

Cardiac Services

Module overview

Please note: This module must be read in conjunction with the Fundamentals of the Framework (including the glossary and acronym list).

Cardiac services are a specialised area of medicine involved in the diagnosis, management and treatment of complications of patients with a wide range of cardiac and/or coronary artery disease—hereafter referred to collectively as cardiac disease.

The management of patients with cardiac disease encompasses the full continuum of care from treatment of early symptoms and risk factors through to the diagnosis and management of chronic disease. It requires high-level and prompt management of acute and critical symptoms to minimise mortality and maximise individual long-term health. Highly specialised management of complex issues necessitates subspecialty expertise to ensure that patients receive the highest quality healthcare service.

The cardiovascular continuum of care and management is complex and requires a high degree of specialisation. This continuum includes prevention, screening, diagnosis, acute or ongoing medical care, surgery, rehabilitation and palliative care. As a result, evidence-based care is delivered in a range of settings by a diverse range of health professionals and requires documented processes among providers—including those in the community—across secondary care and among multidisciplinary groups.

The range of settings for the delivery of cardiac services includes public or private hospitals, stand-alone facilities, community healthcare settings and the patient's home. Increasing degrees of patient complexity, acuity and critical illness impact on staffing and service requirements, resulting in complex service delivery implications for facilities.

Children have specific needs in health services—please refer to the relevant children's services modules.

This module outlines four levels of complexity for cardiac service provision: Levels 3 to 6. It is accepted that emergency presentations may occur at any facility, requiring temporary management of the patient. In a lower level facility, such care and stabilisation should occur in consultation with a higher level service prior to timely transfer. The focus of this module is on specialised cardiac services, including care provided by public and private health facilities.

The Cardiac Services module contains five sections and an appendix (Cardiac Outreach Services), which should be read collectively, and include:

- Section 1: Cardiac Medicine Services (Levels 3 to 6)
- Section 2: Cardiac (Coronary) Care Unit Services (Levels 4 to 6)
- Section 3: Cardiac Diagnostic and Interventional Services (Levels 3 to 6)
- Section 4: Cardiac Surgery Services (Level 6)
- Section 5: Cardiac Rehabilitation Services (Levels 4 to 6, including Ongoing Prevention and Maintenance Services).

Across the sections, it is a general expectation that Level 3 services have access to a registered medical specialist with credentials in internal medicine, have provision for electrocardiography and may provide exercise stress testing. As the levels develop increasing sophistication, it is expected that Level 4 services provide echocardiography, exercise stress testing and a cardiac care unit, along with a registered medical specialist with credentials in internal medicine and/or a registered medical specialist with credentials in

cardiology. Level 4 services may provide transoesophageal echocardiography (TOE) and cardiac catheterisation, while these services, as well as percutaneous coronary intervention, are expected to be provided at Level 5 and 6 services, along with the development of electrophysiology services. A registered medical specialist with credentials in cardiology is also required at a Level 5 service, along with an on-call echocardiography and catheter lab service. As Level 6 typically provides superspecialty services, cardiac surgery services are provided at this level.

Section 1: Cardiac medicine services

Cardiac medicine provides an array of preventative, screening, diagnostic, treatment and rehabilitative services across general and specialised cardiac medical problems. Services may also provide a close observation area for patients with more complex conditions.

Section 2: Cardiac (coronary) care unit services

Cardiac (coronary) care units (hereafter referred to as cardiac care units) are specialised areas providing intensive care for emergency and acute cardiac illness at a high level of expertise. Cardiac care units receive patients from a variety of sources, including directly from the community, via ambulance services and emergency departments, and as internal and external referrals and transfers. Cardiac care units have advanced monitoring and diagnostic equipment, and access to a variety of multidisciplinary healthcare professionals to ensure provision of the full range of appropriate clinical and associated care.

Section 3: Cardiac diagnostic and interventional services

Cardiac diagnostic and interventional services include the full range of cardiac diagnostic and interventional services. Cardiac diagnostic services vary from exercise stress testing, Holter monitoring and transthoracic echocardiography to radioisotope stress testing, magnetic resonance imaging and positron emission tomography. These non-invasive means of diagnosing a patient's possible cardiac condition are further supported by invasive methods of investigation, including cardiac catheterisation (also known as cardiac angiography) and electrophysiology studies. Highly invasive methods of investigation require teams of specialised medical, nursing and allied health staff, often with specific training and dedicated equipment.

Cardiac catheterisation, electrophysiology or multipurpose laboratories are specialised clinical areas providing advanced monitoring, mapping, radiological, and diagnostic and interventional equipment to support the range of procedures for routine and emergency cardiac care. All cardiac catheterisation, electrophysiology or multipurpose laboratories must have the capacity to provide resuscitation, the stabilisation of emergencies, and access to a variety of multidisciplinary healthcare professionals to ensure the provision of the full range of appropriate clinical and associated care. Patients requiring these services come from a variety of sources, including directly from the community via ambulance services and emergency departments, and as internal and external referrals and transfers.

Section 4: Cardiac surgery services

Cardiac surgical services act as referral services for cardiac surgical patients and are capable of providing a range of cardiac surgical services with the associated comprehensive cardiac care services, including perioperative and post-operative care, and multisystem life support.

Section 5: Cardiac rehabilitation services, and ongoing prevention and maintenance services

Cardiac rehabilitation services, both inpatient and outpatient, encompass all measures used to help people with cardiovascular disease return to an active and satisfying life, and to prevent future cardiac events. Cardiac rehabilitation should be tailored to meet the information, education, support and cultural needs of patients and their families, and align with best practice, such as the National Heart Foundation's 2004 framework.¹

The provision of cardiac rehabilitation services includes a number of elements: physical activity, health education, counselling, behaviour modification strategies and support for self-management. These should be routinely integrated into the management of all patients. All eligible patients should be offered inpatient cardiac rehabilitation, unless there are clinical contraindications. Not all elements of a rehabilitation program may be utilised for every cardiac patient during the inpatient period. However, individuals may access cardiac rehabilitation services at varying stages. Routine referrals to outpatient cardiac rehabilitation programs are increasingly important as part of the cardiovascular health continuum.

Ongoing prevention and maintenance services involve longer term services and/or programs aimed at helping people with cardiovascular disease maintain an active and satisfying life, and decreasing the risk of future cardiovascular events.

