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Treatment and care

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Introduction

The treatment and care of patients with heart, stroke and vascular diseases is an important function of the health care system, and is one of the success stories of modern medicine. As the disease group that accounts for the highest disease burden (in terms of deaths and disability), this is not surprising. Heart, stroke and vascular diseases are estimated to have accounted for around 11% of all problems managed by general practitioners (GPs) in 2002–03. They were the principal diagnoses for 7% of all hospitalisations in 2001–02, an increase of around 16% in the last decade, and were the most expensive disease group in Australia in terms of health expenditure.

The potential for people with these diseases to benefit from interventions is substantial. For example, the WHO MONICA Study found that the advances and improvements in acute coronary care, accounted for nearly two-thirds of the decline in coronary heart disease death rates.

The treatment and care of people with heart, stroke and vascular diseases and associated risk factors is quite broad. It covers a number of settings and phases of care—prevention, general practice, specialist care, emergency care, acute care, rehabilitation and long-term care. These components of care are briefly outlined below, and some are covered in more detail in separate sections of this chapter. Specific details on health care expenditure, diagnostic and surgical procedures, and drug treatment, are also presented in this chapter.

Prevention

Prevention encompasses a wide range of interventions that aim to decrease the risk of the disease and occurrence of new cases, delay its onset or limit its progression. It may be undertaken at the population level (such as tobacco taxes to discourage smoking) or aimed at particular individuals (such as drug treatment for lowering high blood pressure). Prevention can occur through individuals acting on their own behalf, through government action, or through the initiative of doctors or others.

For those with established heart, stroke and vascular diseases, it is important to try to prevent the occurrence of further heart, stroke and vascular events such as heart attack or stroke. This subset of prevention is known as secondary prevention.

General practice

General practice care—or primary care—is often the first port of call for people with heart, stroke and vascular diseases or their associated risk factors. GPs have an important role in identifying and managing risk factors, and in detecting and treating disease. Continuity of care, including ongoing secondary prevention for people with chronic conditions, is often provided by GPs through their role of monitoring and coordinating patient care over the longer term.

In 2002–03, heart, stroke and vascular problems represented 11% of all problems managed. These encounters often involved prescription of medication, advice or counselling, referral to a specialist or ordering of a pathology test.

Specialist care

People with the more severe cases of heart, stroke and vascular diseases, including acute cases, are likely to receive care from a specialist medical practitioner at some stage. Of the approximately 19,000 registered medical specialists in 2001, 3.6% indicated cardiology, 0.6% cardiothoracic surgery and 1.5% neurology as their main specialty.

Emergency care

Treatment and care for emergency cases—such as a heart attack or stroke—is an important phase of care for these patients. It includes emergency care before reaching hospital (such as paramedic/ambulance care) and care in the emergency departments of hospitals. It is well established that prompt emergency care is associated with better outcomes. Currently, there are no national data on emergency care available to include in this report.



Acute care

Heart, stroke and vascular diseases are responsible for a large proportion of hospitalisations, many of which are for acute care. In 2001–02, 6.9% of hospitalisations involved a principal diagnosis of one of these diseases. When both principal and additional diagnoses were examined, heart, stroke and vascular diseases were involved in 9.8% of all hospitalisations. Hospital care for these patients often involves some care in a specialist unit. Coronary care units are well-established, having been introduced first in the 1960s. In 2001–02, there were around 120 coronary care and 31 cardiac surgery units in Australian public hospitals, and 26 coronary care and 23 cardiac surgery units in private hospitals.

A similar type of specialised unit—stroke units—has been demonstrated to be very effective for stroke care. These units provide organised, specialist stroke care in an inpatient setting. Use of stroke units is still developing in many OECD countries, including Australia.

Rehabilitation

Rehabilitation is multidisciplinary care aimed at enabling persons with disabilities to improve their functional capacity, to retrain in lost skills, and/or change their psychosocial adaptation. Although there has traditionally been a focus on physical medicine, rehabilitation is now acknowledging the patient's social context.

Rehabilitation begins in the acute hospital environment and, depending on each individual's needs, may continue in a specialised admitted patient rehabilitation unit, or be provided through hospital outpatient services, in the patient's home or at a community rehabilitation facility.

There are currently no comprehensive national data available on patients receiving rehabilitation care after a heart, stroke or vascular disease event.

Long-term care

Long-term or ongoing care is continuing supportive and after-care services provided to an individual with an impairment. It may be provided in an ambulatory or residential setting, and can include supportive, educational, or drug therapies. The role played by informal carers (such as family members, neighbours, friends and volunteers) in providing long-term care also needs to be recognised.

