the older person within acute care settings (addressed in Ch 56) and management of chronic and complex illness (in Ch 66), provide students with a broad overview of many of the key issues facing nursing and the community in the current healthcare system.
- **Clinical practice** boxes promote critical thinking about ethical dilemmas relating to timely and sensitive issues that nursing students may deal with in clinical practice.
- **Emergency management** tables outline the emergency treatment of health problems that are most likely to require emergency intervention.
- **Common assessment abnormalities** tables in assessment chapters alert the nurse to frequently encountered abnormalities and their possible aetiologies.
- **Nursing assessment** tables summarise the key subjective and objective data related to common diseases. Subjective data are organised by functional health patterns.
- **Health history** boxes and tables in assessment chapters present key questions to ask patients related to a specific disease or disorder.
- **Student-friendly pedagogy** includes the following:
  - **Learning objectives and key terms** at the beginning of each chapter help students to identify the key content for each body system or disorder.
  - **Key priority care problems** are identified in individual chapters to illustrate the specific needs of individual patients and their carers. Detailed nursing care plans are available from the web-based resources of the text.
  - **Evidence-based practice** boxes present the evidence of results from research to improve patient outcomes and the implications for nursing practice.
  - Several health disparities boxes highlight the genetic basis, genetic testing and clinical implications for genetic disorders that affect adults.
  - **Review questions** at the end of each chapter help students learn the important points in the chapter. Answers are provided in Appendix C so that the review questions serve as a self-study tool. Further questions can be found in the web resources.
  - **Resources** at the end of each chapter contain information about nursing and healthcare organisations that provide patient teaching and disease and disorder information. Resources include internet sites to help students find current information online, as well as to provide access to the best practice, evidence-based guidelines developed by many of the specialty clinical colleges and organisations within Australia and New Zealand.

### Ancillary website

**LEARNING SUPPLEMENTS FOR THE STUDENT AND INSTRUCTOR**

The fourth edition Evolve website is available at [http://evolve.elsevier.com/AU/Brown/medsurg/](http://evolve.elsevier.com/AU/Brown/medsurg/) and features the following valuable learning aids:

- review questions and answers with answer rationale
- key points from the chapters to provide a brief snapshot of content
- quick quizzes
- concept map creator and concept map for case studies
- tables and efigures
- image collection, including all figures and tables from the book
- videos and animations
- answer guidelines for case study clinical reasoning questions
- additional case studies and answer guidelines
- fluids and electrolytes tutorial
- eNursing Care Plans
- PowerPoint slides
Patient safety and clinical reasoning: Thinking like a nurse

Written by Di Brown

LEARNING OUTCOMES

1. Consider the relationship between national patient safety goals, nursing practice and the use of effective clinical reasoning skills.
2. Explain why critical thinking and clinical reasoning are important nursing skills.
3. Analyse the key characteristics of the critical thinker.
4. Describe the relationship between critical thinking, clinical reasoning and clinical judgement.
5. Explore the tools that can assist the application of clinical reasoning and clinical judgement in the clinical setting.
6. Explain how ‘track and trigger’ tools can be used to assist the process of clinical decision making.
7. Apply clinical reasoning skills to case study analysis.

The clinical care environment is increasingly complex and turbulent. It requires nurses who are adaptable and intelligent, and who have sound knowledge, skills and understanding relevant to the work that they carry out. We know that nurses save lives. However, Gordon explains that nurses also prevent suffering and provide cost-effective care. To do this effectively, nurses need to have the knowledge, skills and confidence to be able to provide safe, high-quality care.

There has been increasing recognition in both New Zealand and Australia of the need to improve the quality and safety of healthcare services. While the systems in both countries are among the world’s best, the care environment in hospitals can still be risky. In Australia, it is estimated that about 10% of patients will suffer adverse events while hospitalised. In New Zealand, while the number of serious and sentinel events has fallen since 2011, medication errors were the third leading cause of death or injury in hospitals in 2012. In the United States, the Institute of Medicine estimates that medical errors are among the top five leading causes of death in hospitalised patients.

To begin to address this issue in a systematic manner the Health Quality and Safety Commission New Zealand (HQSC) was commissioned in November 2010 to lead quality and safety improvements in the health sector. The aim of the Commission is to work with clinicians and health managers to support and encourage quality and safety improvements, to identify areas where improvements can take place, and to drive change. The Australian Commission on Safety and Quality in Health Care (ACSQHC) was established in 2010 by the Australian federal, state and territory governments to lead and coordinate national improvements in the safety and quality of healthcare provision. The Commission engages in collaborative work in the area of patient safety and healthcare quality, which includes the development of the Australian Charter of Healthcare Rights and the National Safety and Quality Health Service Standards, and National Patient Safety Goals. The Commission has also developed a National Safety and Quality Framework to improve the safety and quality of the Australian health system.

Patient safety

WHY IS PATIENT SAFETY IMPORTANT?

Both the HQSC and the ACSQHC have identified similar areas of focus for their national patient safety priorities to ensure that people receive their healthcare without experiencing preventable harm.

National patient safety goals in Australia and New Zealand include consumer and patient involvement in care, medication safety, reducing healthcare-associated infections, management of falls, pressure ulcers, surgical safety, and recognising and responding to clinical deterioration.

While it is clear that preventing harm in any of these priority areas is a multidisciplinary and collaborative endeavour, there is much here that is part of the work of nurses. Within this text, attention is given to the identified national patient safety goals: medication safety (in all nursing management chapters), wound care and the assessment and management of decubitus ulcers (Ch 8), infection prevention and control (Ch 11), and reducing perioperative harms (Chs 14, 15 and 16). Chapter 58 outlines the need for a sound falls assessment and provides a useful assessment chart (Fig 58-7), and Section 12 provides guidance on the assessment and management of potential clinical deterioration. As well, each assessment chapter outlines nursing and multidisciplinary responsibilities for patient assessment and the parameters of relevant clinical observations. However, in order to apply this essential knowledge about patient safety, the nurse needs the skills of critical thinking, clinical reasoning and clinical judgement. This chapter discusses the application of clinical reasoning and clinical judgement to clinical practice and

KEY TERMS

clinical judgement, p 22
clinical reasoning, p 22
critical thinking, p 22
early warning systems, p 25
medical emergency team, p 24
national patient safety goals, p 21

21
provides the novice nurse with a number of tools and ways of thinking to assist them in developing this important skill.

PROVIDING PROFESSIONAL AND SAFE CARE
To support the increasing focus on quality and safety, modern nursing has had to progressively embrace the need for multidisciplinary, patient-focused care. There is an overwhelming body of research which attests to the benefits to patients in terms of quality of patient outcomes and prevention of harm when care is patient-centred and collaborative.9–13 Similarly, there is convincing evidence of the difference nurses can make to both the quality of care and the quality of patient outcomes.7,14 Nurses need to be competent in key dimensions of care which have been found to influence patient safety. These key areas include: (1) a focus on patients and families;7,9,10 (2) the importance of teamwork;2,3,7,10,13,14 (3) the need to understand how to apply evidence to clinical practice;2,12 and (4) the ability to function in a safe manner,7,11 including the capacity to administer medications safely7,11 to prevent healthcare-acquired infections7,11 and to recognise when a patient’s condition may be deteriorating.15

To do this effectively, nurses must be knowledgeable and able to think critically and creatively about clinical care. While the other chapters of this text consider key dimensions of quality and safety—that is, developing the capacity to provide patient-centred care, the importance of teamwork and the role of multidisciplinary teams—as well as the evidence base for clinical practice, this chapter focuses on how nurses need to think about and analyse clinical practice. To do this they need the skills of critical analysis and clinical reasoning, which lead to the making of sound and well-considered clinical judgements.

Clinical reasoning
The terms clinical reasoning, critical thinking and clinical judgement are often used interchangeably.16 Clinical reasoning is a process of seeking relevant clinical information and making clinical judgements based on patient cues and other evidence, in order to decide which is the best course of action for this patient at this time.17 It also involves evaluating the care that was provided and thinking about how care could be improved in future.18,19 It is very similar to clinical judgement which is a result of ‘critical thinking in the clinical area’.18 However, this definition of clinical judgement may not give the level of guidance this is required by a novice nurse when they are first learning about the kind of thinking that is needed to provide safe and effective care. However they are defined, the processes of clinical reasoning, critical thinking and clinical judgement are what is meant when we talk about ‘thinking like a nurse’.18

WHY DO WE NEED TO LEARN TO THINK LIKE A NURSE, AND HOW IS THIS DIFFERENT FROM EVERYDAY THINKING?
Everyone thinks; it is human nature to do so. However, if we look at our everyday actions—such as impulsively buying things we don’t really need, uncritically accepting the information given by various media outlets, voting by habit for particular political parties and so on—we can see that we sometimes ‘unthinkingly’ accept ideas, behaviours and practices that, on deeper reflection, don’t sit well with our values or ideals. While this may not matter very much in everyday living (although there is a lot of evidence to say that it does), it is a topic that has fascinated philosophers for generations. (Socrates, who lived more than 2000 years ago, is reported to have said that the unexamined life is not worth living.)

Nurses who are unable to critically evaluate and reflect as part of their clinical practice (i.e. are not critical thinkers) are a danger to both their patients and their colleagues.2,12,15

WHAT DO WE MEAN BY ‘CRITICAL THINKING’?
Edward Glaser is recognised as one of the key researchers in this area. In his seminal study20 on critical thinking and education, Glaser argued that the ability to think critically involves three things: (1) an attitude of being disposed to consider in a thoughtful way the problems and subjects that come within the range of one’s experiences, (2) knowledge of the methods of logical inquiry and reasoning, and (3) some skill in applying those methods.

Many researchers have agreed with him,21–24 and the consensus is that critical thinking is a disciplined intellectual process which requires individuals to consistently examine their beliefs, knowledge and attitudes in the light of evidence. It means analysing, synthesising and evaluating information, as well as considering underlying assumptions and values. Critical thinking (see Table 2-1) requires a capacity to recognise and formulate problems, then to gather information, and then to understand and evaluate its significance in order to develop conclusions and/or actions. It is self-directed, self-disciplined, self-monitored, and self-correcting.25

<table>
<thead>
<tr>
<th>TABLE 2-1</th>
<th>Key characteristic of the critical thinker</th>
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<tbody>
<tr>
<td>• Open-minded, having an appreciation of alternative perspectives, being willing to respect the right of others to hold different opinions, and understanding other cultural traditions to gain perspectives on self and others.</td>
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<tr>
<td>• Inquisitive, curious and enthusiastic in wanting to acquire knowledge, wanting to know how things work even when the applications are not immediately apparent.</td>
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<tr>
<td>• Truth-seeking, courageous about asking questions to obtain the best knowledge, even if such knowledge might fail to support one’s perceptions, beliefs or interests.</td>
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<td>• Analytical and using verifiable information, demanding the application of reason and evidence, and the inclination to anticipate consequences.</td>
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<td>• Systematic, valuing organisation, and taking a focused and diligent approach to problems at all levels of complexity.</td>
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<tr>
<td>• Self-confident, trusting one’s own reasoning and inclination to utilise these skills rather than other strategies to respond to problems—for example, making decisions based on scientific evidence—and responding to the values and interests of individuals and society.</td>
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HOW DO WE USE CRITICAL THINKING AND CLINICAL REASONING EFFECTIVELY IN NURSING PRACTICE?
While critical thinking and clinical reasoning are sometimes considered to mean the same thing, critical thinking is a process that can be used in all aspects of one’s daily life, whereas clinical reasoning is a process that is used in nursing practice. Both require a number of logical stages and steps. Both include:
• purposeful goal-directed thinking
• cue acquisition and hypothesis generation
• interpretation and evaluation
• judgements based on evidence rather than guesswork.

Both critical thinking and clinical reasoning are based on the principles of scientific method—that is, maintaining a questioning attitude, following an organised approach to discovery and making sure the information is reliable.16,26 The nursing process (see Ch 1, Fig 1-5, which is a tool based on
these principles, provides a basic foundation for nurses to assist them in planning and carrying out care.

While this process looks relatively simple, nurses are working under conditions that demand rapid and accurate assessments, an effective plan of action and a systematic way of evaluating the effects of care activities. Newly graduated nurses may find this process particularly stressful, especially if they are called on to make independent decisions about patients under their care. Early on in their careers, nurses may need to use clinical reasoning or clinical decision-making tools\textsuperscript{17,18} to assist them to make effective clinical judgements.

The two evidence-based models outlined here (Figs 2-1 and 2-2) provide frameworks to assist nurses to use critical thinking effectively to make clinical judgements about patients. The models can also be used to assist students and others to think about the case scenarios that are described in this

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{fig2-1.png}
\caption{The clinical reasoning process with descriptors. \textit{Source:} Levett-Jones, Hoffman, Dempsey, Jeong, et al, 2010.}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{fig2-2.png}
\caption{Clinical judgement model. \textit{Source:} Tanner, 2006.}
\end{figure}
chapter and subsequent chapters of the textbook. The clinical reasoning cycle illustrated in Figure 2-1 outlines the specific steps involved in clinical reasoning. Each step summarises the thinking and planning that is needed to enable the nurse to form sound clinical judgements about a patient’s condition. It illustrates the process of prioritising and planning care and then outlines the stages of evaluation and reflection. While this may look complicated to begin with, with practice and experience the process will eventually become automatic.

APPLYING CLINICAL REASONING SKILLS IN THE CLINICAL SETTING

Once nurses have become familiar with the logical steps required to assess patients and plan and evaluate their care, they also need to think about how clinical reasoning skills can be applied in the clinical setting. To do this:

1. They need to know what to expect: ‘What is normal for this patient with this condition?’
2. Then they need to ask themselves: ‘What is going on here? What else do I need to know?’
3. Finally, the nurse needs to pull all the information together into a synthesised whole in order to form a judgement about what action needs to be taken. This is the use of clinical reasoning to make a clinical judgement.

