Introduction

Cardiovascular disease (CVD) refers to a variety of conditions affecting the circulatory system including hypertension, coronary heart disease, and stroke [1]. CVD has been identified as one of the most serious conditions that will affect the Australian population in the next two decades. It kills more Australians every year than any other health condition and is responsible for enormous health care costs [2]. Of added concern is the increasing rate at which the Australian population is ageing (increasing age is a risk factor for the development of CVD as well as other chronic conditions).

In 2004, CVD accounted for 36% of all Australian deaths [3]. The vast majority of CVD deaths were due to coronary heart disease (19% of female deaths and 18% of male deaths) and stroke (11% of female deaths and 7% of male deaths). CVD was also responsible for 7% of all hospitalisations [3, 4]. In terms of health care costs, CVD was responsible for 12% ($7.8 billion) of the total health expenditure in 2002, making it the most costly health condition [5]. Of the various cardiovascular conditions, coronary heart disease and high blood pressure incurred the greatest health expenditure.

Within the Australian population, certain population groups are at increased risk for developing and dying from cardiovascular conditions [1]. These groups include Indigenous Australians, people of lower socioeconomic status, males over the age of 45 years and males in rural and remote areas [6]. The level of CVD is most concerning in the Australian Indigenous population. A combination of low socioeconomic status, poor nutrition, and rural and remote dwelling contribute to increased levels of heart, stroke, and vascular disease in this population [2, 7].

More detailed information about cardiovascular health in Indigenous people can be found at:
http://www.healthinfonet.ecu.edu.au/heart_review
The cardiovascular system

Cardiovascular diseases affect the organs of the circulatory system. The circulatory system is situated in the chest in front of the respiratory system. It is made up of the heart, arteries, capillaries and veins. The heart is the control centre for the circulatory system, and is responsible for circulating blood throughout the body \[8\]. The heart receives deoxygenated blood (blood depleted of oxygen) from the veins and replaces it with oxygenated blood (blood rich with oxygen) it receives from the lungs and subsequently pumps out to the rest of the body.

The oxygenated blood is transported from the heart throughout the body via the arteries \[8\]. The arteries always carry blood away from the heart. The blood in the arteries (arterial blood) usually looks bright red because the haemoglobin (oxygen-carrying protein) in the red blood cells is full of oxygen.

The blood is supplied to the rest of the body through the capillaries \[8\]. The capillaries are tiny blood vessels that form a fine network throughout many parts of the body, and connect the smallest arteries (arterioles) and the smallest veins (venules). The walls of the capillaries are very permeable and allow for the exchange of fluids and gases (such as oxygen and carbon dioxide). They distribute oxygenated blood from the arteries to the tissues of the body and feed deoxygenated blood from the tissues back into the veins. The veins transport deoxygenated blood to the heart so that the oxygen levels can be replenished \[8\]. The blood in the veins usually looks dark red and occasionally purple because the haemoglobin in the red blood cells is depleted of oxygen.

Diseases affecting the normal structure and function of organs comprising the circulatory system, such as the heart and blood vessels, are termed cardiovascular diseases. Cardiovascular diseases are more likely to develop if an individual possesses one or more associated risk factors.

Risk factors for cardiovascular disease

The development of cardiovascular disease, like other chronic conditions, is strongly influenced by demographic, hereditary, behavioural and physiological circumstances, or risk factors \[9\]. Exposure or predisposition to these factors increases the risk of developing chronic conditions \[2\].

Demographic factors

- Age - increasing age (over 45 years) is a predisposing factor for CVD development
- Sex - men are more likely than women to develop CVD
- Social and economic circumstances - poor socioeconomic conditions are associated with a range of risk factors and increase the likelihood of developing CVD \[9, 2, 1\].

Hereditary factors

- Family history - hereditary predisposition to CVD increases the likelihood of development, especially if an immediate family member has the condition \[9, 2, 1\].

Behavioural risk factors

- Physical inactivity - insufficient or no physical activity (less than 30 minutes a day) increases the level of overweight and obesity and greatly increases the risk of CVD development
- Tobacco smoking - affects the functioning of the circulatory system because tobacco smoke toxins are introduced into the blood stream via the lungs
- Poor nutrition - increased dietary fat and decreased dietary fibre leads to increased weight gain, as well as the accumulation of cholesterol in the blood vessels \[9, 2, 1\].