Services not within the scope of the Cardiac Services module include:

- primary prevention of cardiac disease
- screening, detection and management of early coronary artery and cardiac disease by primary healthcare providers
- cardiac services for children, which are addressed separately in the Children's Services modules.

Service networks

In addition to what is outlined in the Fundamentals of the Framework, specific service network requirements may include access to:

- chronic disease programs
- Heart Support Australia
- Heartline, the COACH Program and 13HEALTH
- the National Heart Foundation
- the Queensland Cardiovascular Health and Rehabilitation Association.

Where cardiac services (e.g. outpatient cardiac rehabilitation services) are outsourced to private organisations, service agreements will be required to ensure alignment with the Framework.

Section 1

Level 3 Cardiac Medicine Service

Service description

A Level 3 service provides an ambulatory and inpatient service that may require a subspecialty outpatient referral. This level of service assesses and stabilises patients, and initiates care, prior to transfer for specialist assessment and treatment where appropriate. Patients who require complex diagnostic investigation will also be referred to higher level cardiac medicine services.

A Level 3 service may be colocated within a general ward or general clinical area, and may have an acute or observation area or access to high-acuity care/beds. The service is predominantly delivered by a registered medical practitioner and registered nurses with visiting, day-only, registered medical specialist consultation services.

Service requirements

As per module overview, plus:

- performs and interprets non-invasive monitoring and 12-lead electrocardiogram (ECG)
- stabilisation of the patient where required prior to transfer to a higher level service
- agreed clinical pathways and/or care guideline protocols used, including use of referral pathways to allied health professionals who may be hospital- or community-based (including cardiac rehabilitation)
- a minimum data set of patient information recorded that aligns with facility protocols
- the provision of formal patient education regarding the patient's condition, lifestyle risk factors and medication management
- availability to an individual who is competent in providing advanced life support and undertakes refresher training annually on-site 24 hours
- cardiac medications, including thrombolytics, on-site 24 hours
- a defibrillator
- access—24 hours—to troponin and B-type natriuretic peptide testing
- access to specialised medical outreach services providing exercise stress testing, and echocardiography and cardiac consultations.

Workforce requirements

As per module overview, plus:

Medical

- a registered medical practitioner available 24 hours (access may be by telephone)
- access—24 hours—to a registered medical specialist with credentials in internal medicine
- all registered medical practitioners are competent in providing advanced life support and undertake refresher training annually

Nursing

- a nurse manager (however titled)
- access to a minimum of two nurses at all times; one being a registered nurse
- a senior registered nurse in charge on each shift with the ability to interpret a 12-lead ECG
- at least one registered nurse who is competent in providing advanced life support undertakes refresher training annually

Allied health

- access to allied health professionals, as required.

Support service requirements

A Level 3 service requires:

Service	On-site	Accessible
anaesthetic		3
cardiac (cardiac care unit)		4
intensive care		4
medical imaging	3	
medication	3	
pathology		2

Section 1

Level 4 Cardiac Medicine Service

Service description

A Level 4 service provides inpatient and outpatient care services to patients with a moderate level of complexity, delivered by a variety of health professionals, including medical, nursing and allied health. This level service may be collocated within a general medical unit with on-site access to an intensive care service and/or cardiac care unit, but does not have the level of service to care for critically ill cardiac medicine patients. Patients admitted to Level 4 cardiac medicine services are managed by a cardiologist or internal registered medical specialist with experience in cardiology. This level service has access to some specialised non-invasive diagnostic services, including exercise stress testing and echocardiography.

Service requirements

As per Level 3, plus:

- on-site cardiac care unit (refer to Section 2, Level 4 Cardiac Care Unit Service); if an on-site intensive care service is provided, the requirement for an on-site cardiac care unit will be met
- access to non-invasive monitoring
- non-invasive diagnostic procedures, including transthoracic echocardiography and exercise stress testing
- access to qualified staff to provide echocardiography and exercise stress testing
- access to related support services
- may have access to invasive diagnostic services (cardiac catheterisation).

Workforce requirements

As per Level 3, plus:

Medical

- either a registered medical specialist with credentials in cardiology or registered medical specialist with credentials in internal medicine and relevant experience in cardiology available 24 hours
- at least one registered medical practitioner available 24 hours

Nursing

- as per Level 3 service

Allied health

- access to qualified staff to provide echocardiography and exercise stress testing.

Support service requirements

A Level 4 service requires:

Service	On-site	Accessible
anaesthetic		4
cardiac (cardiac care unit)	4	
intensive care		4
medical imaging	3	
medication	4	
pathology		3

Section 1

Level 5 Cardiac Medicine Service

Service description

A Level 5 service manages all but the most highly complex cardiac medicine patients and procedures. At this level, there are designated cardiology beds providing comprehensive subspecialty services, with an advanced range of supporting clinical and diagnostic services to match the complexity of patients admitted and referred, including access to on-site intensive care services. All admitted patients are managed by a designated registered medical specialist with credentials in cardiology.

A Level 5 service may be a referral centre for lower level services.

Service requirements

As per Level 4, plus:

- patients individually managed by a designated registered medical specialist with credentials in cardiology, with support from a multidisciplinary team to enable the management of complex patients and multiple comorbidities
- on-site access—24 hours—to diagnostic and interventional services (cardiac catheterisation and/or multipurpose suite)
- designated cardiac medicine wards and on-site cardiac care unit (refer to Section 2, Level 5 Cardiac Care Unit Service)
- access to cardiac and general surgery (refer to Section 4, Level 6 Cardiac Surgery Service)
- access to endocrinology, gastroenterology, infectious diseases, neurology, rehabilitation, renal, urology and vascular services
- patients admitted to the cardiac medicine service referred to the designated registered medical specialist with credentials in cardiology for the management of care
- a documented audit and review of service-based activity, and outcomes and quality activities, including at least two targeted clinical audits, annually
- in addition to providing general cardiac medicine services, including to patients with heart failure and coronary heart disease, a subspecialty service may include, but is not limited to, providing services for adult congenital disease, valvular disease, pulmonary hypertension and genetics, and may provide obstetric cardiac services
- may act as a referral service for lower level services.