IMPLICATIONS FOR NURSING PRACTICE

Nurses are the surveillance system of the hospital. They are with the patients 24 hours a day and are generally the first point of contact during a patient’s hospitalisation. As well as providing comprehensive nursing care, the role of the nurse is to keep patients safe and to be able to recognise and respond when things change or go wrong. There is a growing body of evidence about the nurse’s role in relation to recognising and responding to clinical deterioration, and this provides a sound rationale for the essential role of critical thinking and clinical reasoning in nursing practice.

One of the first skills a nursing student learns is how to take a patient’s vital signs. The technical skills of taking a temperature, pulse, respirations and blood pressure are often acquired in the first or second semester of a nursing program along with learning about how to wash patients and make their beds. Correct application of these assessment skills is fundamental to becoming a competent registered nurse.

Accurate assessment and interpretation of findings saves patients’ lives. There is a body of convincing evidence in the literature which points to the presence of alterations in patients’ vital signs prior to a catastrophic event, with further evidence that if the changes had been picked up earlier then the patient may not have had such a severe outcome. Abnormalities or alterations in vital signs such as blood pressure, respiratory rate, pulse and oxygen saturation are common prior to the occurrence of serious adverse events. This relationship between changes in vital signs and other physiological measures and subsequent events means that nurses need to be able to assess the patient’s condition accurately and then take any necessary action in a timely manner. In other words, they need to be able to recognise and respond to patients who are clinically deteriorating.

While this seems a relatively simple and obvious thing to do, there is also a growing body of research which indicates that nurses are not carrying out these essential observations as often as required, or that when they do carry out the observations they are not taking the action that is required to prevent further harm.

Because of the lack of consistency in recognising and acting on changes in patient’s vital signs a number of clinical tools have been developed to assist nurses in making the clinical judgements necessary to act. Nevertheless, in order to act properly, nurses need to have the clinical judgement skills to assess what is needed for that particular patient at that time.

MEDITICAL EMERGENCY TEAMS

There is a growing body of research indicating that the use of well-structured guidelines and processes will assist nurses and other health professionals to keep patients safe and protect them from harm.

Figure 2-3 shows a simple ‘trigger’ tool outlining parameters that can assist nurses to know when to report changes in a patient’s condition. (A trigger tool is one that sets clear guidelines and standards to provide guidance about when to call for help.) This kind of tool was initially used to enable nurses and junior doctors concerned about a patient’s condition to call the hospital medical emergency or rapid response team. (A medical emergency team [MET] is designed to give an immediate response to at-risk patients in acute care hospitals.)

Medical emergency teams were first introduced as a response to research conducted in the 1990s in New Zealand, Australia and the US which indicated that not only had the outcomes from cardiac arrests in hospitals not improved over

<table>
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<tr>
<th>MEDICAL EMERGENCY TEAM CALLING CRITERIA</th>
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<tr>
<td>All Cardiac and Respiratory Arrests and all conditions listed below.</td>
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<tr>
<th>ACUTE CHANGES IN:</th>
<th>PHYSIOLOGY</th>
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<tr>
<td>AIRWAY BREATHING</td>
<td>Threatened</td>
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<tr>
<td>ALL RESPIRATORY ARRESTS</td>
<td></td>
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<tr>
<td>Respiratory rate &lt;5</td>
<td></td>
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<tr>
<td>Respiratory rate &gt;36</td>
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<tr>
<td>Acute change in saturation &lt;90% despite oxygen</td>
<td></td>
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<tr>
<td>CIRCULATION</td>
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<tr>
<td>ALL CARDIAC ARRESTS</td>
<td></td>
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<tr>
<td>Pulse rate &lt;40</td>
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<tr>
<td>Pulse rate &gt;140</td>
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<tr>
<td>Systolic blood pressure &lt;90</td>
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<tr>
<td>NEUROLOGY</td>
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<tr>
<td>Sudden fall in level of consciousness</td>
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<tr>
<td>(Fall in GCS of &gt;2 points)</td>
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<tr>
<td>Repeated or prolonged seizures</td>
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<td>RENAL</td>
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<tr>
<td>Acute changes in urine output to &lt;50 mL in 4 hours</td>
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<tr>
<td>Other</td>
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<tr>
<td>Any patient who you are seriously worried about that does not fit the above criteria</td>
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To call the Medical Emergency Team, phone your Hospital Emergency number and tell the operator where you are and the location of the patient.

Figure 2-3 Medical emergency team (MET) calling criteria. Source: Intensive Care Unit, Liverpool Hospital, South Western Sydney Local Health District, Australia.
the last 20 years, but also that more than 10% of patients experienced adverse events during their hospitalisation.\textsuperscript{41,42,43} Further, the findings indicated that about 50% of these events were preventable.\textsuperscript{42,43} This gave rise to the introduction of the MET approach to try and prevent the occurrence of adverse events.

The MET was introduced based on five principles (outlined in Table 2-2) that enabled any member of the ward staff to activate the team (Fig 2-3). The goal of the MET was to rapidly mobilise specially trained staff (generally from intensive care) to deliver definitive and prompt care to patients who were clinically deteriorating.\textsuperscript{46} The MET system aimed to reduce cardiac arrests, morbidity and mortality.

Does it work? Chan, et al\textsuperscript{44} found that having an active MET in a hospital reduces the cardiac arrest rate in both adult and children’s hospitals by 30%, and reduces death rates in children’s hospitals to 20% but made no difference in death rates in adult hospitals. On the other hand, the MERIT study\textsuperscript{45} found that introducing a MET significantly reduced mortality in adult hospitals. Do Campo, et al\textsuperscript{46} found a reduction in unexpected adverse events in an acute medical ward and a reduction in the number of unexpected deaths following the introduction of an early warning system. A large Swedish study\textsuperscript{47} in 2010 of more than 275,000 patients admitted before and after implementation of a MET found that in-hospital cardiac arrests decreased and overall in-hospital mortality fell by 10% in the 2 years following the team’s implementation. However, a large randomised control trial conducted in Australia in 2005 found that there were no differences in patient outcomes in hospitals with MET.\textsuperscript{37} A number of reasons have been postulated for this, including: (1) that the Australian study may not have had the necessary power to be able to demonstrate change; and (2) that vital signs were either not recorded accurately, or no action was taken when alterations were noted.\textsuperscript{46,49} Despite this result, the research evidence to date has been convincing enough for hospitals to maintain METs or rapid response teams to support staff when patients are seen to have deteriorated unexpectedly.

### EARLY WARNING SYSTEMS

Observation charts are the primary tool for recording information about vital signs and other patient details. If the charts are not well designed, this may contribute to the failure of staff to readily recognise when a patient’s condition is deteriorating.\textsuperscript{15,49,50}

As a result, many hospitals have now developed early warning systems (EWS) that help nurses and other health professionals more easily identify if a patient’s condition is deteriorating. The observation chart (Fig 2-4) is one example of a ‘track and trigger’ tool. It was developed by the Australian Commission on Safety and Quality in Health Care based on work done in the UK and elsewhere.\textsuperscript{15,28} The guiding principle behind the development of these tools is that they would assist nurses to identify alterations to a patient’s condition and then to take appropriate action.

While this may seem a fairly simple and obvious approach to take, it is clear from the research\textsuperscript{38,44,49,50} that even with the use of ‘track and trigger’ tools the outcomes in terms of improvements in patient mortality have yet to be overwhelmingly demonstrated.

### What role can nurses play in improving practice?

On the surface it seems that having clear parameters and knowing what is ‘normal’ would make it relatively simple for a nurse to recognise what is happening to a patient and therefore to know when to call for help. However, Tait\textsuperscript{38} found that even with risk assessment tools nurses may still be uncertain about the criteria to be used when calling a medical emergency team.

In a number of studies,\textsuperscript{51,52} nurses are described as noticing that ‘something was wrong’ with their patients even if they were not able to articulate the problem clearly. Tait\textsuperscript{38} calls this ability to detect subtle changes in a patient’s condition the ‘professional gaze’, whereas Benner\textsuperscript{53} calls it ‘intuition’ and Tanner\textsuperscript{48} ‘noticing’. These researchers all comment that nurses who are experienced in their specialty develop this skill over time through seeing many similar cases and recognising patterns.

If this is true, then how do novice nurses develop this skill, and how can they keep their patients safe from harm from their first day on the job?

First, nurses need to know what is happening physiologically with each patient. They then need to be able to recognise and prioritise the patient cues in order to interpret the significance of what they are seeing.\textsuperscript{38} To do this effectively, nurses need to have the skills of critical thinking, clinical reasoning and clinical judgement.\textsuperscript{16,53,54} Figure 2-5 illustrates the process and outcomes of this thinking process.

Ideally, a new nurse will also understand the specific needs of each patient. These needs will become clear as the nurse elicits, through careful questioning, how the patient is feeling about their situation. Even with little experience, a nurse will know if they are feeling concerned about a particular patient. In recognition of this, the parameter ‘worried’ has been added to the ‘track and trigger’ observation charts developed in Australia (Fig 2-4). This is when critical thinking and clinical reasoning need to be used in practice.

While critical thinking is a habit that can be developed in all spheres of life, it can be enhanced in the clinical setting by considering it from three perspectives.\textsuperscript{16,53,54}

1. **Thinking ahead:**\textsuperscript{44} This is a responsibility to anticipate what might happen in particular situations. A newly graduated nurse, for example, may know that she or he is

### TABLE 2-2 Rationale for implementation of the MET system

- **Principle 1:** There is time for intervention, as there are warning signs. Clinical deterioration is preceded by physiological deterioration in vital signs. These observations are easy to measure, inexpensive and non-invasive (measuring them does not hurt the patient).
- **Principle 2:** There are effective treatments if dangerous conditions are recognised. Examples include beta-blockers for myocardial ischaemia, fluid therapy for hypovolaemia, non-invasive ventilation and oxygen for respiratory failure, and anticoagulation for thromboembolic disease. The majority of MET interventions are inexpensive, relatively simple and non-invasive.
- **Principle 3:** Any member of staff can activate the MET. The assumption that early intervention saves lives has been shown for the treatment of trauma as well as septic shock. The hospital survival for cardiac arrest is at best 14%. It is intuitive that sick people are easier to treat than dead people.
- **Principle 4:** Early intervention improves outcomes. The review of the critically ill patient is prompt.
- **Principle 5:** The expertise exists and can be deployed. Intensive care doctors and nurses are experts in the delivery of advanced resuscitation.

Source: Adapted from Jones, Bellomo & Goldsmith, 2006.
### Figure 2-4: Example of modified early warning system adult observation chart

#### Source:
ACT Health: Canberra Hospital & Health Service, 2011.

#### Concepts in nursing practice

#### Modified Early Warning Score

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#### MEWS Escalation

- **MEWS 4 - 5**
  - Contact RMO, to review within 30 minutes, inform Team Leader, and start fluid balance chart.
- **MEWS 6 - 7**
  - After 60 minutes if patient not reviewed and MEWS not decreased.
- **MEWS 8 or Greater**
  - Contact Registrar and RMO, Registrar to review in 30 minutes. Notify Consultant. Inform Team Leader and start fluid balance chart.

#### Oxygen Delivery

- If the amount of oxygen the patient is getting needs to be increased then they MUST be reviewed by a medical officer.

#### MEWS Table

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#### MET Criteria

- **Dial “8” or use Code Blue Button**
  - All respiratory & cardiac arrests
  - Threatened Airway, RR in purple zone (RR<5 or >36 breaths per minute)
  - Pulse Rate in purple zone (<40 or >140 beats per minute)
  - Systolic BP in purple zone (<90 mmHg)

- **MET**
  - All patients with a MEWS of 4 or more must also have:
    - A review by the Team Leader
    - A Fluid Balance Chart
    - Increased frequency of observations (see back for details)

- **Urine Output**
  - Calculate the urine output for the previous 4 hours and write the volume and then calculate the MEWS.
  - If not on a fluid balance chart “N/A”
  - If MEWS 4 or more start fluid chart

- **Sedation Score**
  - 0 - Awake & alert
  - 1 - Lightly asleep, responds to stimuli
  - 2 - Mildly drowsy, easy to rouse
  - 3 - Somnolent, difficult to rouse
  - 4 - Severe, somnolent, difficult to rouse

- **Total MEWS**
  - Weight
  - Pain Score
  - Bowel

- **Initial**
  - Initial
### MODIFIED EARLY WARNING SCORES (MEWS)

To calculate the MEWS:
- Record a full set of vital sign observations on the patient.
- Note whether the observation falls into the shaded areas and score accordingly.
- Total the scores from each observation attended to achieve the MEWS score.

A MEWS score of 4 or more will trigger an action (see flow chart on other side).
- Increase frequency of vital signs.
  - Half hourly for 1 hour.
  - Hourly for 4 hours.
  - 4 hourly for 24 hours.

#### VARIANCE TO MEWS

Where a patient has a pre-existing condition that requires a variance from the normal scoring of MEWS, this must be documented in the allocated section of this chart after agreement with the admitting Consultant or Registrar. This Variance must also include a "valid until" date. For chronic conditions this may be for the entire hospital stay.

#### VARIANCE TO MET

Variances to the MET criteria may also be done in the allocated section of this chart. Indicate parameter(s) to be varied and the range for MET.

Document reason for variance.