Palliative care

Palliative care occurs when a person's condition has progressed beyond the stage where curative treatment is effective and attainable or where the person chooses not to pursue curative treatment. It aims to provide relief from suffering and to enhance the quality of life.

Further reading

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General practice care

Key points

- In 2002–03 heart, stroke and vascular problems represented 11% of all problems managed in general practice. This excluded lipid disorders, overweight and obesity, smoking and diabetes, which were counted separately.
- GPs managed heart, stroke and vascular problems at a rate of 16 per 100 encounters. Extrapolated to the total number of GP encounters in Australia, this indicates that GPs managed heart, stroke and vascular problems on about 15 million occasions in that year.
- High blood pressure²⁴ was the most frequently managed problem in general practice in 2002–03, at 8.9 per 100 encounters, and accounted for over half of all heart, stroke and vascular problems.
- Between 1998–99 and 2002–03, the rate of management of heart, stroke and vascular problems in general practice remained steady. By contrast, there was a significant rise in the management of lipid disorders and diabetes over that period.

GPs tend to be the first port of call for a health problem and the coordinators of health care for most people. They provide services ranging from prevention of illness to treatment and rehabilitation. About 82% of the population visited a GP at least once in 2000.

Heart, stroke and vascular conditions constitute a significant proportion of the workload of GPs. This is not surprising given the high prevalence of these conditions and their risk factors. In 2002–03 heart, stroke and vascular problems represented 11% of all problems managed in general practice. This excluded risk factors for heart, stroke and vascular diseases (lipid disorders, overweight, smoking and diabetes), which were counted separately. Overall, GPs managed heart,

stroke and vascular problems at 16 per 100 encounters. Extrapolated to the total number of GPs' encounters in Australia, this indicates that GPs managed heart, stroke and vascular problems on about 15 million occasions in that year.

Information on the health profile of GPs' patients also highlights the importance of GPs in preventing, treating and managing heart, stroke and vascular conditions. In 2002–03, 55% of all adult general practice patients and one-third of child patients aged 2–17 years were overweight.²⁵ About 17% of adult patients smoked daily and 4% smoked occasionally.

Patient characteristics

In 1998–00, patients at encounters where GPs managed heart, stroke and vascular problems were more likely to be male and were significantly older than those at other encounters—almost 60% were aged 65 years and over. Most were long-standing patients at the practice, indicating continuity of care for these chronic conditions. About one in four general practice patients had heart, stroke and vascular problems in 1998–00. Of these, 12% also had diabetes, 11% had lipid disorders, 10% were current smokers and almost two-thirds were overweight.

What problems do GPs manage?

Heart, stroke and vascular problems

High blood pressure²⁶ was the most frequently managed problem in general practice in 2002–03, at 8.9 per 100 encounters, and accounted for over half of all heart, stroke and vascular problems. However, new cases of high blood pressure were uncommon (0.5 per 100 encounters), indicating that most of these encounters were for ongoing monitoring and treatment.

²⁴ Includes ICPC-2 codes K86 (hypertension, uncomplicated) and K87 (hypertension, complicated).

²⁵ Includes ICPC-2 codes T82 (obesity) and T83 (overweight).

²⁶ Includes ICPC-2 codes K86 (hypertension, uncomplicated) and K87 (hypertension, complicated).



Other relatively common heart, stroke and vascular conditions were coronary heart disease²⁷ (1.2 per 100 encounters), cardiac check-ups (1.1 per 100 encounters), heart failure (0.7 per 100 encounters) and certain abnormal heart rhythms (atrial fibrillation or flutter at 0.7 per 100 encounters). Problems related to stroke and to other vascular disease were managed less frequently (both 0.2 per 100 encounters).

Risk factors

GPs managed smoking problems at 0.3 per 100 encounters in 2002–03. The rate of management of smoking appears quite low, given that almost one in five general practice encounters with adults are with daily smokers, but it is possible that it was addressed as part of the overall management of a chronic condition and not recorded separately.

Overweight²⁸ problems were managed at 1.1 per 100 encounters in 2002–03. Compared with the prevalence of overweight and obesity among GPs' patients (55%), the rate of management of this problem is very low but increased from that in 1998–99, when it was 0.1 per 100 encounters. However, GPs may have managed these problems at a different encounter.