Workforce requirements

As per Level 4, plus:

Medical

- a designated registered medical specialist with cardiology credentials available 24 hours
- sufficient supporting registered medical specialists with credentials in cardiology to

provide sustainable 24-hour coverage

- a nominated cardiac medicine unit lead clinician with responsibility for clinical governance of the service

Nursing

- all nursing staff responsible for direct patient care are registered nurses, with enrolled nurses, student nurses and assistants in nursing in this environment under the supervision of a registered nurse in a supportive role
- all nursing staff with or working towards relevant competencies and/or formal education programs in cardiac nursing

Allied health

- an identified radiographer, cardiac scientist or echocardiographer, physiotherapist and pharmacist available 24 hours
- access to allied health professionals who may be hospital- or community-based

Other

- access to technical support staff (e.g. biomedical engineers and scientific officers), as required.

Support service requirements

A Level 5 service requires:

Service	On-site	Accessible
anaesthetic	5	
cardiac (cardiac care unit)	5	
intensive care	5	
medical imaging	4	
medication	5	
nuclear medicine	4	
pathology	4	
surgical		4

Section 1

Level 6 Cardiac Medicine Service

Service description

A Level 6 service provides the highest level of care for complex and critically ill cardiac patients in designated cardiology beds, with the full range of support services available on-site 24 hours a day, including diagnostic and interventional radiology (cardiac catheterisation and/or multipurpose suite) and access to cardiac surgery. This level service acts as a referral service for all lower level cardiac medicine services.

Service requirements

As per Level 5, plus:

- on-site 24 hours Level 5 cardiac care unit (refer to Section 2 of this module, Cardiac Care Unit Services)
- a Level 5 diagnostic and interventional service (refer to Section 3 of this module, Cardiac Diagnostic and Interventional Services)
- on-site cardiac surgical service (refer to Section 4 of this module, Cardiac Surgery Services).

Workforce requirements

As per Level 5 service.

Support service requirements

A Level 6 service requires:

Service	On-site	Accessible
anaesthetic	6	
cardiac (cardiac care unit)	5	
cardiac (cardiac diagnostic and interventional)	5	
cardiac (cardiac surgery)		6
intensive care	6	
medical imaging	4	
medication	5	
nuclear medicine	4	
pathology	4	
surgical	6	

Section 2

Level 4 Cardiac Care Unit Service

Service description

A Level 4 service may be collocated within an intensive care service or may be a stand-alone unit. This level service is capable of providing a high standard of general cardiac care, but does not have the level of service to care for critically ill cardiac patients, for example, patients requiring advanced haemodynamic support. A Level 4 cardiac care unit is managed by a registered medical specialist with credentials in cardiology or internal medicine and experience in cardiology. A Level 4 cardiac care unit has on-site non-invasive diagnostic procedures, including exercise stress testing and echocardiography, and access to diagnostic cardiac catheterisation, for low-complexity patients.

Service requirements

As per module overview, plus:

- access to diagnostic cardiac angiography for low-complexity adult patients
- on-site non-invasive diagnostic procedures, including transthoracic echocardiography and exercise stress testing
- the capacity to insert a temporary pacing wire
- access—24 hours—to troponin testing
- cardiac medications, including thrombolytics, on-site 24 hours
- all patients admitted to the unit under the care of a registered medical specialist with credentials in cardiology or internal medicine and experience in cardiology
- where patient throughput is less than recommended by the relevant standards, thereby threatening ongoing competence, episodes of practice at a higher level service may be required.

Workforce requirements

As per module overview, plus:

Medical

- a registered medical specialist with credentials in either cardiology or internal medicine and relevant experience in cardiology available 24 hours
- all medical staff are competent in providing advanced life support

Nursing

- a nurse manager (however titled)
- access to a minimum of two nurses at all times, one being a registered nurse
- a senior registered nurse in charge on each shift with the ability to interpret 12-lead ECG and administer thrombolysis
- at least one registered nurse who is competent in providing advanced life support rostered in the cardiac care unit 24 hours

Allied health

- access to allied health professionals, as required

Other

- access to technical support staff (e.g. technical, biomedical and radiation safety specialists), as required.

Support service requirements

A Level 4 service requires:

Service	On-site	Accessible
anaesthetic		4
intensive care		4
medical imaging	4	
medication	4	
pathology		3

Section 2

Level 5 Cardiac Care Unit Service

Service description

A Level 5 service provides comprehensive cardiac care to critically ill and complex cardiac patients. This level service has access—24 hours—to on-site diagnostic and interventional services (cardiac catheterisation and/or multipurpose suite), and undertakes percutaneous coronary intervention on all but the highest complexity patients. A Level 5 service may be a referral centre for lower level services.

Service requirements

As per Level 4, plus:

- on-site access to diagnostic and interventional services (cardiac catheterisation)
- identified pharmacist, physiotherapist and cardiac scientist available 24 hours
- on-site access—24 hours—to surgical and medical services
- the capacity to provide invasive monitoring and intra-aortic balloon pump management
- access to cardiac surgery via documented processes in place with the nearest public or suitably licensed private health facility performing cardiac surgery; this affiliation must include an agreed plan for emergency patient transfer to a higher level service for emergency cardiac surgery and must be reviewed by both parties at least annually
- patients advised in advance of the potential risk of delayed surgical intervention for a complication arising from the catheterisation procedure due to the requirement for emergency transfer of the patient to the affiliated health facility for cardiac surgery
- evidence of comprehensive, ongoing medical, nursing, allied health and support service education programs, as appropriate, relevant to the specialised facilities of the unit
- a demonstrable and documented formal audit and review of cardiac care units and quality activities, including at least two targeted clinical audits, annually
- on-site access—24 hours—to general imaging services, including portable x-ray and computerised tomography (CT) with automatic film processing and/or picture archiving and communications system (PACS) and mobile image intensifier in designated units
- transthoracic echocardiography available on-site 24 hours
- on-site access—during business hours—to transoesophageal echocardiography
- access to cardiac viability assessment via nuclear medicine in addition to exercise stress testing
- access to electrophysiology services may be available.

Workforce requirements

As per Level 4, plus:

Medical

- a registered medical specialist with credentials in cardiology available to cover the cardiac care unit 24 hours
- sufficient supporting registered medical specialists with credentials in cardiology to provide sustainable coverage of the cardiac care unit
- sufficient supporting registered medical specialists with credentials in cardiology to provide sustainable 24-hour coverage

Nursing

- all nursing staff responsible for direct patient care are registered nurses, with enrolled nurses, student nurses and assistants in nursing in this environment under the supervision of a registered nurse in a supportive role
- all nursing staff with or working towards relevant competencies in cardiac care nursing

Allied health

- as per Level 4 service

Other

- as per Level 4 service.