#### ESCORT OFF WARD AREA

If the patient requires movement to another clinical area, the following escort should accompany the patient:
- MEWS > 4 Registered Nurse
- MEWS > 6 Registered Nurse & JMO
- MEWS > 8 Registered Nurse & Registrar
Going to work on an acute surgical ward where the majority of patients have orthopaedic procedures. It is their responsibility, therefore, to revise what they know about the care of orthopaedic patients and to think about the types of medications patients may be taking. The nurse also needs to review relevant ward policies and procedures, and to plan the type of care that may be required by patients.

2. **Thinking in action.** This is the ability to ‘think on your feet’ and tends to be ‘rapid, dynamic reasoning that considers several cues and priorities at once’ (p 4). This type of thinking will improve with time as the nurse gains more experience and is able to think back to other similar cases. Nevertheless, it is an important skill for a nurse and can be improved by, for example, taking part in clinical simulation activities and being exposed to online, real-time testing of knowledge, skills and decision making. Tanner calls this ‘reflection in action’.

3. **Thinking back (reflecting).** Every situation can be used as a learning experience: whether something went well or badly, lessons can be learned for use in the future. In many hospitals, debriefing sessions are held following major adverse events, but not in relation to the day-to-day, normal care activities of the ward. For the individual nurse, it is important to develop the habit of critically reviewing what they have done and learned each day in order to improve and to be able to take better action in future. Each person will do this in different ways—some will keep a journal, others will use a mentor or a more senior nurse to assist, while still others will discuss what has happened with friends or via discussion boards on the internet. The critical factor is to learn to tease out the themes or underlying assumptions that caused you to respond in the ways that you did. What could you have done differently? Why did you act in the way you did? What was the outcome for the patient, the family and other members of the healthcare team?

Benner, et al talk of ‘clinical forethought’ in which nurses (or other health professionals) develop specific habits of thinking, including: (1) future think, (2) clinical forethought about specific patient problems, (3) anticipation of risks for particular patients, and (4) seeing the unexpected. These are complicated cognitive skills that can be acquired and improved only with practice. A newly graduated nurse will need to consciously practice these ways of thinking while in the clinical field to ensure that they develop the highly attuned, holistic approach of the expert nurse as quickly as possible.

While thinking critically about clinical care issues is challenging and difficult, it is a crucial skill for all levels of nurse. It is as important as technical ability. Tanner provides a succinct summary of the relationship between clinical judgement and patient safety, as shown in Box 2-1.

As with many things in nursing, the capacity to think critically is not immediately visible to a person watching a nurse practise, but it will become evident in the way that nurses respond to changes in patients’ conditions. Students in nursing, and indeed all nurses, have a responsibility to improve their capacity to think critically about life and clinical care. Thinking critically about life events will enable nurses to transfer their skills to the clinical field, thus ensuring that patients, as far as possible, are not harmed as a result of their interaction with the healthcare system. As Florence Nightingale said, ‘The very first requirement in a hospital…is that it should do the sick no harm…’

The following case study is based on the clinical reasoning cycle and provides a way for nurses to think about nursing care in a structured manner, using skills in clinical reasoning and clinical judgement. The case also provides a framework that students can use to work through this textbook and learn about becoming a nurse.

### CASE STUDY

Les Green is an 86-year-old man who fell from a ladder. He has sustained two fractured ribs on his right side and one fractured rib on the left side. He presented to ED last night complaining of pain in his chest.

Les Green has mild asthma. Twenty years ago he underwent a left inguinal hernia repair. Otherwise, he is a healthy gentleman. His only medication is a bronchodilator.

#### Consider the patient situation

Les Green was admitted to the ward last night. You have commenced your shift and at handover are told that Les Green had IV patient-controlled analgesia (PCA) in situ and he was using it appropriately. He didn’t seem to be in too much pain. He has some bruising around his chest area. His wife will be visiting this morning to bring in his pyjamas. The night nurse also told you that his medication chart hasn’t been written up yet and so he self-administered his bronchodilator at around 5 am.

**Think about what other information you need from Les Green or the night nurse to plan his care.**

#### Collect cues

You commence your shift and check his charts. He currently has a vital signs chart and a patient-controlled analgesia (PCA) chart.
His vital signs at 0730 are:
Temperature 37°C, pulse 110 bpm, respirations 22 pm, BP 90/60,
O₂ saturation 98%.

His patient-controlled analgesia is running at 10 mcg of
Fentanyl/mL. His pain levels have not been recorded.

He also has a medication chart, but you remember that he has been
self-administering his bronchodilator. You note that the
doctor needs to see Les Green when he gets to the hospital to
chart his medication.

When you go to Les Green's bedside you notice that he has not
eaten breakfast. He says he doesn't feel like eating but would like to
have a shower. However, he has great difficulty in moving, and
when you ask him if he wants to go to the toilet before his shower
he declines. While you assist him to shower, you notice there is
quite a lot of bruising around his rib cage. After you have dried him
he tries to stand up, but says that he feels dizzy. You let him sit for
a few minutes. After dressing him, you assist him into a wheelchair to
go back to bed. He sleeps for the rest of the morning.

Process the information
Look at Les Green's vital signs (above for 0730 obs). At 1200 his
temperature is 37°C, pulse is 120 bpm, respiratory rate is 25 pm,
BP is 90/50, O₂ saturation is 94%.

Are these signs what you would consider 'normal' for a generally
well 86-year-old man? What do you think is going on here? What
relationships can you establish between Les Green's vital signs and
other things you noticed while he was out of bed? What physiological
reasons might account for these vital signs?

Identify the problem
After processing the information you have collected and talking
to Les Green further, you find that he is in pain. He is complaining
that his pain level is eight on a visual analogue scale.

Establish goals
What are the most important short-term goals to achieve?

Take action
Make a list of nursing actions you would take and explain the
rationale behind each of these.

(You ring the doctor, who tells you to give Les Green his
pain relief and see if this will settle him. He tells you to 'keep
an eye on him'.)

Evaluate
It is now one hour since you have given Les Green some
breakthrough pain relief. He tells you that his pain score has
dropped from eight down to four, and says he is 'feeling a lot
better'. (The doctor has added Les Green's bronchodilator to
the medication chart.)

Consider the patient situation
Les Green continues to doze in bed. You wake him at 1400 hours
to take his vital signs and notice a worrying trend. His pulse and
respiratory rates have increased and his blood pressure is slightly
lower than it was at 1200.

Collect cues
What other cues could you collect to assist you in identifying any
problem?

Continue to evaluate
You decide to complete a physical assessment of Les Green.
Your findings are:
• He is pale.
• He is complaining that his mouth is dry and he feels thirsty.
• You ask him if he has urinated this shift. He tells you that he
  used a urine bottle in ED when he was admitted but hasn’t
done so since then.
• He has no palpable bladder.

Process the information
What is going on here?

Identify the problem
What is Les Green’s problem?

Establish goals
What are the most important short-term goals to achieve?

Take action
What actions would you take to improve Les Green’s condition?

Evaluate
You continue to monitor Les Green for the rest of the shift and
notice that by 1545 he is starting to look a little less pale and has
urinated 120 mL.

Reflection and review
1. What have you learned from this case study?
2. What could nursing staff have done to prevent Les Green’s
deterioration?


REVIEW QUESTIONS

1. A colleague asks you to describe clinical reasoning. How do
   you respond? Clinical reasoning is
   a. a way of carrying out nursing care that is safe and
effective.
   b. always being critical about ideas and looking to find what
   is wrong with them.
   c. analysing, synthesising and evaluating situations.
   d. analysing, synthesising and evaluating situations, as well
   as considering underlying assumptions and values.

2. Critical thinking in clinical practice is an important skill
   because it ensures that (select all that apply)
   a. nurses will plan and evaluate care efficiently.
   b. nurses will be able to consider individual patient cues
   and problems and act accordingly.
   c. nurses will be able to reflect on their practice and
   consider how they can improve in future.
   d. nurses will recognise when things are going wrong with
   patients.

3. Your hospital wants to introduce a MET. You are asked to
   outline the rationale for this to other staff on your ward. You
   explain that
   a. MET is an effective way of increasing the input of ICU
   specialists for very sick ward patients.
   b. clinical deterioration can be seen before patients arrest.
   c. it can only be initiated by specially trained staff.
   d. it can only be used in cases of cardiac arrest.

4. The advantages of using early warning systems for clinical
   observations include (select all that apply)
   a. clear guidelines and parameters.
   b. information about medication history.
   c. information about when to call a medical officer.
   d. patient diagnosis.

5. The nurse explains to the patient that she or he will take
   regular observations of the patient’s condition and ensure,
   as far as possible, that the patient is kept safe. The patient
   asks how this differs from what the doctor does. The
NURSING MANAGEMENT:
Coronary artery disease and acute coronary syndrome

Written by Linda Bucher and Sharmila Johnson
Adapted by John Rolley

LEARNING OUTCOMES
1. Describe the aetiology and pathophysiology of coronary artery disease, angina and acute coronary syndrome.
2. Identify risk factors for coronary artery disease and the nursing role in the promotion of therapeutic lifestyle changes in patients at risk.
3. Compare and contrast the precipitating factors, signs and symptoms, multidisciplinary care and nursing management of the patient with coronary artery disease and chronic stable angina.
4. Describe the signs and symptoms, complications, diagnostic study results and multidisciplinary care of the patient with acute coronary syndrome.
5. Describe the pathophysiology of myocardial infarction from the onset of injury to the healing process.
6. Identify commonly used drug therapy in treating patients with coronary artery disease and acute coronary syndrome.
7. Identify key issues to include in the rehabilitation of patients recovering from acute coronary syndrome and coronary revascularisation procedures.
8. Describe the precipitating factors, clinical presentation and multidisciplinary care of patients who are at risk of or have experienced sudden cardiac death.

Cardiovascular disease, which incorporates ischaemic heart disease and other vascular conditions, is the major cause of death in Australia,1 and the second leading cause of death in New Zealand2 (see Fig 30-1). Coronary artery disease (CAD), or ischaemic heart disease, is the most common type of cardiovascular disease.1,2 Although the mortality rate from CAD has decreased by more than 60% in the last few decades due to advances in prevention, assessment and treatment, it remains the leading cause of all cardiovascular disease deaths and thus deaths in general. Patients with CAD can be asymptomatic or develop chronic stable angina. Unstable angina (UA) and myocardial infarction (MI) are more serious symptoms of CAD and are termed acute coronary syndrome (ACS). In 2009, 63% of Australians having a heart attack survived, compared to 47% in 1997.1 In 2012 it was estimated that nearly 700,000 Australians have CAD;1 and in New Zealand, each day approximately 15 people die as the result of ischaemic heart disease.2

Multiple causal factors contribute to CAD. A number of modifiable risk factors contribute to around 90% of the risk of myocardial infarction observed worldwide: blood lipid abnormalities, smoking, hypertension, diabetes mellitus, abdominal obesity, psychosocial factors, physical inactivity, and inadequate intake of fruits and vegetables.3 Given that

Figure 30-1 Leading causes of death for men and women, Australia and New Zealand.

KEY TERMS
acute coronary syndrome (ACS), p 757
angina, p 750
atherosclerosis, p 738
chronic stable angina, p 750
collateral circulation, p 739
coronary artery disease (CAD), p 738
coronary revascularisation, p 756
metabolic equivalent (MET), p 769
myocardial infarction (MI), p 757
percutaneous coronary intervention (PCI), p 756
Prinzmetal’s angina, p 751
silent ischaemia, p 751
stent, p 756
sudden cardiac death (SCD), p 771
unstable angina (UA), p 757
CORONARY ARTERY DISEASE

Coronary artery disease (CAD) is a type of blood vessel disorder that is included in the general category of atherosclerosis. The term atherosclerosis comes from two Greek words: athere, meaning ‘fatty mush’, and skleros, meaning ‘hard’. This combination implies that atherosclerosis begins as soft deposits of fat that harden with age. Consequently, atherosclerosis is commonly referred to as ‘hardening of the arteries’. Although this condition can occur in any artery in the body, the atheromas (fatty deposits) prefer the coronary arteries. The terms arteriosclerotic heart disease, cardiovascular heart disease, ischaemic heart disease, coronary heart disease and CAD all describe this disease process.

AETIOLOGY AND PATHOPHYSIOLOGY

Atherosclerosis is the major cause of CAD. It is characterised by deposits of lipids within the intima of the artery. The genesis of plaque formation is the result of complex interactions between the components of the blood and the elements forming the vascular wall. Endothelial injury and inflammation play a central role in the development of atherosclerosis. The endothelium (the inner lining of the vessel wall) is normally non-reactive to platelets and leukocytes, as well as coagulation, fibrinolytic and complement factors. However, the endothelial lining can be injured as a result of tobacco use, hyperlipidaemia, hypertension, toxins, diabetes, hyperhomocysteinaemia and infection, causing a local inflammatory response (Fig 30-2, A). C-reactive protein (CRP), a protein produced by the liver, is a non-specific marker of inflammation and is increased in many patients with CAD. The level of CRP rises when there is systemic inflammation. Chronic elevations of CRP are associated with unstable plaques and the oxidation of low-density lipoprotein (LDL) cholesterol.

Developmental stages

CAD is a progressive disease that develops over many years. When it becomes symptomatic, the disease process is usually well advanced. The stages of development in atherosclerosis are: (1) fatty streak, (2) fibrous plaque, and (3) complicated lesion.

Fatty streak

Fatty streaks, the earliest lesions of atherosclerosis, are characterised by lipid-filled smooth muscle cells. As streaks of fat develop within the smooth muscle cells, a yellow tinge appears (Fig 30-2, B). Fatty streaks can be seen in the coronary arteries by age 15 and involve an increasing amount of surface area as one ages. Yet, atherosclerotic plaque has been found in fetuses and infants, particularly where the mother smoked. Treatment that lowers LDL cholesterol may reverse this process.