Physiological risk factors

High blood pressure - increased intake of salt and alcohol, poor nutritional behaviour, inactivity, overweight, and tobacco smoking all contribute to the development of high blood pressure

High blood cholesterol - is related to a variety of nutritional and behavioural factors such as those for high blood pressure. Cholesterol refers to two types of liquid fat in the blood - high-density lipoprotein (HDL) is referred to as good cholesterol, but low-density lipoprotein (LDL) is a risk factor for CVD. Excessive LDL cholesterol in the blood leads to the development of fatty deposits on the insides of arteries and veins

Overweight and obesity - insufficient or lack of physical activity greatly increases the development of overweight and obesity

Diabetes - is characterised by high blood glucose levels and is a risk factor for CVD development, but is also caused by the development of CVD \[9, 2, 1\].

Possessing one or more of these risk factors places an individual at risk of developing cardiovascular disease as well as a number of
other chronic conditions, such as diabetes and renal disease [2]. While these risk factors have been grouped according to the source or type of risk, it is important to realise that they are not discrete, in many cases they are inter-related. For example, poor nutrition increases the risk of overweight and obesity, high blood pressure and cholesterol, and diabetes, as does decreased physical activity.

Conditions of the cardiovascular system

Cardiovascular diseases are those affecting the heart and/or associated blood vessels. Widely known cardiovascular conditions include coronary heart disease, heart failure, rheumatic heart disease, stroke, and peripheral vascular disease [10]. Except for rheumatic heart disease, the diseases are caused by a damaged blood supply to the heart, brain or limbs.

The World Health Organization (WHO) has classified diseases of the circulatory system in the International Classification of Diseases (ICD), a compilation of all known conditions according to the system of the body that is affected. In the ICD, diseases of the circulatory system are categorised according to whether they are blood vessel disorders, hypertensive diseases, heart disorders, blood/brain disorders, or rheumatic disorders [10]. In Australia, coronary heart disease and stroke are responsible for the majority of deaths and hospitalisations attributed to cardiovascular disease [2].

The various cardiovascular conditions are described below according to broad ICD categories. Atherosclerosis and hypertensive disease are discussed first. They are distinct ICD disease categories but also constitute risk factors for the development of other cardiovascular conditions such as coronary heart disease (CHD) and stroke. A discussion of these more serious and prevalent public health conditions will follow.

Atherosclerosis and other diseases of the blood vessels

This collective group of conditions affecting the arteries, arterioles and capillaries, are frequently risk factors for other cardiovascular conditions, such as coronary heart disease [11]. The three main conditions forming this category include atherosclerosis, aneurysms and thrombosis. These conditions usually contribute to the development of other cardiovascular conditions and, as in the case of atherosclerosis, to other chronic conditions such as diabetes [12].

Atherosclerosis plays a major part in the development of CVD. It is the collection of cholesterol and other fatty substances inside the arteries, eventually leading to the thickening and hardening of the artery walls [13]. In the process, blood flow (and hence oxygen supply) to the heart muscle is impeded [11, 7]. It is a significant contributor to the development of angina, heart attacks, CHD, and stroke.

The term aneurysm refers to a localised widening or dilation of an artery, vein or the heart [8]. It is characterised by a bulge at the site where the wall of the blood vessel is weakened and may eventually rupture. In blood vessels where the volume of blood flow is very high (such as the aorta) a ruptured aneurysm usually results in rapid death [1].

Thrombosis refers to the formation or presence of a blood clot (thrombus) in a blood vessel anywhere in the body [11]. When the clot is dislodged and travels through the bloodstream, it may lodge in another vessel, impairing the flow of blood. Risk factors for thrombosis include advanced age, cancer, genetic factors, immobilisation or inactivity, pelvic or leg trauma, pregnancy and surgery [1].

Hypertensive disease

Hypertensive cardiovascular diseases affect the blood and typically refer to abnormally high blood pressure. High blood pressure is defined as greater than or equal to 140/90 mm/Hg [2] (normal blood pressure is 120/80 mm/Hg but some fluctuation may occur) [14]. Hypertension refers to a state of repeatedly elevated blood pressure equal to or exceeding this measure.