Support service requirements

A Level 5 service requires:

Service	On-site	Accessible
anaesthetic	5	
intensive care	5	
medical	4	
medical imaging	4	
medication	5	
nuclear medicine	4	
pathology	4	
surgical	4	

Section 2

Level 6 Cardiac Care Unit Service

Service description

A Level 6 service provides the highest level of complex care for patients with serious cardiac conditions requiring continuous cardiac and haemodynamic monitoring. This level service also has on-site access to cardiac surgery. This service is staffed by specially trained medical and nursing staff, enabling close monitoring and early intervention. This service may be a referral service for all lower level coronary care services.

Service requirements

As per Level 5, plus:

- access to electrophysiology services in addition to a full range of diagnostic and interventional services (cardiac catheterisation and coronary intervention)
- on-site cardiac surgery allowing service provision to higher risk patients (refer to Section 4, Level 6 Cardiac Surgery Service).

Workforce requirements

As per Level 5 service.

Support service requirements

A Level 6 service requires:

Service	On-site	Accessible
anaesthetic	6	
intensive care	6	
medical	5	
medical imaging	5	
medication	5	
nuclear medicine	4	
pathology	4	
surgical	6	

Section 3

Level 3 Cardiac Diagnostic and Interventional Service

Service description

A Level 3 service provides an ambulatory and inpatient diagnostic service to low-risk patients. No interventional service, including cardiac catheterisation, is provided at this level. This level service has access to limited support services and may be collocated with other clinical areas. These non-invasive diagnostic services include exercise stress testing, Holter monitoring and transthoracic echocardiogram. A Level 3 service is able to assess, treat and stabilise the patient prior to timely transfer to higher level specialist services, where required. The service is delivered predominantly by a registered medical practitioner and registered nurses with visiting, day-only, registered medical specialist consultation services.

Service requirements

As per module overview, plus:

- access—24 hours—to a range of medical services (may be by telephone)
- on-site access—24 hours—to a clinician who is competent in providing advanced life support
- access—24 hours—to troponin testing
- on-site access—24 hours—to cardiac medications, including thrombolytic
- access to cardiac medicine and cardiac rehabilitation service (Section 1, Level 3 Cardiac Medicine Service and Section 5, Level 3 Cardiac Rehabilitation Service)
- the performance and interpretation of non-invasive monitoring and 12-lead ECG
- Holter monitoring and interpretation, or the facilities to transfer data for off-site interpretation
- the performance and interpretation of exercise stress testing
- may provide and interpret transthoracic echocardiography
- agreed clinical pathways and/or equivalent care guideline protocols, including the use of documented processes for referral to allied health professionals in acute and community settings.

Workforce requirements

As per module overview, plus:

Medical

- a registered medical practitioner available 24 hours (access may be by telephone)
- all registered medical practitioners supervising exercise stress testing are competent in providing advanced life support

Nursing

- a designated nurse manager (however titled)
- access to a minimum of two nurses at all times, one being a registered nurse

- a senior registered nurse or other appropriately trained health professional in charge on each shift with the ability to interpret 12-lead ECG
- all registered nursing staff supervising exercise stress testing are competent in providing advanced life support

Allied health

- allied health professionals, as required
- cardiac scientist or other appropriately trained health professional with the ability to interpret 12-lead ECG.

Support service requirements

A Level 3 service requires:

Service	On-site	Accessible
anaesthetic		3
cardiac (cardiac care unit)		4
medical	3	
medical imaging	3	
medication	4	
pathology		2

Section 3

Level 4 Cardiac Diagnostic and Interventional Service

Service description

A Level 4 service may be a stand-alone cardiac catheterisation, vascular or operating theatre unit with on-site access to an intensive care service and cardiac care unit, and may also provide transoesophageal echocardiograms. This cardiac service also provides invasive angiographic diagnostic services (cardiac catheterisation), but not percutaneous coronary intervention or diagnostic electrophysiology. They may also insert implantable cardioverter defibrillators, pacemakers and temporary pacing wires, which may be undertaken in cardiac laboratories, an operating theatre or a vascular angiography laboratory. The service must have the capacity to provide resuscitation and stabilisation of emergencies.

Service requirements

As per Level 3, plus:

- on-site transthoracic echocardiography
- patients under the care of a registered medical specialist with credentials in invasive cardiology
- patients have a follow-up in the 24 hours post-procedure
- patients with a new pacemaker insertion receive ongoing cardiac telemetry until pacemaker function is checked
- intra-aortic balloon pump available on-site
- documented processes with the nearest public or suitably licensed private health facility performing cardiac surgery, which must:
 - include a documented process for emergency patient transfer to a higher level service for emergency cardiac surgery
 - be reviewed by both parties at least annually
- patients advised in advance of the potential risk of delayed surgical intervention for a complication arising from the catheter procedure due to the requirement for emergency transfer to an affiliated health facility for cardiac surgery
- all clinical staff have knowledge of radiation and protection practices
- all staff have access to radiation safety documentation and attend radiation in-service annually
- ongoing training and competency to ensure radiation safety and safe femoral arterial and venous sheath removal
- access to post-procedure clinics or a post-procedure specialist review
- access to a cardiac medicine or cardiac care unit service at a minimum (refer to Section 1, Level 3 Cardiac Medicine Service or Section 2, Level 3 Cardiac Care Unit Service).

Workforce requirements

As per Level 3, plus:

Medical

- a minimum of two registered medical specialists with credentials in invasive cardiology
- all registered medical practitioners are competent in advanced life support

Nursing

- a senior registered nurse in charge on each shift is competent in advanced life support

Allied health

- a radiographer and echocardiographer or cardiac scientist with relevant qualifications and/or experience appropriate to the service being provided (e.g. device implantation) available 24 hours
- access to allied health professionals via a documented process (access may be by telephone)

Other

- access to technical support staff (e.g. technical, biomedical and radiation safety specialists), as required.

Support service requirements

A Level 4 service requires:

Service	On-site	Accessible
anaesthetic	4	
cardiac (cardiac care unit)	4	
cardiac (cardiac surgery)		6
intensive care	4	
medical	4	
medical imaging	4	
medication	4	
pathology		3
surgical	4	

Specific risk considerations

In addition to risk management outlined in the Fundamentals of the Framework, specific risk management requirements relevant to a Level 4 Cardiac Diagnostic and Interventional Service include the development of an interventional service from a diagnostic service. It should be recognised that, in the process of the development of an interventional service,

facilities may not have the case load to allow for the minimum recommended volumes to be attained in the first year.