Complicated lesion

The final stage in the development of the atherosclerotic lesion is the most dangerous. As the fibrous plaque grows,
NON-MODIFIABLE RISK FACTORS

Age, gender and ethnicity

The incidence of CAD is almost twice as high among men as women in Australia and New Zealand. After 65 years, the incidence in men and women equalises, although cardiovascular disease causes more deaths in women than men. Additionally, CAD is present in Australian Indigenous women at rates higher than their non-Indigenous counterparts. (See Table 30-2 for the recommended age to start cardiovascular disease and diabetes risk assessment.)

Heart disease kills almost 10 times more women than breast cancer. Even though cardiovascular disease remains the leading cause of death in women and the mortality rate for women with CAD has remained relatively constant in recent years, just 15% of women consider CAD their greatest health risk. It is only recently that there has been research focusing on the symptoms and course of CAD in women. Women tend to manifest CAD 10 years later in life than men. This is thought to be related to the loss of the cardio-protective effects of natural oestrogen with the onset of menopause. Most women have symptoms of angina rather than MI when presenting with their initial cardiac event (see the Gender Differences box on CAD).

Genetic link

Genetic predisposition is an important factor in the occurrence of CAD. Family history is a risk factor for CAD and MI. Most times, patients with angina or MI can name a parent or sibling who died of CAD.

The genetic basis of CAD/MI is complex and, to date, poorly understood. It is estimated that the genetic contribution to CAD/MI is as high as 40% to 60%. This proportion relates mainly to genes that control known risk factors (e.g. lipid metabolism). (Genes known to contribute to CAD risk are listed in eTable 30-1, available on the website for this chapter.)

(See the Genetics in Clinical Practice box.)

MAJOR MODIFIABLE RISK FACTORS

Elevated serum lipids

An elevated serum lipid level is one of the four most firmly established risk factors for CAD. The various types of serum lipids are presented in Figure 30-6. The risk of CAD is associated with a serum cholesterol level of more than 5.2 mmol/L or a fasting triglyceride level of more than 3.7 mmol/L. (See Table 28-6 for normal serum lipid values.)

For lipids to be used and transported by the body, they must become soluble in blood by combining with proteins. Lipids combine with proteins to form lipoproteins. Lipoproteins are vehicles for fat mobilisation and transport, and vary in composition. They are classified as high-density lipoproteins...
### Problems of oxygenation: Perfusion

#### Figure 30-4 New Zealand cardiovascular risk assessment levels.

In accordance with Australian guidelines, patients with systolic blood pressure ≥ 180 mmHG, or total cholesterol of >7.5 mmol/L, should be considered at increased absolute risk of CVD.

<table>
<thead>
<tr>
<th>Risk level for 5-year cardiovascular (CVD) risk</th>
<th>Total cholesterol:HDL ratio*</th>
<th>Total cholesterol:HDL ratio*</th>
</tr>
</thead>
<tbody>
<tr>
<td>High risk</td>
<td>30%</td>
<td>25–29%</td>
</tr>
<tr>
<td>Moderate risk</td>
<td>20–24%</td>
<td>16–19%</td>
</tr>
<tr>
<td>Low risk</td>
<td>10–15%</td>
<td>5–9%</td>
</tr>
<tr>
<td>&lt;5%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Charts in this age bracket are for use in Indigenous populations only.

Adults over the age of 60 with diabetes are equivalent to high risk (>15%), regardless of their calculated risk level. Nevertheless, reductions in risk factors in this age group can still lower overall absolute risk.

* In accordance with Australian guidelines, patients with systolic blood pressure ≥ 180 mmHG, or total cholesterol of >7.5 mmol/L, should be considered at increased absolute risk of CVD.

**Figure 30-5** Australian cardiovascular risk assessment levels.

*Source: Heart Foundation, 2014.
TABLE 30-1 Risk factors for coronary artery disease

<table>
<thead>
<tr>
<th>Non-modifiable risk factors</th>
<th>Modifiable risk factors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong>&lt;br&gt;Gender (men &gt; women until 60 years of age)</td>
<td>Major&lt;br&gt;Serum lipids: elevated triglycerides and LDL cholesterol; decreased HDL cholesterol*</td>
</tr>
<tr>
<td>Ethnicity (Indigenous Australians, Māori, Pacific Islanders and people from Indian subcontinent &gt; other Australians and New Zealanders)</td>
<td>Nutrition&lt;br&gt;Hypertension: ≥130/85 mmHg*&lt;br&gt;Tobacco use&lt;br&gt;Alcohol intake**&lt;br&gt;Physical inactivity&lt;br&gt;Obesity: waist circumference &gt;102 cm in men and &gt;88 cm in women*&lt;br&gt;Social history&lt;br&gt;Related conditions&lt;br&gt;Diabetes mellitus&lt;br&gt;Fasting blood sugar &gt;6.4 mmol/L*&lt;br&gt;Kidney function: microalbumin +/- urine protein, eGFR 45 mL/min/1.73 m²&lt;br&gt;Familial hypercholesterolaemia&lt;br&gt;Homocysteine levels&lt;br&gt;Evidence of atrial fibrillation</td>
</tr>
<tr>
<td>Genetic predisposition and family history of heart disease</td>
<td><strong>HDLs, LDLs and very-low-density lipoproteins (VLDLs). (See Fig 30-7, which illustrates the types of dietary fat.)&lt;br&gt;HDLs contain more protein by weight and fewer lipids than any other lipoprotein. HDLs carry lipids away from arteries and to the liver for metabolism. This process of HDL transport prevents lipid accumulation within the arterial walls. Therefore, high serum HDL levels are desirable and lower the risk of CAD. There are two types of HDLs: HDL&lt;sub&gt;2&lt;/sub&gt; and HDL&lt;sub&gt;3&lt;/sub&gt;. They differ by their density and apolipoprotein composition. Apolipoproteins are found on lipoproteins and activate enzyme or receptor sites that promote the removal of fat from plasma. Several types of apolipoproteins exist (e.g. apo A-I, apo B-100, apo C-I). Women produce more apo A-I than men, and premenopausal women have HDL&lt;sub&gt;2&lt;/sub&gt; levels approximately three times greater than men. This is thought to be related to the protective effects of natural oestrogen. After menopause, women's HDL&lt;sub&gt;2&lt;/sub&gt; levels decrease and quickly approach those of men. In general, HDL levels are higher in women, decrease with age, and are low in people with CAD. Physical activity, moderate alcohol consumption, and oestrogen administration increase HDL levels. LDLs contain more cholesterol than any of the lipoproteins and have an attraction for arterial walls. VLDLs contain both cholesterol and triglycerides, and may deposit cholesterol directly on the walls of arteries. Elevated LDL levels correlate closely with an increased incidence of atherosclerosis and CAD. Therefore, low serum LDL levels are desirable.</strong>&lt;br&gt;Certain diseases (e.g. type 2 diabetes, chronic kidney disease), drugs (e.g. corticosteroids, hormone therapy) and genetic disorders have been associated with elevated triglyceride levels. Lifestyle factors that can contribute to elevated triglycerides include high alcohol consumption, high intake of refined carbohydrates and simple sugars, and physical inactivity. When a high triglyceride level is combined with a high LDL</td>
</tr>
</tbody>
</table>

*Three or more of these risk factors meet the criteria for metabolic syndrome as defined by the National Heart Lung and Blood Institute and American Heart Association.<br>**Alcohol is a risk factor for elevated BP (which itself is a major determinant of risk for atherosclerotic disease), stroke and cardiomyopathy.<br>**HDL, high-density lipoprotein; LDL, low-density lipoprotein<br>Source: Adapted from New Zealand Cardiovascular Guidelines Handbook, 2012; Australian National Vascular Disease Prevention Alliance, 2012. Available from www.health.govt.nz/publication/new-zealand-primary-care-handbook-2012, accessed 11 May 2014.

TABLE 30-2 Recommended age to start cardiovascular disease and diabetes risk assessment

<table>
<thead>
<tr>
<th>Group</th>
<th>Men*</th>
<th>Women*</th>
<th>Australian guidelines**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymptomatic people without known risk factors</td>
<td>Age 45 years</td>
<td>Age 55 years</td>
<td>All adults over 45 years</td>
</tr>
<tr>
<td>Māori, Pacific Islander peoples or people from the Indian subcontinent† (NZ)*</td>
<td>Age 35 years</td>
<td>Age 45 years</td>
<td>Age 35 years</td>
</tr>
<tr>
<td>Aboriginal and Torres Strait Islander peoples (Aus)**</td>
<td>Age 35 years</td>
<td>Age 45 years</td>
<td>Age 35 years</td>
</tr>
<tr>
<td>People with other known cardiovascular risk factors or at high risk of developing diabetes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family history risk factors&lt;br&gt;• Diabetes in first-degree relative (parent, brother or sister)&lt;br&gt;• Premature coronary artery disease or ischaemic stroke in a first-degree relative (father or brother &lt;55 years, mother or sister &lt;65 years)&lt;br&gt;Personal history risk factors&lt;br&gt;• People who smoke (or who have quit in only the last 12 months)&lt;br&gt;• Gestational diabetes, polycystic ovary syndrome&lt;br&gt;• Prior blood pressure &gt;160/85 mmHg (NZ); &gt;180 mmHg systolic or &gt;100 mmHg (AUS)&lt;br&gt;• Prior TC:HDL ratio &gt;7 (NZ), serum total cholesterol &gt;7.5 mmol/L (AUS)&lt;br&gt;• Known IGT (impaired glucose tolerance) or IFG (impaired fasting tolerance)&lt;br&gt;• BMI &gt;30 or truncal obesity (waist circumference &gt;100 cm in men (NZ), 102 cm (AUS), or &gt;90 cm in women (NZ), 88 cm (AUS)&lt;br&gt;• eGFR &lt;60 mL/min/1.73 m² (NZ), &lt;45 mL/min/1.73 m² (AUS)&lt;br&gt;People with diabetes</td>
<td></td>
<td></td>
<td>Annually from diagnosis</td>
</tr>
<tr>
<td>People with diabetes&lt;br&gt;Family history risk factors&lt;br&gt;• Diabetes in first-degree relative (parent, brother or sister)&lt;br&gt;• Premature coronary artery disease or ischaemic stroke in a first-degree relative (father or brother &lt;55 years, mother or sister &lt;65 years)&lt;br&gt;Personal history risk factors&lt;br&gt;• People who smoke (or who have quit in only the last 12 months)&lt;br&gt;• Gestational diabetes, polycystic ovary syndrome&lt;br&gt;• Prior blood pressure &gt;160/85 mmHg (NZ); &gt;180 mmHg systolic or &gt;100 mmHg (AUS)&lt;br&gt;• Prior TC:HDL ratio &gt;7 (NZ), serum total cholesterol &gt;7.5 mmol/L (AUS)&lt;br&gt;• Known IGT (impaired glucose tolerance) or IFG (impaired fasting tolerance)&lt;br&gt;• BMI &gt;30 or truncal obesity (waist circumference &gt;100 cm in men (NZ), 102 cm (AUS), or &gt;90 cm in women (NZ), 88 cm (AUS)&lt;br&gt;• eGFR &lt;60 mL/min/1.73 m² (NZ), &lt;45 mL/min/1.73 m² (AUS)&lt;br&gt;People with diabetes</td>
<td></td>
<td></td>
<td>Annually from diagnosis</td>
</tr>
</tbody>
</table>

**GENE DIFERENCES**

<table>
<thead>
<tr>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Coronary artery disease</strong></td>
<td></td>
</tr>
<tr>
<td>• Initial cardiac event for men is more often MI than angina.</td>
<td>• Women experience the onset of heart disease approximately 10 years later than men.</td>
</tr>
<tr>
<td>• Men report more typical signs and symptoms of angina and MI.</td>
<td>• CAD is the leading cause of death for women, regardless of ethnicity.</td>
</tr>
<tr>
<td>• Men receive more evidence-based therapies (e.g. aspirin, statins, diagnostic catheterisation, PCI) when acutely ill from CAD (e.g. MI) than women.</td>
<td>• Initial cardiac event for women is more often angina than MI.</td>
</tr>
<tr>
<td>• Mortality rates from CAD have fallen more rapidly for men than women.</td>
<td>• More women than men with MI die of sudden cardiac death before reaching the hospital.</td>
</tr>
<tr>
<td>• Before menopause, women have high HDL cholesterol levels and lower LDL cholesterol levels than men. After menopause LDL levels increase.</td>
<td>• Fatigue is often the first symptom of ACS in women.</td>
</tr>
</tbody>
</table>

| **Acute coronary syndrome** | |
| • Incidence of MI is highest among middle-aged men. | • Women are older than men when seen with first MI and often have more comorbidities. |
| • After age 65, the incidence of MI in men and women equalises. | • Fewer women than men manifest the ‘classic’ signs and symptoms of UA or MI. |
| • Men present more frequently than women with an acute MI as the first symptom of CAD. | • Fatigue is often the first symptom of ACS in women. |
| • Men develop greater collateral circulation than women. | • Women experience more ‘silent’ MIs compared with men. |
| • Men have larger-diameter coronary arteries than women; vessel diameter is inversely related to risk of restenosis after interventions. | • Among those who have an MI, women are more likely to suffer a fatal cardiac event within 1 year than men. |
| • Standard screening for risk of sudden cardiac death (e.g. EP studies) is more predictive in men. | • Women report more disability after a cardiac event than men. |
| • More women than men with MI develop greater collateral circulation than men. | • Women who have coronary artery bypass graft surgery have a higher mortality rate and more complications after surgery than men. |

**GENETICS IN CLINICAL PRACTICE**

**Familial hypercholesterolaemia**

**Genetic basis**
- Autosomal dominant disorder.
- Mutation in low-density lipoprotein receptor (LDLR) gene.
- Gene codes for low-density lipoprotein (LDL) receptor that binds to LDLs.
- LDLs are the primary carriers of cholesterol in the blood. By removing LDLs from the bloodstream, the LDL receptors play a critical role in regulating cholesterol levels.
- Exists in both heterozygous (most common) and homozygous forms.