Although hypertension is considered a risk factor for the development of other cardiovascular conditions, it is itself a cardiovascular condition [1]. Research has shown that hypertension is caused by a number of risk factors such as physical inactivity, high salt intake, overweight and obesity, and mental stress [2].

Hypertension is usually chronic, and although initially there may be no symptoms, over time dizziness, hot flashes, headache, fatigue, nosebleeds, and nervousness may occur [8]. However in more serious cases, complications can develop in target organs of the cardiovascular system (organs that are involved in circulating and filtering the blood) [15]. This can result in blood vessel changes in the retina of the eye (retinopathy), abnormal thickening of the heart muscle and arteries (atherosclerosis), kidney failure and brain damage (stroke) [14, 16, 12]. Hypertension is usually diagnosed through measurement of blood pressure [14, 17]. Health professionals recommend treatment with oral medications, regular
exercise, weight reduction in overweight people, diet monitoring, and salt restriction [1].

Coronary heart disease

Also known as ischaemic heart disease and sometimes referred to as coronary artery disease, coronary heart disease (CHD) includes those conditions directly affecting the blood vessels that supply oxygen-rich blood to the heart muscle [2]. These blood vessels start from the aorta, and are called the coronary arteries because they encircle the heart in the shape of a crown.

The development of CHD is usually associated with a number of risk factors. Preventable risk factors for CHD include tobacco smoking, high blood pressure, high blood cholesterol, overweight and obesity, diet and physical inactivity [9].

Generally, conditions classified under CHD are caused by the build-up of hard, fatty substances (usually cholesterol) in the coronary arteries, known as atherosclerosis [2]. Over time, this build-up can lead to complete blockage of these arteries, obstructing the natural flow of blood to the heart tissues.

Conditions within the CHD category include angina and myocardial infarction (heart attack) [18]. These conditions can be classified as either acute or chronic depending on severity and duration. Angina is chest pain that results from inadequate supply of oxygen to the heart muscle [1]. A heart attack refers to the sudden deficiency of circulating blood to the heart muscle [2]. This occurs when the arteries leading to the heart become clogged with cholesterol, stopping the normal flow of blood to the heart muscle [18]. If left untreated, this situation can lead to the death of some portions of heart muscle.

CHD can be diagnosed using a number of techniques but currently, the most common and effective technique is coronary angiography. In this technique, a contrast dye is injected into the arteries, so that the path of blood flow can be viewed on an x-ray [1].

CHD is usually treated with medications (such as aspirin to reduce the clotting action of red blood cells and beta blockers to relieve stress on the heart by reducing overall force and contraction) or surgery (such as bypass surgery, where new routes are created from existing veins or arteries to allow oxygen to travel to the heart muscle) [1].

Stroke

Also known as cerebrovascular disease, stroke refers to the condition of reduced blood flow to the brain due to a blocked or ruptured artery [11]. This impairment of blood flow to the brain results in reduced oxygen reaching the brain, and causes the sudden death of some brain cells. Depending on the region of the brain where this occurs, it may result in a loss of some sensory or motor function, causing long-term disability. It has been estimated that over 75% of stroke sufferers with a disability need assistance with self-care, communication, and mobility [2].

There are two types of stroke, ischaemic stroke and cerebral haemorrhage. Ischaemic stroke is the most common form of stroke and results when a blood or cholesterol clot (thrombosis) blocks the arteries to the brain [2]. This usually occurs in blood vessels that have been narrowed because of fatty build-up. If a clot breaks loose, it can travel through the blood vessels and lodge in an artery of the brain forming a blockage (embolism). This can block the flow of blood to the brain [19].

Cerebral haemorrhage refers to a weakening and widening of a blood vessel in the brain (aneurysm) which eventually leads to bleeding in the brain [2]. These haemorrhages can occur due to injury to the head or rupture of a blood vessel in the head. This can eventually lead to ischaemic stroke. Over 75% of people suffering from cerebral haemorrhage die within a month and those that survive are left with severe disabilities.

The results of a stroke depend on the area of the brain affected and the degree of damage [8]. Usual effects include weakness or an inability to move or feel sensation in a leg or arm. Sometimes speech problems, weak face muscles (causing drooling), numbness, and tingling can be experienced. Occasionally there may also be problems with balance, vision, swallowing and breathing. Some conditions may produce similar symptoms but should not be mistaken for a stroke; they include brain tumours, dehydration and mineral imbalances, or drug over-dosage.