Services must comply with the minimum patient throughput standards pursuant to section 12(2)(g) of the *Private Health Facilities Act 1999*. Where patient throughput is less than the relevant standard, threatening staff skill maintenance and ongoing competence, episodes of practice at a higher level service may be required.

In this setting, if the minimum case load cannot be achieved, a documented process with another cardiac catheter unit is required to ensure staff skill levels are maintained. Continued functioning of the service will be conditional on acceptable performance, as determined by formal and timely peer-review auditing of institutional and individual procedures.

It should be noted that a service must provide at least 12 months of cardiac diagnostic procedures and then at least 12 months of cardiac therapeutic procedures prior to performing emergency low-risk cases.

Section 3

Level 5 Cardiac Diagnostic and Interventional Service

Service description

A Level 5 service provides comprehensive diagnostic and interventional services to all patients except those at the highest level of complexity. This level service has on-site access—24 hours—to diagnostic and interventional services (cardiac catheterisation suite), and may have a designated electrophysiology or multipurpose laboratory. This level of service undertakes elective (and may provide emergency) percutaneous coronary intervention. This service may also provide electrophysiology services for adult patients.

A Level 5 service has access to inpatient cardiac care unit services providing invasive monitoring, intra-aortic balloon pump management and access to transoesophageal echocardiography, but does not have on-site cardiac surgical services.

Service requirements

As per Level 4, plus:

- a referral service for lower level units
- access to cardiac viability assessment
- on-site access—24 hours—to Level 5 cardiac care unit at a minimum (refer to Section 2 of this module, Level 5 Cardiac Care Unit Service)
- the capacity to provide invasive monitoring, and intra-aortic balloon pump insertion and management
- on-site transthoracic echocardiography available 24 hours
- on-site access—during business hours—to transoesophageal echocardiography
- on-site access—24 hours—to diagnostic and interventional services (cardiac catheterisation suite)
- may have a designated electrophysiology or multipurpose laboratory.

Workforce requirements

As per Level 4, plus:

Medical

- a registered medical specialist with credentials in invasive cardiology available 24 hours
- a registered medical specialist with credentials in electrophysiology procedures and/or pacing procedures available during business hours where electrophysiological procedures and/or pacing procedures are provided
- sufficient supporting registered medical specialists with credentials in interventional/invasive cardiology to provide a sustainable service 24 hours

Nursing

- adequate registered nursing staff with a minimum of three health professionals in the team with qualifications or experience in cardiac diagnostic and interventional procedures, as well as ongoing clinical competency relevant to the service being provided, including expertise in managing balloon pump insertion, immediately available 24 hours
- all nursing staff responsible for direct patient care are registered nurses, with enrolled nurses, student nurses and assistants in nursing in this environment under the supervision of a registered nurse in a supportive role
- two nurses for scrub/scout—at least one being a registered nurse who meets the Australian College of Operating Room Nurses' (ACORN) current standards for perioperative nursing for registered and enrolled nurses in Australia
- all registered nurses have either completed or are working towards competency in providing advanced life support
- nursing staff with or working towards relevant competencies and/or education programs appropriate to the specialist service provided

Allied health

- access—24 hours—to an identified pharmacist and physiotherapist
- a radiographer and an echocardiographer or cardiac scientist available
- where electrophysiology services are provided, access to a radiographer and cardiac scientist with knowledge of, and experience in, complex electrophysiology ablations

Other

- as per Level 4 service.

Support service requirements

A Level 5 service requires:

Service	On-site	Accessible
anaesthetic	5	
cardiac (cardiac care unit)	5	
cardiac (cardiac surgery)		6
intensive care	5	
medical	5	
medical imaging	4	
medication	4	
nuclear medicine	4	
pathology	4	
surgical	5	

Section 3

Level 6 Cardiac Diagnostic and Interventional Service

Service description

A Level 6 service provides diagnostic and interventional services for patients with the highest level of complexities, and provides on-site access—24 hours—to cardiac surgery to enable safe service provision for these patients. This level of service acts as a referral service for all lower level services. This service has an on-site cardiac catheterisation suite, and/or a designated electrophysiology and/or multipurpose laboratory. Elective and emergency percutaneous coronary intervention and electrophysiology services on adult patients may also be available.

Service requirements

As per level 5, plus:

- on-site access—24 hours—to cardiac surgery services (refer to Section 4, Level 6 Cardiac Surgery Service)
- on-site access—24 hours—to a cardiac care unit (refer to Section 2, Level 5 Cardiac Care Unit Service)
- access—during business hours—to electrophysiology services, including epicardial and chronic lead extraction requiring on-site cardiac surgery.

Workforce requirements

As per Level 5 service.

Support service requirements

A Level 6 service requires:

Service	On-site	Accessible
anaesthetic	5	
cardiac (cardiac surgery)	6	
intensive care	5	
medical	5	
medical imaging	5	
medication	5	
nuclear medicine	4	
pathology	4	
perioperative	5	
surgical	6	

Section 4

Level 6 Cardiac Surgery Service

Service description

A Level 6 service provides comprehensive surgical cardiac care, including complex multisystem life support, to critically ill patients, and on-site access—24 hours—to intra-aortic balloon pump insertion and management. Access to an on-site intensive care service to provide pre- and post-operative care for cardiac surgical patients, and access to on-site interventional cardiac services (refer to Section 3, Cardiac Diagnostic and Interventional Services), is also available.

Therapeutic and diagnostic procedures are performed at all levels of patient complexity, as cardiac surgery is available on-site and cardiopulmonary bypass can begin within 2 hours where necessary. There is access within the state to extracorporeal membrane oxygenation and/or ventricular assist devices.

Service requirements

As per module overview, plus:

- documented processes for referral to subspecialist services (e.g. ventricular assist devices, transplant and medical specialists)
- access—24 hours—to a perfusionist where extracorporeal membrane oxygenation services are provided
- documented processes for referral to allied health professionals who may be hospital- or community-based
- Royal Australasian College of Surgeons (RACS) accreditation if providing cardiac registrars' surgical training (see www.surgeons.org)
- access to cardiac rehabilitation (refer to Section 5, Cardiac Rehabilitation Services)
- access—24 hours—to relevant equipment to support intra-aortic balloon insertion, extracorporeal membrane oxygenation and ventricular assist devices.