**Incidence**
- Heterozygotes: 1 in 500
- Homozygotes: rare

**Genetic testing**
- Disorder is characterised by elevated serum LDLs.
- Serum lipid profile can be used to measure total cholesterol, triglycerides, LDLs and high-density lipoproteins (HDLs).
- DNA testing is available.

**Clinical implications**
- Common genetic disease.
- High cholesterol levels are a result of defective function of the LDL receptors.
- Plasma levels of LDLs elevated throughout life.
- Develop severe atherosclerosis in early to middle years.
- Xanthomas (fatty deposits under the surface of the skin) can occur (see eFig 30-1, available on the website for this chapter).
- Treatment strategies include low-fat diet, exercise and lipid-lowering medications.
- Homozygous familial hypercholesterolaemia is much more severe than the heterozygous form. Cholesterol levels may exceed 600 mg/dL in these patients.

![Figure 30-6 Types of serum lipids.](https://example.com/fig30-6.png)

**HDL**, high-density lipoprotein; **LDL**, low-density lipoprotein; **VLDL**, very-low-density lipoprotein.  

ACS, acute coronary syndrome; CAD, coronary artery disease; EP, electrophysiology; HDL, high-density lipoprotein; LDL, low-density lipoprotein; MI, myocardial infarction; PCI, percutaneous coronary intervention; UA, unstable angina.
Problems of oxygenation: Perfusion

The stress of an elevated BP increases the rate of atherosclerotic development. This relates to the shearing stress that causes endothelial injury. Atherosclerosis, in turn, causes narrowed, thickened arterial walls and decreases the distensibility and elasticity of vessels. More force is required to pump blood through diseased arteries, and this increased force is reflected in a higher BP. This increased workload results in left ventricular hypertrophy and decreased stroke volume with each contraction. Excessive salt intake positively correlates with elevated BP, adding volume and increasing systemic vascular resistance (SVR) to the cardiac workload. (See Ch 29 for a complete discussion of hypertension.)

Tobacco use
A third major risk factor in CAD is tobacco use. The risk of developing CAD is two to six times higher in those who smoke tobacco or use smokeless tobacco than in those who do not. Further, tobacco smoking decreases oestrogen levels, placing premenopausal women at greater risk for CAD. Risk is proportional to the number of cigarettes smoked. Changing to lower-nicotine or filtered cigarettes does not affect risk. Nicotine in tobacco smoke causes catecholamine (i.e. adrenaline, noradrenaline) release. These neurohormones cause an increased heart rate (HR), peripheral vasoconstriction and increased BP. These changes increase the cardiac workload. Tobacco smoke is also related to an increase in LDL level, a decrease in HDL level, and release of toxic oxygen radicals. All of these add to vessel inflammation and thrombosis. Carbon monoxide, a by-product of combustion found in tobacco smoke, affects the oxygen-carrying capacity of haemoglobin by reducing the sites available for oxygen transport. Thus the effects of an increased cardiac workload, combined with the oxygen-depleting effect of carbon monoxide,
**TABLE 30-3** Reducing risk factors for coronary artery disease

When teaching the patient and/or carer about risk reduction for coronary artery disease, include the following information.

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Health-promoting behaviours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hypertension</strong></td>
<td>• Monitor home blood pressure (BP) and attend regular check-ups</td>
</tr>
<tr>
<td></td>
<td>• Take prescribed medications for BP control.</td>
</tr>
<tr>
<td></td>
<td>• Reduce salt intake (see eTable 29-1, available on the website for this chapter).</td>
</tr>
<tr>
<td></td>
<td>• Stop tobacco use. Avoid exposure to environmental tobacco (second-hand) smoke.</td>
</tr>
<tr>
<td></td>
<td>• Control or reduce weight.</td>
</tr>
<tr>
<td></td>
<td>• Move as much as possible, and walk for 30 minutes a day.</td>
</tr>
<tr>
<td><strong>Elevated serum lipids</strong></td>
<td>• Reduce total fat intake.</td>
</tr>
<tr>
<td></td>
<td>• Reduce animal (saturated) fat intake.</td>
</tr>
<tr>
<td></td>
<td>• Take prescribed medications for lipid reduction.</td>
</tr>
<tr>
<td></td>
<td>• Adjust total intake to achieve and maintain ideal body weight.</td>
</tr>
<tr>
<td></td>
<td>• Engage in daily physical activity.</td>
</tr>
<tr>
<td></td>
<td>• Increase amount of complex carbohydrates, fibre and vegetable proteins in diet.</td>
</tr>
<tr>
<td>*<em>Tobacco use</em></td>
<td>• Begin a program to quit smoking.</td>
</tr>
<tr>
<td></td>
<td>• Change daily routines associated with smoking to reduce desire to smoke.</td>
</tr>
<tr>
<td></td>
<td>• Substitute other activities for smoking.</td>
</tr>
<tr>
<td></td>
<td>• Ask carers to support efforts to stop smoking.</td>
</tr>
<tr>
<td></td>
<td>• Avoid exposure to environmental tobacco smoke.</td>
</tr>
<tr>
<td><strong>Physical inactivity</strong></td>
<td>• Develop and maintain at least 30 minutes of moderate physical activity daily (minimum 5 days a week).</td>
</tr>
<tr>
<td></td>
<td>• Increase activities to a fitness level.</td>
</tr>
<tr>
<td><strong>Psychological state</strong></td>
<td>• Increase awareness of behaviours that are harmful to health.</td>
</tr>
<tr>
<td></td>
<td>• Alter patterns that are conducive to stress (e.g. get up 30 minutes earlier so breakfast is not eaten on the way to work).</td>
</tr>
<tr>
<td></td>
<td>• Set realistic goals for self.</td>
</tr>
<tr>
<td></td>
<td>• Reassess priorities in light of health needs.</td>
</tr>
<tr>
<td></td>
<td>• Learn effective stress management strategies.</td>
</tr>
<tr>
<td></td>
<td>• Seek professional help if feeling depressed, angry, anxious, etc.</td>
</tr>
<tr>
<td></td>
<td>• Plan time for adequate rest and sleep.</td>
</tr>
<tr>
<td><strong>Obesity†</strong></td>
<td>• Change eating patterns and habits.</td>
</tr>
<tr>
<td></td>
<td>• Reduce energy intake to achieve body mass index of 18.5–24.9 kg/m².</td>
</tr>
<tr>
<td></td>
<td>• Increase physical activity to increase energy expenditure.</td>
</tr>
<tr>
<td></td>
<td>• Avoid fat and crash diets, which are not effective over time.</td>
</tr>
<tr>
<td></td>
<td>• Avoid large, heavy meals. Consider smaller, more frequent meals.</td>
</tr>
<tr>
<td><strong>Diabetes‡</strong></td>
<td>• Follow the recommended diet.</td>
</tr>
<tr>
<td></td>
<td>• Control or reduce weight.</td>
</tr>
<tr>
<td></td>
<td>• Take prescribed antidiabetic medications.</td>
</tr>
<tr>
<td></td>
<td>• Monitor blood glucose levels regularly.</td>
</tr>
</tbody>
</table>

*Smoking cessation is discussed in Chapter 6 and Tables 6-3 to 6-6. †See Chapter 37 for additional health-promoting behaviours. ‡See Chapter 45 for additional health-promoting behaviours.

Significantly decrease the oxygen available to the myocardium. There is also some indication that carbon monoxide is a chemical irritant and causes injury to the endothelium.

The benefits of smoking cessation are dramatic and almost immediate. CAD mortality rates drop to those of non-smokers within 12 months. However, nicotine is highly addictive, and often intensive intervention is required to assist people to quit. Individual and group counselling sessions, nicotine replacement therapy, smoking cessation medications (e.g. bupropion, varenicline), and hypnosis are examples of smoking cessation strategies. (See Ch 6, Tables 6-3 to 6-6, for information on smoking cessation.)

Chronic exposure to environmental tobacco (second-hand) smoke also increases the risk of CAD. People who live in the same household as the patient should be encouraged to stop smoking. This reinforces the individual’s effort and decreases the risk of ongoing exposure to environmental smoke. Pipe and cigar smokers, who often do not inhale, have an increased risk of CAD similar to those exposed to environmental tobacco smoke.

**Physical inactivity**

Physical inactivity is the fourth major modifiable risk factor. Physical inactivity implies a lack of adequate physical exercise on a regular basis. An example of health-promoting regular physical activity is brisk walking (5 to 6.5 kilometres per hour) for at least 30 minutes five or more times a week.

The mechanism by which physical inactivity predisposes a person to CAD is mostly still unknown. Physically active people have increased HDL levels. Exercise improves thrombo-lytic activity, thus reducing the risk of clot formation. Exercise may also encourage the development of collateral circulation in the heart.

Exercise training for those who are physically inactive decreases the risk of CAD through more efficient lipid metabolism, increased HDL production, and more efficient oxygen extraction by the working muscles, thereby decreasing the cardiac workload. For those individuals with CAD, regular physical activity reduces symptoms, improves functional capacity, and improves other risk factors such as insulin resistance and glucose intolerance.

**Obesity**

The mortality rate from CAD is statistically higher in obese people. Obesity is defined as a body mass index (BMI) of greater than 30 kg/m². A waist measurement of more than 100 cm in men (NZ), 102 cm (Aus), or more than 90 cm in women (NZ), 88 cm (Aus) increases the risk of CAD.

The increased risk for CAD is proportional to the degree of obesity. Obese people may produce increased levels of LDLs and triglycerides, which are strongly related to atherosclerosis. Obesity is often associated with hypertension. There is also evidence that people who tend to store fat in the abdomen (an ‘apple’ figure) rather than in the hips and buttocks (a ‘pear’ figure) have a higher incidence of CAD (see Table 37-2). As obesity increases, the heart grows and uses more oxygen. In addition, there is an increase in insulin resistance in obese individuals.

**CONTRIBUTING MODIFIABLE RISK FACTORS**

**Diabetes mellitus**

The incidence of CAD is two to four times greater among people who have diabetes, even those with well-controlled...
blood glucose levels, than the general population. The patient with diabetes manifests CAD not only more frequently but also at an earlier age. There is no age difference between male or female patients with diabetes in the onset of symptoms of CAD. Diabetes virtually eliminates the lower incidence of CAD in premenopausal women.

Undiagnosed diabetes is frequently discovered at the time a person has an MI. The person with diabetes has an increased tendency towards endothelial dysfunction. This may account for the development of fatty streaks in these patients. Diabetic patients also have alterations in lipid metabolism and tend to have high cholesterol and triglyceride levels. Management of diabetes should include lifestyle changes and drug therapy to achieve a haemoglobin A1C (HbA1c) level of less than 7%.14

Metabolic syndrome
Metabolic syndrome refers to a cluster of risk factors for CAD whose underlying pathophysiology may be related to insulin resistance. These risk factors include obesity as defined by increased waist circumference, hypertension, abnormal serum lipids and an elevated fasting blood glucose (see Table 37-8). These interrelated risk factors of metabolic origin appear to promote the development of CAD. (Chapter 37 discusses metabolic syndrome.)

Psychological states
The Framingham study provided early evidence that certain behaviours and lifestyles contribute to the development of CAD. Several behaviour patterns correlate with CAD. However, the study of these behaviours remains controversial and complex. One type of behaviour, referred to as type A, includes perfectionism and a hardworking, driven personality. The type A person often suppresses anger and hostility, has a sense of time urgency, is impatient, and creates stress and tension. This person may be more prone to MIs than a type B person; who is more easy going, takes upsets in stride, knows personal limitations, takes time to relax, and is not an overachiever. However, findings from studies about these relationships are inconsistent.

Studies now are focusing on specific psychological risk factors thought to increase risk of CAD. These include depression, acute and chronic stress (e.g. poverty, serving as a carer), anxiety, hostility and anger, and lack of social support. In particular, depression is a risk factor for both the development and worsening of CAD. Depressed patients have elevated levels of circulating catecholamines that may contribute to endothelial injury and inflammation and platelet activation. Higher levels of depression are also associated with an increased number of adverse cardiac events.20 More research on the treatment of depression and other negative psychological states (e.g. anger) in patients with or at risk for CAD is needed to improve these patients’ emotional and physical health.

Stressful states correlate with the development of CAD.22 Sympathetic nervous system (SNS) stimulation and its effect on the heart are the physiological mechanism by which stress predisposes one to the development of CAD. SNS stimulation causes an increased release of catecholamines (i.e. adrenaline, noradrenaline). This stimulation increases HR and intensifies the force of myocardial contraction, resulting in increased myocardial oxygen demand. Also, stress-induced mechanisms can cause elevated lipid and glucose levels and changes in blood coagulation, which can lead to increased atherogenesis.

Homocysteine
High blood levels of homocysteine have been linked to an increased risk for CAD and other cardiovascular diseases.23 Homocysteine is produced by the breakdown of the essential amino acid methionine, which is found in dietary protein. High homocysteine levels possibly contribute to atherosclerosis by: (1) damaging the inner lining of blood vessels, (2) promoting plaque build-up, and (3) altering the clotting mechanism to make clots more likely to occur (see Table 28-6).

Research is ongoing to determine whether a decline in homocysteine can reduce the risk of heart disease. B-complex vitamins (B6, B12, folic acid) have been shown to lower blood levels of homocysteine. Generally, a screening test for homocysteine is limited to those suspected of having elevated levels, such as older patients with pernicious anaemia or people who develop CAD at an early age.