Strokes can be diagnosed through medical history, physical examinations, x-rays, blood tests, and/or heart monitoring [11]. Treatment of stroke includes a process of medication (to minimise blood clotting and treat blood pressure), rehabilitation (to maximise a person’s functional abilities), and occasionally surgery (to clear blockages and relieve swelling) [1].

Rheumatic heart disease

Conditions resulting in heart damage due to rheumatic fever are classified as rheumatic heart diseases [20]. Rheumatic heart disease involves damage to the heart valves and heart muscle as a result of an attack of acute rheumatic fever (a complication resulting from a streptococcal throat infection) [21, 22].
Briefly, rheumatic fever is an illness that occurs due to bacterial infection commencing in the throat [11]. It is similar to scarlet fever and affects mainly children [23]. Symptoms include fever, pain in the joints, nausea, stomach cramps and vomiting, but it can also cause long-lasting effects in the skin, joints, heart, and brain [22].

Poor living conditions have been linked to low levels of hygiene and, in turn, high levels of infection [24]. People living in conditions where malnutrition is common and levels of skin, respiratory and gastrointestinal diseases are high, are at risk for developing rheumatic heart diseases [25]. Such conditions are associated with overcrowding, urbanisation and lack of access to medical services [26].

Like most health conditions, rheumatic heart diseases are usually classified as acute or chronic, depending on the duration of symptoms. Acute rheumatic heart diseases generally refer to brief, severe conditions affecting the heart and heart components.

Conditions under this category include:

- rheumatic myocarditis - caused by a viral infection that affects the function of the heart muscle
- rheumatic pericarditis - caused by infection, tissue disorders, metabolic disorders, trauma, heart failure and certain drugs. It is characterised by cysts and a loss of the pericardium which leads to a loss of proper circulation
- rheumatic endocarditis - caused by infection or growths on the endocardium [8].

Chronic rheumatic heart diseases generally refer to more prolonged conditions affecting the aorta and heart valves. Conditions in this category include:

- rheumatic mitral valve diseases (MVD) - caused by widening or degeneration of the mitral valve
- rheumatic aortic valve diseases (AVD) - caused by degeneration of the roots or valves in the aorta, aorta trauma, defects in the ventricles, or collapse of the aortic valves
- rheumatic tricuspid valve diseases (TVD) - caused by a combination of high blood pressure, obstruction of outflowing blood and widening of the heart ventricles [27].

**Other forms of heart disease**

Conditions affecting the heart muscle and heart function are classified in this broad category as they may be caused by a number of factors and can result in various cardiovascular and other chronic conditions [9]. These conditions include:

- Pericarditis - the inflammation of the lining around the heart (the pericardium)
- Endocarditis - the inflammation of the inner lining of the heart (the endocardium) and also the heart valves
- Myocarditis (sometimes called cardiomyopathy) - the inflammation of the heart muscle (myocardium). It is usually caused by viral infection of the heart muscle
- Cardiac arrest - the lack of adequate contraction of the left side of the heart, which immediately causes circulatory failure throughout the body, caused by a lack of coordinated contractions
- Cardiac arrhythmia - the loss of rhythm in heart contractions called fibrillation
- Heart failure - the inability of the heart to pump blood with normal efficiency resulting in a lack of blood flow to essential organs such as the brain [8, 11].

These conditions can be caused by infection, trauma, and occasionally lesions (as a result of infection) [1]. They usually result in chest pain, a lack of coordinated contractions, breathlessness, fatigue, loss of consciousness, shallow breathing or loss of breathing, and a reduced supply of oxygen to vital organs and lower extremities [9]. Occasionally, the cells in the heart muscle are completely destroyed resulting in a loss of normal heart muscle function.

**Prevention and management**

This sub-section will be expanded to include information on a range of prevention and management issues. Cardiac rehabilitation is the first topic to be developed. Topics to be added are: primary prevention; stroke rehabilitation ; and rheumatic heart disease prevention and rehabilitation

**Cardiac rehabilitation**

Cardiac rehabilitation describes all measures used to help individuals with heart disease and associated risk factors return to an active and satisfying life, while preventing the recurrence of cardiac events . As such, cardiac rehabilitation has also been referred to as a secondary prevention measure for cardiovascular disease [19].