Workforce requirements

As per module overview, plus:

Medical

- two registered medical specialists with credentials in cardiac surgery rostered/available to provide 24-hour cover for cardiac surgical services
- on-site registered medical practitioner available 24 hours (refer to Level 6 Intensive Care Service)
- a minimum of three registered medical specialists with credentials in cardiac surgery to provide a sustainable roster of availability
- a registered medical specialist with credentials in cardiac surgery available 24 hours for consultation and emergency procedures
- access—24 hours—to a registered medical specialist with credentials in cardiology
- all medical staff are competent in providing advanced life support

Nursing

- a nurse manager (however titled)
- all nursing staff responsible for direct patient care are registered nurses, with enrolled nurses, student nurses and assistants in nursing in this environment under the supervision of a registered nurse in a supportive role
- at least one registered nurse competent in providing advanced life support rostered on each separate clinical area at all times
- all nursing staff with or working towards relevant competencies and/or education programs in post-operative cardiac surgical nursing
- four categories of nursing staff—intensive care, anaesthetic, perioperative and surgical cardiac ward registered nurses (for further information on nursing workforce requirements, refer to the relevant Level 6 requirements in the relevant module)

Allied health

- access to allied health professionals (including a perfusionist, cardiac scientist, social worker, dietician/nutritionist and occupational therapist, who may be hospital- or community-based), as required

Other

- access to technical support staff (e.g. biomedical engineers and scientific officers), as required.

Support service requirements

A Level 6 service requires:

Service	On-site	Accessible
anaesthetic	6	
intensive care	6	
medical imaging	5	
medication	5	
pathology	5	
perioperative	6	
surgical	6	

Specific risk considerations

In addition to risk management outlined in the Fundamentals of the Framework and set out in the module overview, specific risk management requirements dictate that a Level 6 cardiac surgery service must also demonstrate processes for the formal audit and review of cardiac surgical services and quality activities, including:

- at least two targeted clinical audits annually
- compliance with facility, district and/or any external death review processes
- ideally, participation in the Queensland Audit of Surgical Mortality, facilitated by RACS.

Services must also comply with the minimum patient throughput standards pursuant to section 12(2)(g) of the *Private Health Facilities Act 1999*. Where patient throughput is less than the relevant standard, thereby threatening staff skill maintenance and ongoing competence, episodes of practice at a higher level service may be required.

Section 5

Level 4 Cardiac Rehabilitation Service—Inpatient

Service description

A Level 4 inpatient cardiac rehabilitation service, also known as phase 1 cardiac rehabilitation, encompasses all measures used to help people with heart disease return to an active and satisfying life, and prevent a recurrence of cardiac events. Inpatient cardiac rehabilitation should begin as soon as possible after admission to hospital. The core group of people eligible for cardiac rehabilitation are those who have had:

- myocardial infarction
- cardiovascular diagnostic and interventional procedures
- cardiac surgery
- stable or unstable angina
- stable heart failure
- other cardiovascular or coronary heart disease.

In the absence of clinical contraindications for participation in inpatient cardiac rehabilitation, all eligible clients should be routinely offered this service. All cardiac patients and their families require information, education and support based on their individual needs, aimed at identifying and reducing cardiac disease risk, appropriate to their cardiac diagnosis and/or intervention. Medical or formal assessment of the patient's level of risk should be performed and documented in the patient chart to enable the identification of eligibility and referral to an appropriate outpatient cardiac rehabilitation service.

Service requirements

As per module overview, plus:

- a structured education program delivered on a needs basis
- cardiovascular patient risk assessment and management plan (verbal and/or written)
- empowerment of the patient/client to adopt self-management strategies
- basic information on the condition and reassurance of common reactions (physiological)
- guidelines for return to work and/or driving, activities of daily living and home exercise
- a standardised education resource with risk-assessment capacity (e.g. *My Heart My Life* or equivalent and culturally sensitive resources)
- culturally appropriate advice (preferably a verbal explanation as well as written documentation), including return to work, activities of daily living and any driving restrictions
- documented processes for referral and/or access to allied health professionals, who may be hospital- or community-based
- documented processes for referral to an outpatient cardiac rehabilitation service or alternative, which subsequently contacts the client either in person prior to the client being discharged and/or within 2 weeks of discharge from the inpatient service via a follow-up telephone call and/or home visit and/or letter.

Workforce requirements

As per module overview, plus:

Medical

- access to a registered medical specialist with credentials in cardiac care medicine

Nursing

- access to a registered nurse

Allied health

- access to a variety of allied health professionals, as required
- access to an allied health professional with an exercise qualification (e.g. physiotherapist, physiologist, occupational therapist)

Other

- access to Aboriginal and Torres Strait Islander health workers, and community support/recreational workers.

Support service requirements

A Level 4 inpatient service requires:

Service	On-site	Accessible
medication	4	

Section 5

Level 5 Cardiac Rehabilitation Service—Inpatient

Service requirements

As per Level 4 inpatient service, plus:

- a structured education program facilitated by a multidisciplinary team delivered during set times and dates
- inpatient or timely access to allied health professionals, as required.

Workforce requirements

As per Level 4 inpatient service, plus:

Nursing

- a registered nurse with designated time for the provision of cardiac rehabilitation services

Allied health

- Aboriginal and Torres Strait Islander health workers, and community support workers/recreational workers.

Support service requirements

A Level 5 inpatient service requires:

Service	On-site	Accessible
medication	5	

Section 5

Level 6 Cardiac Rehabilitation Service—Inpatient

Service requirements

As per Level 5 inpatient service, plus:

- the provision of motivational interviewing by a trained healthcare professional.

Workforce requirements

As per Level 5 inpatient service, plus:

Medical

- liaison with a registered medical specialist with credentials in cardiac care medicine.

Support service requirements

A Level 6 inpatient service requires:

Service	On-site	Accessible
medication	5	

Section 5

Level 4 Cardiac Rehabilitation Service—Outpatient

Service description

A Level 4 outpatient service, also known as phase 2 cardiac rehabilitation, is a recognised focal point for the development of a life-long approach to the prevention of cardiovascular disease. Empowering the patient to adopt self-management strategies is a key objective. Indications for outpatient cardiac rehabilitation services include people who have experienced a recent cardiac event, known cardiovascular disease, and, increasingly, those at high risk of developing cardiovascular disease.

The core group of people eligible for outpatient cardiac rehabilitation are those who have:

- coronary heart disease (i.e. myocardial infarction, coronary artery bypass graft surgery, percutaneous transluminal coronary angioplasty and stable angina)
- had valvular surgery
- heart failure
- congenital heart disease
- heart and lung transplants
- a pacemaker or implanted automatic cardioverter defibrillator.