Substance abuse
The use of illicit drugs, such as cocaine and methamphetamines, can produce coronary spasm resulting in myocardial ischaemia and chest pain. Most people who are seen in the ED with drug-induced chest pain are initially indistinguishable from those with CAD. Although MI can occur, these patients more often have sinus tachycardia, high BP, angina and anxiety.24

NURSING AND MULTIDISCIPLINARY MANAGEMENT: CORONARY ARTERY DISEASE
Health promotion
The appropriate management of risk factors in CAD may prevent, modify or slow the progression of the disease. Over the past 30 years, there has been a gradual and persistent decline in cardiovascular-related deaths. The decline relates to people’s efforts to become generally healthier, as well as advances in drugs and technology to treat CAD. Prevention and early treatment of heart disease must involve a multifaceted approach and needs to be ongoing throughout the life span.

Identification of high-risk people
Signs and symptoms of CAD are not apparent in the early stages of the disease. Therefore, regardless of the healthcare setting, it is extremely important to identify people at risk for CAD. Risk screening involves obtaining a thorough health history. Question the patient about a family history of heart disease in parents and siblings. Note the presence of any cardiovascular symptoms. Assess environmental factors, such as eating habits, type of diet and level of exercise, to elicit lifestyle patterns. Include a psychosocial history to determine tobacco use, alcohol ingestion, recent stressful events (e.g. loss of a spouse), and any negative psychological states (e.g. anxiety, depression, anger). The place and type of employment provide important information on the kind of activity performed, exposure to pollutants or noxious chemicals, and the degree of stress associated with work.

Identify the patient’s attitudes and beliefs about health and illness. This information can give some indication of how disease and lifestyle changes may affect the patient and can reveal possible misconceptions about heart disease. Knowledge of the patient’s educational background can help to decide the level needed for teaching. If the patient is taking medications, it is important to know the names and dosages and if the patient is compliant with the drug regimen.
Intermittent claudication

TABLE 30.14 Acute coronary syndrome

<table>
<thead>
<tr>
<th>Subjective data</th>
<th>Objective data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Important health information</strong></td>
<td><strong>General</strong></td>
</tr>
<tr>
<td><em>Past medical history:</em> Previous history of CAD, chest pain/angina, MI, valve disease (e.g., aortic stenosis), heart failure or cardiomyopathy; hypertension, diabetes, anaemia, lung disease; hyperlipidaemia</td>
<td></td>
</tr>
<tr>
<td><em>Medications:</em> Use of antplatelets or anticoagulants, nitrates, angiotensin-converting enzyme inhibitors, β-adrenergic blockers, calcium channel blockers; antihypertensive drugs; lipid-lowering drugs; over-the-counter drugs (e.g., vitamin and herbal supplements)</td>
<td></td>
</tr>
<tr>
<td><em>History of present illness:</em> Description of events related to current illness, including any self-treatments and response (see Table 30-8)</td>
<td></td>
</tr>
<tr>
<td><strong>Functional health patterns</strong></td>
<td><strong>Integumentary</strong></td>
</tr>
<tr>
<td><em>Health perception–health management:</em> Family history of heart disease; sedentary lifestyle; tobacco use; exposure to environmental smoke</td>
<td></td>
</tr>
<tr>
<td><em>Nutritional–metabolic:</em> Indigestion, heartburn, nausea, belching, vomiting</td>
<td></td>
</tr>
<tr>
<td><em>Elimination:</em> Urinary urgency or frequency, straining at stool</td>
<td></td>
</tr>
<tr>
<td><em>Activity–exercise:</em> Palpitations, dyspnoea, dizziness, weakness</td>
<td></td>
</tr>
<tr>
<td><em>Cognitive–perceptual:</em> Substernal chest pain or pressure (squeezing, constricting, aching, sharp, tingling), possible radiation to jaw, neck, shoulders, back or arms (see Table 30-7)</td>
<td></td>
</tr>
<tr>
<td><em>Coping–stress tolerance:</em> Stressful lifestyle, depression; anger, anxiety; feeling of impending doom</td>
<td></td>
</tr>
<tr>
<td><strong>Possible diagnostic findings</strong></td>
<td><strong>Cardiovascular</strong></td>
</tr>
<tr>
<td>Positive serum cardiac markers, ↑ WBC count; positive exercise or pharmacological stress test and thallium scans; pathological Q wave, ST-segment elevation, and/or T-wave abnormalities on ECG; cardiac enlargement, calcifications, or pulmonary congestion on chest X-ray; abnormal wall motion with stress echocardiogram; positive coronary angiography</td>
<td></td>
</tr>
<tr>
<td><strong>Acute intervention</strong></td>
<td><strong>Nursing implementation: Acute coronary syndrome</strong></td>
</tr>
<tr>
<td><strong>Priorities for nursing interventions in the initial phase of ACS</strong></td>
<td><strong>Acute intervention</strong></td>
</tr>
<tr>
<td>(1) pain assessment and relief, (2) physiological monitoring, (3) promotion of rest and comfort, (4) alleviation of stress and anxiety, and (5) understanding of the patient’s emotional and behavioural reactions. Patients with increased anxiety levels have a greater risk for adverse outcomes such as recurrent ischaemic events and arrhythmias. Proper management of these priorities decreases the oxygen needs of a compromised myocardium and reduces the risk of complications. In addition, institute measures to avoid the hazards of immobility while encouraging rest.</td>
<td></td>
</tr>
<tr>
<td><strong>Pain</strong></td>
<td>Provide NTG, morphine and supplemental oxygen as needed to eliminate or reduce chest pain. Ongoing evaluation of pain intensity will guide future management decisions.</td>
</tr>
</tbody>
</table>

BP, blood pressure; CAD, coronary artery disease; ECG, electrocardiogram; MI, myocardial infarction; WBC, white blood cell.
and documentation of the effectiveness of the interventions are important. Once pain is relieved, you may have to deal with denial in a patient who interprets the absence of pain as an absence of cardiac disease.

**Monitoring** Maintain continuous ECG monitoring while the patient is in the ED and intensive care unit and after transfer to a step-down or general unit. Arrhythmias need to be identified quickly and treated. During the initial period after MI, ventricular fibrillation is the most common lethal arrhythmia. In many patients, premature ventricular contractions or ventricular tachycardia precedes this arrhythmia. Monitor the patient for reinfarction or ischaemia by monitoring the ST segment for shifts above or below the baseline of the ECG. Silent ischaemia can occur without clinical symptoms such as chest pain. Its presence places a patient at higher risk for adverse outcomes and even death. If you note ST segment changes, notify the doctor. (See Ch 32 for a complete discussion of ECG monitoring.)

Perform a physical assessment to detect deviations from the patient’s baseline findings. Assess heart and breath sounds and any evidence of early HF (e.g. dyspnoea, tachycardia, pulmonary congestion, distended neck veins). In addition to routine vital signs, monitor intake and output at least once a shift.

Assessment of the patient’s oxygenation status is important, especially if the patient is receiving oxygen. If a nasal cannula is used to deliver oxygen, check the nares for irritation or dryness, and make sure it is free from interruption. Comfort measures that can promote rest and sleep include a quiet environment, use of relaxation techniques (e.g. relaxation breathing, guided imagery), and assurance that staff are nearby and responsive to the patient’s needs.

**Rest and comfort** It is important to promote rest and comfort with any degree of myocardial injury. Bed rest may be ordered for the first few days after an MI that involves a large portion of the ventricle. A patient with an uncomplicated MI (e.g. angina resolved, no signs of complications) may rest in a chair within 8 to 12 hours after the event. The use of a commode or bedpan is based on patient preference.

When sleeping or resting, the body requires less work from the heart than it does when active. It is important to plan nursing and therapeutic interventions to ensure adequate rest periods free from interruption. Comfort measures that can promote rest include a quiet environment, use of relaxation techniques (e.g. relaxation breathing, guided imagery), and assurance that staff are nearby and responsive to the patient’s needs.

It is important that the patient understand the reasons why activity is limited but not completely restricted. Gradually increasing the patient’s cardiac workload through more demanding physical tasks so that the patient can achieve a discharge activity level adequate for home care. Box 30-2 outlines the phases of cardiac rehabilitation.

**Anxiety** Anxiety is present in all patients with ACS to some degree. It is the nurse’s role to identify the source of anxiety and assist the patient in reducing it. If the patient is afraid of being alone, allow a carer to sit quietly nearby or to check in with the patient frequently. If a source of anxiety is fear of the unknown, explore these concerns with the patient. For anxiety caused by lack of information, provide teaching based on the patient’s stated need and level of understanding. Answer the patient’s questions with clear, simple explanations.

It is important to start teaching at the patient’s level rather than to present a prepackaged program. For example, patients generally are not ready to learn about the pathology of CAD. The earliest questions usually relate to how the disease affects perceived control and independence. Examples include the following:

• When will I leave the coronary care unit?
• When can I get out of bed?
• When will I be discharged?
• When can I return to work?
• How many changes will I have to make in my life?
• Will this happen again?

Tell the patient that a more complete teaching program will begin once they are feeling stronger. Frequently the patient may not be able to ask the most serious concern of ACS patients: Am I going to die? Even if a patient denies this concern, it is helpful for you to start a conversation by reminding that fear of dying is a common concern among most patients who have experienced ACS. This gives the patient ‘permission’ to talk about an uncomfortable and fearful topic.

**Emotional and behavioural reactions** Patients’ emotional and behavioural reactions vary but frequently follow a predictable response pattern (Box 30-3). The nurse’s role is to understand what the patient is currently experiencing and to support the use of constructive coping styles. Denial may be a positive coping style in the early phase of recovery from ACS.

Assess the support structure of the patient and carer. Help to determine how you can help maximise the support system. Often the patient is separated from the most significant support system at the time of hospitalisation. The nurse’s role includes talking to the patient’s family and informing them about the patient’s condition and progress, allowing the patient and key family members to interact as necessary, and supporting those who will provide the necessary support to the patient. Open visiting is helpful in decreasing anxiety and increasing support for the patient with ACS. Social isolation has been
Psychosocial responses to acute coronary syndrome

Denial
- May have history of ignoring signs and symptoms related to heart disease
- Minimises severity of medical condition
- Ignores activity restrictions
- Avoids discussing illness or its significance

Anger and hostility
- Is commonly expressed as, ‘Why did this happen to me?’
- May be directed at family, staff or medical regimen

Anxiety and fear
- Fears long-term disability and death
- Overtly manifests apprehension, restlessness, insomnia, tachycardia
- Less overtly manifests increased verbalisation, projection of feelings to others, hypochondriasis
- Fears activity
- Fears recurrent chest pain, heart attacks and sudden death

Dependency
- Is totally reliant on staff
- Is unwilling to perform tasks or activities unless approved by healthcare provider
- Wants to be monitored by ECG at all times
- Is hesitant to leave the intensive care or telemetry unit or hospital

Depression
- Mourns loss of health, altered body function and changes in lifestyle
- Realises seriousness of situation
- Begins to worry about future implications of health problem
- Shows symptoms of withdrawal, crying, apathy
- May be more evident after discharge

Realistic acceptance
- Focuses on optimum rehabilitation
- Plans changes compatible with altered cardiac function
- Actively engages in lifestyle changes to address modifiable risk factors

ECG, electrocardiogram.

Coronary revascularisation

Patients with ACS may undergo coronary revascularisation with PCI or CAGB surgery. The major nursing responsibilities for patient care after PCI involve monitoring for signs of recurrent angina; frequent assessment of vital signs, including HR and rhythm; evaluation of the catheter insertion site for signs of bleeding; neurovascular assessment of the involved extremity; and maintenance of bed rest per institution policy.

For patients having CAGB surgery, care is provided in the intensive care unit for the first 24 to 36 hours. Ongoing and intensive monitoring of the patient’s haemodynamic status is critical. The patient will have numerous invasive lines for monitoring cardiac status and other vital organs (see Ch 62). These include: (1) a pulmonary artery catheter for measuring CO and other haemodynamic parameters, (2) an intrathoracic line for continuous BP monitoring, (3) pleural and mediastinal chest tubes for chest drainage, (4) continuous ECG monitoring to detect arrhythmias, (5) an endotracheal tube connected to mechanical ventilation, (6) epicardial pacing wires for emergency pacing of the heart, (7) a urinary catheter to monitor urine output, and (8) a nasogastric tube for gastric decompression. Most patients are extubated within 6 hours and transferred to a step-down unit within 24 hours for continued monitoring of cardiac status.

Many of the postoperative complications that develop after CAGB surgery relate to the use of CPB. Major consequences of CPB are systemic inflammation, which includes complications of bleeding and anaemia from damage to red blood cells and platelets; fluid and electrolyte imbalances; hypothermia as blood is cooled as it passes through the CPB machine; and infections. Focus nursing care on assessing the patient for bleeding (e.g. chest tube drainage, incision sites), haemodynamic monitoring, checking fluid status, replacing electrolytes as needed, and restoring temperature (e.g. warming blankets).

Postoperative arrhythmias, specifically atrial arrhythmias, are common in the first 3 days after CAGB surgery. Postoperative atrial fibrillation (AF) occurs in 20% to 50% of patients.36

Role of registered nurse (RN)

Preprocedure
- Assess for allergies, especially to contrast medium. Perform baseline assessment, including vital signs, pulse oximetry, heart and breath sounds, neurovascular assessment of extremities (e.g. distal pulses, skin temperature, skin colour, sensation).
- Teach patient and carer about procedure and postprocedure care.