Cardiac rehabilitation aims to:

- maximise physical, psychological, and social functioning to enable individuals with heart disease to experience a better quality of life
- introduce and encourage behaviours that may minimise the risk of cardiac conditions and events
• assist and shorten the length of recovery after an acute cardiac event
• promote strategies for achieving agreed goals of ongoing prevention
• develop and maintain skills for long-term self-management and behaviour change
• promote the use of health and community services in conjunction with prescribed medication and professional advice [19]

Ideally, cardiac rehabilitation services should be provided in collaboration with the person’s cardiac specialist or general practitioner (GP), who retain overall responsibility for the person’s management. Cardiac rehabilitation should include some form of physical activity, health education, counselling, support, and behaviour modification strategies tailored to meet the personal and cultural needs of the individual and their family [19].

Inpatient rehabilitation

Inpatient cardiac rehabilitation is delivered on an individual basis over 1-6 days and begins as soon as possible after admission to hospital [19]. It is recommended that every eligible inpatient receive access to individualised programs and, where possible, group education and discussion.

The main elements of inpatient rehabilitation are:
• basic information and reassurance
• supportive counselling
• mobilisation and resumption of daily living activities
• discharge planning
• referral to outpatient rehabilitation

Inpatient cardiac rehabilitation programs in Australia provide services for patients following heart attack, heart surgery, coronary angioplasty, and, in some cases, stable angina and chronic heart failure [2].

Outpatient rehabilitation

Structured outpatient cardiac rehabilitation is integral to the development of a life-long approach to prevention, and involves the services of ambulatory rehabilitation, and maintenance rehabilitation.

Ambulatory rehabilitation

Ambulatory rehabilitation programs are generally conducted during convalescence and begin within a few days after discharge from hospital and usually end within 2-3 months [19].

The main elements of outpatient rehabilitation are:
• assessment, review, and follow-up
• low or moderate intensity physical activity
• education, discussion, and counselling
• physical activity supervision, emergency procedures, and equipment
• exercise testing
• monitoring and evaluation
• specification for collection of cardiovascular data
• performance indicators for outpatient programs [19]

Formal rehabilitation programs vary widely in content, but are typically conducted by allied health professionals in a range of settings, and, where needed, provide individual psychological and social support for patients and family members.

Maintenance

Maintenance involves a lifetime of monitoring in which physical fitness and risk factor control are supported in a minimally supervised or unsupervised setting.

The main elements of ongoing prevention are:
• ongoing assessment and management
• providing examples of ongoing prevention activities

These programs are even more varied in content (and few have been evaluated), but may generally consist of: regular recall and review by doctors or nurses; additional medication; further education; social support; exercise classes; and behavioural intervention.
References


16. Office for Aboriginal and Torres Strait Islander Health (2001) Specialist eye health guidelines for use in Aboriginal and Torres Strait Islander populations. Canberra: Commonwealth Department of Health and Aged Care


The Australian Indigenous HealthInfoNet is an innovative Internet resource that contributes to ‘closing the gap’ in health between Indigenous and other Australians by informing practice and policy in Indigenous health.

Two concepts underpin the HealthInfoNet’s work. The first is evidence-informed decision-making, whereby practitioners and policy-makers have access to the best available research and other information. This concept is linked with that of translational research (TR), which involves making research and other information available in a form that has immediate, practical utility. Implementation of these two concepts involves synthesis, exchange and ethical application of knowledge through ongoing interaction with key stakeholders.

The HealthInfoNet’s work in TR at a population-health level, in which it is at the forefront internationally, addresses the knowledge needs of a wide range of potential users, including policy-makers, health service providers, program managers, clinicians, Indigenous health workers, and other health professionals. The HealthInfoNet also provides easy-to-read and summarised material for students and the general community.

The HealthInfoNet encourages and supports information-sharing among practitioners, policy-makers and others working to improve Indigenous health – its free on line yarning places enable people across the country to share information, knowledge and experience. The HealthInfoNet is funded mainly by the Australian Department of Health and Ageing. Its award-winning web resource (www.healthinfonet.ecu.edu.au) is free and available to everyone.