Referrals to outpatient cardiac rehabilitation come from a variety of sources, including registered medical practitioners, Aboriginal and Torres Strait Islander health workers, endorsed cardiac specialists, primary healthcare centres, community health centres, and inpatient or outpatient hospital clinics.

Outpatient cardiac rehabilitation may be provided in a range of settings, including hospitals, community health facilities, recreation centres and general medical practice, or a combination of these. Outpatient cardiac rehabilitation may also be provided on an individual basis in the patient's home, and may include a combination of home visits, telephone support, videoconferencing and telehealth, or specifically developed self-education materials.

A Level 4 outpatient cardiac rehabilitation service or equivalent secondary prevention program may be conducted by a single health professional with documented, annually reviewed emergency protocols where available, consistent with recommendations for a facility offering rehabilitation after cardiovascular disease (*ACRA Practitioner Guidelines for Cardiac Rehabilitation, 2008*).²

A Level 4 outpatient service includes:

- a structured program delivered on a needs basis
- documented entry and exit assessment
- a clinical pathway or equivalent
- education on risk factors and prevention strategies
- support to empower the patient/client to adopt self-management strategies
- an exercise component (not mandatory)
- a standardised education resource (e.g. *My Heart My Life* or equivalent) and other culturally sensitive resources
- follow-up processes/referrals by telephone, by mail or in person.

Service requirements

As per module overview, plus:

- documented emergency management protocols (reviewed annually)
- access to oxygen and resuscitation equipment (bag and mask at a minimum) and, if providing an outpatient cardiac rehabilitation service that involves an exercise component, a minimum of a semi-automatic external defibrillator within the facility
- access to monitoring equipment (blood pressure and blood glucose).

Workforce requirements

As per module overview, plus:

Medical

- access to a registered medical practitioner who has access, via documented processes, to a registered medical specialist with credentials in cardiac care/rehabilitation medicine to provide advice and guidance, as required

Cardiac Rehabilitation Coordinator

- a trained health professional with a degree, diploma or certificate of registration in medicine, nursing, physiotherapy, occupational therapy, exercise physiology, psychology, social work, pharmacy or nutrition, and additional training and/or work experience in cardiac rehabilitation, adult education principles and physical activity programs
- in some instances, only one trained health professional where there is access to medical guidance and the availability of referral for medical opinion

Allied health

- access and documented processes for referral to a variety of allied health professionals, as required

Other

- Aboriginal and Torres Strait Islander health workers, and community support/recreational workers (if the service is predominantly for Aboriginal and Torres Strait Islander peoples).

Section 5

Level 5 Cardiac Rehabilitation Service—Outpatient

Service description

A Level 5 outpatient service or equivalent secondary prevention program is conducted by a multidisciplinary team of health professionals in accordance with recommendations for the facility. Programs are designed to empower the patient/client to adopt self-management strategies.

A Level 5 outpatient service is as for a Level 4 service, but must also include:

- a structured education and exercise program facilitated by a multidisciplinary team and delivered per group during set times and dates
- access to exercise equipment
- formalised, individualised and comprehensive assessment covering physical, psychological and social parameters
- a discharge letter to the registered medical practitioner or endorsed specialist, as nominated.

Service requirements

As per Level 4 outpatient service, plus:

- must have a staff:patient ratio during exercise sessions of:
 - one health professional if fewer than 10 participants or low-intensity exercise
 - two health professionals if more than 10 participants or moderate-intensity exercise (National Heart Foundation's 2004 framework)¹.

Workforce requirements

As per Level 4 outpatient service.

Section 5

Level 6 Cardiac Rehabilitation Service—Outpatient

Service description

A Level 6 outpatient service is as per a Level 5 service, with the additional provision of psychosocial counselling, cognitive behavioural therapy, motivational interviewing, psychology or social work services.

Workforce requirements

As per Level 5 outpatient service.

Section 5

Cardiac Rehabilitation—Ongoing Prevention and Maintenance Services

Service description

Ongoing maintenance of behaviour change beyond the period of time of ambulatory and/or inpatient rehabilitation is critical for long-term health benefits. Services or programs offered within this period have an emphasis on supporting behaviours and decreasing the risk of future cardiovascular events. Where programs are provided, both the needs of the patient and resources available will determine the type of program or service provided.

Service requirements

As per module overview and outpatient cardiac rehabilitation programs, plus:

- follow-up processes/referrals by telephone, by mail or in person, as required
- may include ongoing assessment and management of the individual's goals
- may include the involvement of a registered medical practitioner as an integral part of an ongoing management plan
- may include access to exercise equipment.

Workforce requirements

As per module overview, plus:

- a designated health professional with credentials in, and knowledge of, cardiac rehabilitation or health behaviour/physical activity
- Aboriginal and Torres Strait Islander health workers, and community support workers, with services delivered either from a community-controlled Aboriginal and Torres Strait Islander health service or, if the service is predominantly for Aboriginal and Torres Strait Islander peoples, from within an Aboriginal and Torres Strait Islander community.

Appendix 1

Cardiac Outreach Services

Cardiac outreach services were established to help improve health outcomes for rural Australians by increasing access to medical specialist services in metropolitan, regional, rural and remote communities. Visiting specialist services in geographical areas of identified need assist in addressing the burden that cardiac disease places on people in rural and remote communities.

Cardiac outreach services will generally be provided on a day-only/consultation basis by a higher level service where local services are unavailable. Outreach services provide a range of timely, safe and efficient services to patients who would otherwise have to travel to metropolitan or major health centres, often at significant personal cost and/or hardship. Outreach services are characterised by a multidisciplinary-care approach involving the visiting medical personnel, local doctors, midwives, and Aboriginal and Torres Strait Islander health workers. Cardiac outreach services also:

- facilitate visiting specialist and local health professional relationships, and communication about ongoing patient care
- increase and maintain the skills of regional, rural and remote health professionals in accordance with local need
- increase visiting specialist services in areas of identified need.