Postprocedure
- Perform assessment and compare to baseline: vital signs, pulse oximetry, heart and breath sounds, neurovascular assessment of extremity used for procedure, assessment of catheter insertion site for haematoma or bleeding.
- Monitor ECG for arrhythmias or other changes (e.g. ST segment elevation).
- Monitor patient for chest pain and other sources of pain or discomfort.
- Monitor IV infusions of anticoagulants, antiplatelets.
- Teach patient and carer about discharge medications (e.g. aspirin, prasugrel, antianginal medications).

Role of the enrolled nurse

- Take vital signs and report increases or decreases in heart rate or blood pressure to RN.
- Report decreases in pulse oximetry to the RN.
- Administer medications before and after the procedure (consider applicable Nursing Practice Act and agency policy).
- Assess neurovascular status of involved extremity every 15 minutes for the first hour, then according to agency policy (consider applicable Nursing Practice Act and agency policy).
- Check for bleeding at catheter insertion site every 15 minutes for the first hour, then according to agency policy.
- Report changes in neurovascular status of involved extremity or any bleeding to the RN.

Role of personal care assistants
- Report patient complaints of chest pain, shortness of breath, and/or any other discomfort or distress to RN.
- Assist with oral hygiene, hydration, meals and toileting.
β-Adrenergic blockers should be restarted as soon as possible after surgery (unless contraindicated) to reduce the incidence of AF. Discharge is often delayed in these patients in order to begin anticoagulation therapy. (See Ch 32 for information on treatment of AF.)

Nursing care for the patient with a CABG also involves caring for the surgical sites (e.g. chest, arm, leg). Care of the radial artery harvest site includes monitoring sensory and motor function of the distal hand. The patient with radial artery harvest should take a calcium channel blocker for approximately 3 months to decrease the incidence of arterial spasm at the arm or anastomosis site.

Care of the leg incision is minimal since endoscopy is used to harvest the vein. Management of the chest wound, which involves a sternotomy, is similar to that of other chest surgery (see Ch 24). Other interventions include strategies to manage pain and prevent venous thromboembolism (e.g. early ambulation, sequential compression device) and respiratory complications (e.g. use of incentive spirometer, splinting during coughing and deep-breathing exercises). (See Ch 16 for care of the postoperative patient.)

Postoperatively, patients may experience some cognitive dysfunction. This includes impairment of memory, concentration, language comprehension and social integration. Patients may cry or become teary. Postoperative cognitive dysfunction (POCD) can manifest days to weeks after surgery and may remain a permanent disorder. It is seen in 40% of patients several months after cardiac surgery. 56 (POCD is discussed in Ch 16.)

In the older patient, elective CABG is generally well tolerated. However, the incidence of postoperative complications, including arrhythmias, stroke and infection, is high. Although the benefits of treatment may outweigh risks in this population, complications are higher than in younger individuals.

Postoperative nursing care of the patient with a MIDCAB or OPCAB procedure is similar to that for CABG surgery patients. Pain management is important regardless of the procedure. Patients report higher levels of pain with thoracotomy incisions than a sternotomy incision. The recovery time is somewhat shorter with these procedures, and patients often resume routine activities sooner than patients who have CABG surgery.

Ambulatory and home care
Cardiac rehabilitation is the restoration of a person to an optimal state of function in six areas: physiological, psychological, mental, spiritual, economic and vocational. Many people recover from ACS physically, yet they may never attain psychological wellbeing. All patients (e.g. patients with ACS, chronic stable angina, cardiac surgery) need to be referred to a cardiac rehabilitation program. In considering rehabilitation, the patient must recognise that CAD is a chronic disease. It is not curable, nor will it disappear by itself. Therefore, basic changes in lifestyle must be made to promote recovery and future health. These changes often are needed at a time when a person is middle aged or older. The patient must realise that recovery takes time. Resumption of physical activity after ACS or CABG surgery is slow and gradual. However, with appropriate and adequate supportive care, recovery is more likely to occur.

Patient teaching
Patient teaching needs to occur at every stage of the patient’s hospitalisation and recovery (e.g. ED, telemetry unit, home care). The purpose of teaching is to give the patient and carer the tools they need to make informed decisions about their health. For teaching to be meaningful, the patient must be aware of the need to learn. Careful assessment of the patient’s learning needs helps them to set goals that are realistic.

The timing of the teaching is important. When patients and carers are in crisis (either physiological or psychological), they may not be interested in learning new information. Answer the patient’s questions in simple, brief terms. The answers often require repetition. When the shock and disbelief accompanying a crisis subside, the patient and carer are better able to focus on new and more detailed information.

Limit use of medical terminology. For example, explain that the heart, a four-chambered pump, is a muscle that needs oxygen, like all other muscles, to work properly. When blood vessels supplying the heart muscle with oxygen are blocked by plaque, less oxygen is available to the muscle. As a result, the heart cannot pump normally. It helps to have a model of the heart or to sketch a picture of what is being explained.

Anticipatory guidance involves preparing the patient and carer for what to expect in the course of recovery and rehabilitation. By learning what to expect during treatment and recovery, the patient gains a sense of control over his or her life.

EVIDENCE-BASED PRACTICE

Do exercise-based cardiac rehabilitation programs improve outcomes?

Clinical question
In patients with coronary heart disease (P), do exercise-based cardiac rehabilitation programs (I) versus usual care (C) reduce mortality and morbidity and improve quality of life (O)?

Best available evidence
Systematic review of randomised controlled trials (RCTs)

Critical appraisal and synthesis of evidence

- 47 RCTs (n = 10,794) of patients with myocardial infarction (MI), angina pectoris, coronary artery bypass graft (CABG) or percutaneous transluminal coronary angioplasty (PTCA).
- Exercise-based cardiac rehabilitation was exercise alone or with psychosocial or educational interventions. Usual care included standard medical care and drug therapy with no structured exercise training.
- Exercise-based rehabilitation reduced overall and cardiovascular mortality, decreased hospital admissions and improved quality of life.
- Cardiac rehabilitation did not reduce risk of recurrent MI or revascularisation (CABG or PTCA).

Conclusion
- Exercise-based cardiac rehabilitation reduces risk of dying from heart disease.

Implications for nursing practice

- Provide assistance in accessing cardiac rehabilitation programs.
- Reinforce benefits of adhering to recommended physical activity.
- Reduce program dropout rates by motivating patients to stay engaged.

Reference for evidence

### EVIDENCE-BASED PRACTICE

<table>
<thead>
<tr>
<th>Best available evidence*</th>
<th>Clinician expertise</th>
<th>Patient preferences and values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combination strategies (e.g. medication plus behavioural support) work best to help patients stop smoking.</td>
<td>You have heard from several patients who have successfully stopped smoking that they tried more than one intervention at a time to stop smoking (e.g. medication plus support group, hypnotherapy plus support group).</td>
<td>After reviewing all the information, Jamie Boaz informs you that he is willing to start with the nicotine patch but does not want to do anything else at this time.</td>
</tr>
</tbody>
</table>

### BOX 30-4 Acute coronary syndrome

**When teaching the patient and/or carer about acute coronary syndrome, include the following information.**

- Signs and symptoms of angina and MI and what to do should they occur (e.g. take glyceryl trinitrate)*
- When and how to seek help (e.g. contact ambulance services)
- Anatomy and physiology of the heart and coronary arteries
- Cause and effect of CAD
- Definition of terms (e.g. CAD, angina, MI, sudden cardiac death, heart failure)
- Identification of and plan to decrease risk factors (see Tables 30-2, 30-3 and 30-4)
- Rationale for tests and treatments (e.g. ECG monitoring, blood tests, angiography), activity limitations and rest, diet and medications*
- Appropriate expectations about recovery and rehabilitation (anticipatory guidance)
- Resumption of work, physical activity, sexual activity
- Measures to promote recovery and health
- Importance of the gradual, progressive resumption of activity*

*Identified by patients as most important to learn before discharge. CAD, coronary artery disease; ECG, electrocardiogram; EMS, emergency medical services; MI, myocardial infarction.

Patient teaching guide

**Your decision and action**

As his nurse, you respect and support his decision. You document your teaching and JB's response. You ask his doctor for a prescription for the nicotine patch before he is discharged from hospital.

### References


The idea of perceived control is operationalised as the process by which the patient exercises choice and makes decisions by cutting back. Cutting back is one way of minimising the psychological and physiological losses after MI (or any other life-changing event). For example, a middle-aged man who smokes two packets of cigarettes a day, is 15 kg overweight, and gets no physical exercise has a seemingly overwhelming task. He may decide that he can live with a weight reduction plan and will get more exercise (although perhaps not daily) but that it is not possible for him to quit smoking. He reasons that because he is modifying two of the three risk factors, he will be healthier. Ideally, the tobacco risk factor should be a priority for this patient. If the information regarding risks and effects of tobacco use is not accepted, the patient’s lifestyle choices are, in the end, up to each individual.

In addition to teaching the patient and carer what they wish to know, several types of information are essential in achieving optimal health. Box 30-4 presents a teaching guide for the patient with ACS.

### Physical activity

Physical activity, an integral part of rehabilitation, is necessary for optimal physiological functioning and psychological wellbeing. It has a direct, positive effect on maximal oxygen uptake, increasing CO, decreasing blood lipids, decreasing BP, increasing blood flow through the coronary arteries, increasing muscle mass and flexibility, improving the psychological state, and assisting in weight loss and control. A regular schedule of physical activity, even after many years of sedentary living, is beneficial.

One method of identifying levels of physical activity is through metabolic equivalent (MET) units: 1 MET is the amount of oxygen needed by the body at rest—3.5 mL of oxygen per kilogram per minute. The MET determines the energy costs of various exercises (Box 30-5). In hospital, activity level is gradually increased so that by the time of discharge the patient can tolerate moderate-energy activities of 3 to 6 METs. Many patients with UA that has resolved or an uncomplicated MI are in hospital for approximately 3 or 4 days. By day 2, the patient can ambulate in the hallway and begin limited stair climbing (e.g. three or four steps). Many cardiologists order low-level exercise stress tests before discharge to assess readiness for discharge, optimal HR for an exercise program, and potential for ischaemia or reinfarction. If tests are positive (i.e. ischaemia at a low level of energy expenditure), the patient is evaluated for cardiac catheterisation before discharge. If the test is negative, a catheterisation may still be done before discharge or several weeks after discharge. Because of the short hospital stay, it is critical to give the patient specific guidelines for physical activity so that overexertion will not occur. It is important to tell the patient to “listen to what your body is saying”—the most important aspect of recovery.

Teach patients to check their pulse rate. The patient should know the limits within which to exercise. Tell the patient the maximum HR that should be present at any point. If the HR exceeds this level or does not return to the rate of the resting pulse within a few minutes, instruct the patient to stop and rest. Also instruct the patient to stop exercising and rest if chest pain or shortness of breath occurs.

In a normal, healthy person the minimum threshold for improving cardiopulmonary fitness is 60% of the age-
Problems of oxygenation: Perfusion

beginning an exercise program should do so under supervision whenever possible.

The more important factor is the patient’s response to physical activity in terms of symptoms rather than absolute HR, especially since many patients are taking β-adrenergic blockers and may not be able to reach a target HR. This point cannot be overstressed. Basic physical activity guidelines for patients after ACS follow the FITT formula (Box 30-6).

The basic categories of physical activity are isometric (static) and isotonic (dynamic). Most daily activities are a mixture of the two. Isometric activities involve the development of tension during muscular contraction but produce little or no change in muscle length or joint movement. Lifting, carrying and pushing heavy objects are isometric activities. Because the HR and BP increase rapidly during isometric work, exercise programs involving isometric exercises should be limited.

Isotonic activities involve changes in muscle length and joint movement with rhythmic contractions at relatively low muscular tension. Walking, jogging, swimming, bicycling and jumping rope are examples of activities that are predominantly isotonic. Isotonic exercise can put a safe, steady load on the heart and lungs and improve the circulation in many organs.

Discuss participation in an outpatient cardiac rehabilitation program with all patients (see Box 30-2). These programs are beneficial, but not all patients choose or are able to participate in them (e.g. location and travel limitations). Home-based cardiac rehabilitation programs can provide an alternative. Physical activity guidelines are developed for the patient, and staff maintain ongoing contact with the patient (e.g. during rehabilitation programs, or via the telephone, exercise logs,

### BOX 30-5 Energy expenditure in metabolic equivalents

<table>
<thead>
<tr>
<th>Metabolic equivalents (METs) for selected activities*</th>
<th>Activity METs (min)</th>
<th>METs (max)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>METs for leisure activities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aerobics</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Cycling</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8 km per hour</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>16 km per hour</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>21 km per hour</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Music, playing an instrument</td>
<td>2.5</td>
<td>4</td>
</tr>
<tr>
<td>Dancing, ballroom</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Gardening</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Mowing lawn (pushing)</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Weeding/cultivating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Running</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General light jogging</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Training 10 km per hour</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>Skipping &lt;80/min</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Swimming</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Breast stroke</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Freestyle</td>
<td></td>
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<tr>
<td>Tennis</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Walking</td>
<td></td>
<td></td>
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<tr>
<td>1–3 km per hour</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>3–6 km per hour</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td><strong>METs for activities of daily living</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrying heavy groceries</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Cleaning windows</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Cooking</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>General housework</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Grocery shopping</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Loading/unloading washing machine</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Mowing by hand</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Painting/decorating</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Sexual intercourse</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Showering</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Vacuuming</td>
<td>3</td>
<td>3.5</td>
</tr>
<tr>
<td>Walking up stairs</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Washing a car</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Washing dishes</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>


### BOX 30-6 FITT activity guidelines after acute coronary syndrome

When teaching the patient and/or carer after an acute coronary syndrome, include the following information.

#### Warm-up/cool-down
- Educate the patient to perform mild stretching for 3–5 minutes before the physical activity and 5 minutes after the activity. Activity should not be started or stopped abruptly.