Cardiac outreach services must be safe and provided within the capability of the host service, which may be temporarily upgraded due to the extra personnel, equipment and support services being provided by the outreach service. When providing cardiac outreach services, the following should be considered:

- planning for outreach services must be realistic (e.g. it needs to be recognised that some patient referral to a larger or higher level service will be necessary)
- there must be appropriate patient assessment and referral from local healthcare providers
- services should be designed to meet a local priority and deemed necessary for the local population, as they cannot reasonably be provided by existing medical staff
- clinical support structures and processes must be in place at the local level, and these services must be staffed and resourced
- services must be planned and coordinated
- services should build on the local services and contribute to the local capacity, with sustainability being paramount
- the provision of specialist cardiac services to an outreach location must take into consideration the after-care available and level of workforce skill provided on a routine basis
- procedures and treatments should only be undertaken when on-site personnel, equipment and facilities are adequate for the purpose
- consultative services provided at the outreach location by a health professional will be of a higher level than the service capability of the local service
- services are usually provided on a day-only, outpatient basis
- all registered medical practitioners providing cardiac outreach services must have appropriate credentials in the procedures or treatments offered
- on-site equipment and facilities must be adequate for the diagnostic procedure

- the cardiac outreach consultation must have documented protocols and processes between the outreach service and the local facility, which should be reviewed annually
- adequate processes for the communication of consultation outcome, diagnoses and results, and ongoing patient management must be in place.

Telehealth services may be offered as an alternative. These are defined as any health delivery service where healthcare and health-related activities are provided at a distance, usually with the aid of telecommunications technology. Telemedicine is a subterm of telehealth that relates specifically to medical practice, as opposed to other areas of healthcare, by removing physical and social distances between health professionals and their patients. The term telehealth is used throughout this document to encompass the full multidisciplinary range of services that may be provided. Telehealth is an extension of the way patients and nurses, doctors and other specialists may communicate. Telehealth has enabled:

- better access to specialist services for rural and remote communities, enabling patients to receive follow-up care and other specialist services closer to home
- the provision of coordinated, timely patient care for more remote clients
- participation in education and training sessions, and case conferences, peer support sessions and meetings, without the need to leave critical clinical and administrative areas for long periods of time
- a reduction in cost, time and travel burdens to patients and healthcare professionals.³

Legislation, regulations and legislative standards

Refer to the Fundamentals of the Framework for details.

Non-legislative standards, guidelines, benchmarks, policies and frameworks – Cardiac Medical Services

In addition to what is outlined in the Fundamentals of the Framework, the following are relevant to cardiac medical services:

- Australasian Society for Ultrasound in Medicine. Policies and Statements B1. Policy on Diagnostic Ultrasound Services. ASUM; 1999.
www.asum.com.au/site/files/P&S/B1_policy.pdf
- Queensland Government. HQCC Standards Version 1.1: Management of Acute Myocardial Infarction On and Following Discharge. Health Quality and Complaints Commission; nd.
[www.hqcc.qld.gov.au/_uploads/255959302856Management_of_AMI_on_and_following_discharge\[1\].pdf](http://www.hqcc.qld.gov.au/_uploads/255959302856Management_of_AMI_on_and_following_discharge[1].pdf)
- Queensland Government. Selected Specialist Services Direction Statement 2001-2010 (includes solid organ transplant services and organ donation services). Queensland Health; 2001.
- Therapeutic Goods Administration. Regulatory guidelines and standards for medical devices. www.tga.gov.au/

Non-legislative standards, guidelines, benchmarks, policies and frameworks – Cardiac Diagnostic and Interventional Services

In addition to what is outlined in the Fundamentals of the Framework, the following are relevant to cardiac diagnostic and interventional services:

- Australasian Sonographer Accreditation Registry. Program Accreditation Guidelines. ASAR; 2007. www.asar.com.au/pdfs/PAG_June_2009.pdf
- Australian College of Operating Room Nurses. Standards for Perioperative Nursing for Registered and Enrolled Nurses in Australia. www.acorn.org.au/
- Cardiac Society of Australia and New Zealand. Guidelines for Ambulatory Electrocardiographic Monitoring. CSANZ; 2009. [www.csanz.edu.au/Portals/0/Guidelines/Procedures/Guidelines%20for%20Investigations%20and%20Procedures%20-%20Ambulatory%20ECG%20Monitoring%20\(2009\).pdf](http://www.csanz.edu.au/Portals/0/Guidelines/Procedures/Guidelines%20for%20Investigations%20and%20Procedures%20-%20Ambulatory%20ECG%20Monitoring%20(2009).pdf)
- Cardiac Society of Australia and New Zealand. Guidelines for Competency in Adult Diagnostic Cardiac Catheterisation and Coronary Angiography. CSANZ; 2008. www.csanz.edu.au/
- Cardiac Society of Australia and New Zealand. Guidelines for Competency in Percutaneous Coronary Intervention. CSANZ; 2008. www.csanz.edu.au/
- Cardiac Society of Australia and New Zealand. Guidelines for Training Requirements to Insert Implantable Defibrillators for Primary Prevention Indications. CSANZ; 2005. www.csanz.edu.au/
- Cardiac Society of Australia and New Zealand. Guidelines on Support Facilities for Coronary Angiography and Percutaneous Coronary Intervention including Guidelines on the Performance of Procedures in Rural Sites. CSANZ; 2008. www.csanz.edu.au/
- Cardiac Society of Australia and New Zealand. Recommended Guidelines for Subspecialty Training in Adult Cardiac Electrophysiology. CSANZ; 2007. www.csanz.edu.au/
- Cardiac Society of Australia and New Zealand. Recommended Guidelines for Subspecialty Training in Cardiac Implantable Electronic Devices: Selection, Implantation and Follow Up. CSANZ; 2005. www.csanz.edu.au/
- Cardiac Society of Australia and New Zealand. Training Guidelines in Adult Echocardiography. CSANZ; 2009. www.csanz.edu.au/

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1. Nation Heart Foundation of Australia and Australian Cardiac Rehabilitation Association. Recommended Framework for Cardiac Rehabilitation '04. National Heart Foundation, 2004. www.heartfoundation.org.au/SiteCollectionDocuments/cr%2004%20rec.pdf
2. Australian Cardiovascular Health & Rehabilitation Association (ACRA). Practitioner's Guide to Cardiac Rehabilitation. ACRA; 2008. www.acra.net.au/images/news/Section_1March_2008.pdf
3. Queensland Government: Begg S, Khor SL, Bright M, Stanley L, O'Brien J, Harper C. Differentials in the burden of disease and injury in Queensland, 2003. Queensland Burden of Disease and Injury Circular Series 1, no 5. Brisbane: Queensland Health; 2008. www.health.qld.gov.au/ph/documents/pdu/c5_differential_final.pdf