#### Frequency
- Encourage the patient to perform physical activity on most days of the week.

#### Intensity
- Activity intensity is determined by the patient’s HR. If an exercise stress test has not been performed, the HR of the patient recovering from an MI should not exceed 20 beats/minute over the resting HR.

#### Type of physical activity
- Physical activity should be regular, rhythmic and repetitive, using large muscles to build up endurance (e.g. walking, cycling, swimming, rowing).

#### Time
- Physical activity sessions should be at least 30 minutes long. Educate the patient to begin slowly at personal tolerance (perhaps only 5–10 minutes) and build up to 30 minutes.

HR, heart rate; MI, myocardial infarction.
email). Maintaining contact with the patient is one key to the success of these programs.

Older women (65 years or older) who experience MI may frequently have poor adherence to a regular physical activity program. Often these women describe continued fatigue post-MI that is poorly understood. Another factor that has been linked to poor adherence to a physical activity program after MI is depression. Depression is common among patients with CAD, especially in women. Routinely screen for depression in all patients with CAD and recommend treatment as appropriate.

**Resumption of sexual activity** It is important to include sexual counselling for cardiac patients and their partners. This often-neglected area of discussion may be difficult for both patients and healthcare providers to approach. However, the patient’s concern about resumption of sexual activity after hospitalisation for ACS often produces more stress than the physiological act itself. Most of these patients change their sexual behaviour not because of physical problems, but because they are concerned about sexual inadequacy, death during intercourse, and impotence. A concerned and knowledgeable healthcare professional can clarify any misperceptions and increase the patient’s knowledge.

Before providing guidelines on resumption of sexual activity, it is important to know the patient’s physiological status, the physiological effects of sexual activity and the psychological effects of having a heart attack.

When educating patients it is helpful to consider sex as a physical activity and to discuss or explore feelings in this area when other physical activities are discussed. One helpful approach is, ‘Many people who have had a heart attack wonder when they will be able to resume sexual activity. Has this been of concern to you?’ It is important to emphasise that sexual activity is like other forms of activity and should be gradually resumed after MI. If a patient’s ability to perform sexually is concerning them, tell them that the energy used is no more than that required to walk briskly or climb two flights of stairs. This type of non-threatening explanation allows the patient to explore their feelings, and gives the patient an opportunity to raise questions with you or another healthcare provider.

Common guidelines are presented in Box 30-7. The patient needs to know that the inability to perform sexually after MI is common and that sexual dysfunction usually disappears after several attempts. Reinforce the idea that patience and understanding usually solve the problem. However, with the availability of drugs to correct erectile dysfunction, many male patients may be interested in using them. Caution the patient that these drugs are not to be used with nitrates because severe hypotension and even death have been reported. Encourage patients to discuss the use of these drugs with their treating doctor.

It is common for a patient who experiences chest pain on physical exertion to have some angina during sexual stimulation or intercourse. The patient may be instructed to take GTN prophylactically. It is also helpful to have the patient avoid sex soon after a heavy meal or after excessive ingestion of alcohol, when extremely tired or stressed, or with unfamiliar partners. Initially, patients should avoid anal intercourse because of the likelihood of eliciting a vasovagal response.

Tell the patient that resumption of sex depends on the patient and his or her partner’s emotional readiness and on the doctor’s assessment of the extent of recovery. It is generally safe to resume sexual activity 7 to 10 days after an uncomplicated MI.

**Evaluation**

eNursing Care Plan 30-1 (found on the website for this chapter) presents the expected outcomes for the patient with an ACS.

**SUDDEN CARDIAC DEATH**

Sudden cardiac death (SCD) is unexpected death resulting from a variety of cardiac causes. Classification of SCD is not clear; however, an estimated 30,000 Australians experience sudden cardiac arrest each year. Most of these events occur outside the hospital and survival is still quite poor.

**AETIOLOGY AND PATHOPHYSIOLOGY**

In SCD a sudden disruption in cardiac function produces an abrupt loss of CO and cerebral blood flow. The affected person may or may not have a known history of heart disease. SCD is often the first sign of illness for 25% of those who die of heart disease.

Acute ventricular arrhythmias (e.g. ventricular tachycardia, ventricular fibrillation) cause the majority of cases of SCD. Structural heart disease accounts for 10% of the cases of SCD. Patients in this group include those with left ventricular hypertrophy, myocarditis and hypertrophic cardiomyopathy. Hypertrophic cardiomyopathy is a risk factor for SCD, especially in young, athletic people.

Approximately 10% to 12% of cases of SCD among people less than age 45 occur in the absence of structural heart disease. These involve disturbances in the conduction system (e.g. prolonged QT syndrome, Wolff-Parkinson-White syndrome).
It is difficult to know who is at high risk for SCD. However, left ventricular dysfunction (EF less than 30%) and ventricular arrhythmias following MI have been found to be the strongest predictors. Other risk factors include history of syncope, left ventricular outflow tract obstruction (e.g., aortic stenosis), male gender, and family history of ventricular arrhythmias.

**SIGNS, SYMPTOMS AND COMPLICATIONS**

People who experience SCD because of CAD fall into two groups: (1) those who did not have an acute MI; and (2) those who did have an acute MI. The first group accounts for the majority of cases of SCD. These victims usually have no warning signs or symptoms. Patients who survive are at risk for another SCD event because of the continued electrical instability of the heart that caused the initial event to occur.

The second, smaller group of patients includes those who have had an MI and have suffered SCD. Such patients usually have prodromal symptoms, such as chest pain, palpitations and dyspnoea. Death usually occurs within 1 hour of the onset of acute symptoms.

**NURSING AND MULTIDISCIPLINARY MANAGEMENT: SUDDEN CARDIAC DEATH**

People who survive an episode of SCD require a diagnostic workup to determine whether they have had an MI. Thus, serial analysis of cardiac markers and ECGs are done, and the patient is treated accordingly. (See section on multidisciplinary care of ACS.) In addition, because most people with SCD have CAD, cardiac catheterisation is indicated to determine the possible location and extent of coronary artery occlusion. PCI or CABG surgery may be indicated.

Most SCD patients have a lethal ventricular arrhythmia that is associated with a high incidence of recurrence. Thus, it is useful to know when those people are most likely to have a recurrence and what drug therapy is the most effective treatment. Assessment of arrhythmias in these patients includes 24-hour Holter monitoring or other type of event recorder, exercise stress testing, signal-averaged ECG, and electrophysiology study (EPS). EPS is performed under fluoroscopy. Pacing electrodes are placed in selected intracardiac areas, and stimuli are selectively used to attempt to produce arrhythmias. The patient’s response to various antiarrhythmic medications is determined and monitored in a controlled environment (see Ch 32).

The most common approach to preventing a recurrence is the use of an implantable cardioverter-defibrillator (ICD). It has been shown that an ICD improves survival compared with drug therapy alone. (Chapter 32 discusses ICDS.) Drug therapy with amiodarone may be used in conjunction with an ICD to decrease episodes of ventricular arrhythmias.

Teaching people about the symptoms of impending cardiac arrest and the actions to take can save lives. Rapid cardiopulmonary resuscitation (CPR) (see Appendix A) and defibrillation with an automatic external defibrillator (AED), combined with early advanced cardiac life support, have greatly improved long-term survival rates for a witnessed arrest.

When caring for these patients, be alert to the patient’s psychosocial adaptation to this sudden ‘brush with death’. Many of these patients develop a ‘time bomb’ mentality. They fear the recurrence of cardiac arrest and may become anxious, angry and depressed. Their partners and family members are likely to experience the same feelings. Patients and families also may need to deal with additional issues such as possible driving restrictions, role reversal and change in occupation. The grief response varies. Be attuned to the specific needs of the patient and family members and teach them accordingly while providing appropriate emotional support.

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**CASE STUDY**

**Myocardial infarction**

**Patient profile**
Darrell Masters, a 51-year-old, successful business executive, is rushed to the hospital by ambulance after experiencing crushing substernal chest pain that radiates down his left arm. He also complains of dizziness and nausea.

**Objective data**

**Physical examination**
- Diaphoretic; short of breath, nauseous
- BP 165/100 mmHg, pulse rate 120/min, respiratory rate 26/min

**Diagnostic studies**
- 12-lead ECG shows sinus tachycardia with ST elevation in leads II, III, aVF, V5, V6 with occasional premature ventricular contractions
- Cardiac-specific troponin I level elevated
- Cholesterol 9.1 mmol/L
- HbA1c 0.09
- Infero-lateral wall MI

**Multidisciplinary care**

**Emergency department**
- Oxygen 6 L/min via Hudson mask, titrate to keep O2 saturation above 93%
- Continuous ECG monitoring
- Given aspirin 325 mg (chewable)
- Clopidogrel 600 mg orally
- Weight-based heparin IV (unless PCI is available, then this is contraindicated)
- Glyceryl trinitrate IV, titrate to relieve chest pain; don’t give if systolic BP below 100 mmHg
- Morphine 2 to 4 mg IV every 5 minutes, PRN for chest pain unrelieved by glyceryl trinitrate
- Vital signs, pulse oximetry every 10 minutes or more frequently if unstable
- Preparation of patient for transfer to cardiac catheterisation laboratory for possible PCI

**Clinical reasoning**
1. Which coronary artery(ies) is (are) most likely occluded in Darrell Masters’ coronary circulation?
2. Explain the pathogenesis of CAD. What risk factors contribute to its development? What risk factors were present in Darrell Masters’ life?
3. What is angina? How does chronic stable angina differ from angina associated with acute coronary syndrome?
4. Explain the pathophysiological basis for the signs and symptoms that Darrell Masters exhibited.
5. Explain the significance of the results of the laboratory tests and the 12-lead ECG findings.
6. Provide a rationale for each treatment measure ordered for Darrell Masters.
7. **Priority decision:** Based on the assessment data presented, what are the priority care problems? Identify any other care problems.
8. **Priority decision:** What are the priority nursing interventions for Darrell Masters immediately after his MI? Immediately after his PCI?
9. **Delegation decision:** Identify activities that can be delegated to a patient care assistant.
10. **Evidence-based practice:** Two days after an uncomplicated PCI and the placement of two stents, Darrell Masters wants to know what the most effective strategies are to prevent another MI. Based on his clinical situation, what would you tell him?


**REVIEW QUESTIONS**

1. In teaching a patient about coronary artery disease, the nurse explains that the changes that occur in this disorder include which of the following (select all that apply)?
   a. diffuse involvement of plaque formation in coronary veins.
   b. abnormal levels of cholesterol, especially low-density lipoproteins.
   c. accumulation of lipid and fibrous tissue within the coronary arteries.
   d. development of angina due to a decreased blood supply to the heart muscle.
   e. chronic vasoconstriction of coronary arteries leading to permanent vasospasm.

2. After teaching ways to decrease risk factors for CAD, the nurse recognises that additional instruction is needed when the patient says,
   a. ‘I would like to add weight lifting to my exercise program.’
   b. ‘I can only keep my blood pressure normal with medication.’
   c. ‘I can change my diet to decrease my intake of saturated fats.’
   d. ‘I will change my lifestyle to reduce activities that increase my stress.’

3. A hospitalised patient with a history of chronic stable angina tells the nurse that she is having chest pain. The nurse bases his actions on the knowledge that ischaemia
   a. will always progress to myocardial infarction.
   b. will be relieved by rest, glyceryl trinitrate, or both.
   c. indicates that irreversible myocardial damage is occurring.
   d. is frequently associated with vomiting and extreme fatigue.

4. The nurse is caring for a patient who is 2 days post-MI. The patient reports that she is experiencing chest pain. She states, ‘It hurts when I take a deep breath.’ Which of the following actions would be a priority?
   a. Notify the doctor immediately and obtain a 12-lead ECG.
   b. Obtain vital signs and auscultate for a pericardial friction rub.
   c. Apply high-flow oxygen by face mask and auscultate breath sounds.
   d. Medicate the patient with PRN analgesic and re-evaluate in 30 minutes.

5. A patient is admitted to the ICU with a diagnosis of unstable angina. Which of the following medications would the nurse expect the patient to receive (select all that apply)?
   a. ACE inhibitor
   b. antiplatelet therapy.
   c. thrombolytic therapy.
   d. prophylactic antibiotics
   e. intravenous glyceryl trinitrate

6. A patient is recovering from an uncomplicated MI. Which rehabilitation guideline is a priority to include in the teaching plan?
   a. Refrain from sexual activity for a minimum of 3 weeks.
   b. Plan a diet program that aims for a 0.5 kg to 1 kg weight loss per week.
   c. Begin an exercise program that aims for at least five 30-minute sessions per week.
   d. Consider the use of erectile agents and prophylactic GTN before engaging in sexual activity.

7. The most common finding in individuals at risk for sudden cardiac death is
   a. aortic valve disease.
   b. mitral valve disease.
   c. left ventricular dysfunction.
   d. atherosclerotic heart disease.

Answers to the questions are found in Appendix C. For rationales to these answers, visit [http://evolve.elsevier.com/AU/Brown/med surg](http://evolve.elsevier.com/AU/Brown/med surg).

**REFERENCES**


43. Exner DV. Implantable cardioverter defibrillator therapy for patients with less severe left ventricular dysfunction. Curr Opin Cardiol 2009;24:61.

RESOURCES

Australasian Cardiovascular Nursing College
www.acnc.net.au

Australian Cardiovascular Health and Rehabilitation Association
www.acra.net.au

Cardiac Society of Australia and New Zealand
www.csanz.edu.au

Heart Foundation (Australia)
www.heartfoundation.org.au

Heart Foundation (New Zealand)
www.heartfoundation.org.nz

World Heart Federation
www.world-heart-federation.org

See the Evolve site for more great resources at http://evolve.elsevier.com/AU/Brown/medsurg/