Lipid disorders were managed at 3.0 per 100 encounters in 2002–03. Diabetes was managed at 2.9 per 100 encounters.

How do GPs manage these problems?

At 62% of contacts with heart, stroke and vascular problems in 1998–00 at least one medication was prescribed, advised or given. For 16% of heart, stroke and vascular problems, GPs provided at least one non-pharmacological treatment, mainly advice or counselling. The patient was referred at almost 6% of heart, stroke and vascular encounters, mainly to a specialist, for extra care and GPs ordered an investigation, usually pathology, at 12%.

Among the top 30 medications most frequently prescribed by GPs to all patients in 2002–03 were:

- lipid-lowering drugs (atorvastatin, simvastatin)
- blood pressure-lowering drugs (irbesartan, atenolol, frusemide)
- antithrombotic drugs (aspirin, warfarin).

GPs referred certain heart, stroke and vascular conditions for hospital admission relatively frequently in 2002–03. These included patients with heart failure, coronary heart disease and suspected heart attack. Coronary heart disease was also among the 10 problems most frequently referred to a medical specialist. By contrast, GPs rarely referred patients with high blood pressure to other health professionals or services, suggesting that high blood pressure is mostly handled in general practice.

Among the pathology tests most frequently ordered overall by GPs in 2002–03 were blood lipids (3.3 per 100 encounters) and blood glucose (2.1 per 100 encounters). High blood pressure, diabetes and lipid disorders were the top three problems for which GPs ordered pathology tests most frequently.

Trends in management

Between 1990–91 and 1998–00 the management rate of heart, stroke and vascular problems fell slightly. Breaking this down further, rates for coronary heart disease and heart failure decreased but heart, stroke and vascular check-ups increased, indicating that GPs are becoming more involved in prevention. The prescription of medications to lower blood lipids and blood pressure, and anticoagulants also rose in that period, while prescriptions for anti-angina medications fell. Counselling and advice were given significantly more frequently by the end of the decade.

Between 1998–99 and 2002–03, the management rate of heart, stroke and vascular problems remained steady. By contrast, there was a significant rise in

²⁷ Includes ICD-10 codes K74 (ischaemic heart disease with angina) and K76 (ischaemic heart disease without angina).

²⁸ Includes ICD-10 codes T82 (obesity) and T83 (overweight).

the management of lipid disorders over that period, amounting to an average increase per year of 110,000 encounters. This was due to ongoing management of people with lipid disorders, rather than an increase in new cases detected. The rate of management of diabetes also rose significantly after 1998–99, translating into an estimated average increase per year of 80,000 general practice encounters for diabetes.

Further reading

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Drug treatment

Key points

- The use of calcium channel blockers has risen over the last decade.
- Angiotensin-converting enzyme (ACE) inhibitors and angiotensin receptor antagonists have become the most frequently used class of blood pressure-lowering drug.
- Among lipid-lowering drugs, the use of statins has increased considerably since 1994, doubling between 1998 and 2000.
- The use of antiplatelet drugs, particularly aspirin, has risen markedly in the late 1990s.
- In 2000, the cost of heart, stroke and vascular drugs sold under the PBS amounted to \$1,546 million; that is, 34% of government and patient costs for all prescription PBS drugs dispensed through pharmacies.
- Over 51 million prescriptions for heart, stroke and vascular drugs were dispensed in 2000—one-quarter of all prescriptions.

There is a wide range of effective drugs to treat people with heart, stroke and vascular diseases. These drugs can improve quality of life and lower death rates. A brief overview of the use of prescription medicines for heart, stroke and vascular diseases in Australia is presented here. These data refer to the use of prescription drugs (both privately prescribed drugs and those listed on the PBS) dispensed through pharmacies in the community only; medicines provided in public hospitals are not included.

Drug use is expressed in defined daily dose per 1,000 population per day (DDD/1,000/day). This is based on the assumed average dose per day of a drug used for its main indication in adults. The DDD enables valid comparisons between drugs independent of differences in price, preparation and quantity per prescription.

Blood pressure-lowering drugs

Although drugs in this class are grouped as 'blood pressure-lowering', they have other important and useful effects and are given to treat various conditions, not just high blood pressure. As the reason for which the drug is prescribed is not recorded, it is not possible to determine the actual drug use for specific conditions or purposes. These data therefore show the use of the drugs not only to lower blood pressure but also for other purposes.

Combinations of blood pressure-lowering drugs are often given because this increases their efficacy and also allows lower doses of each drug to be used, reducing side effects.

Diuretics

Diuretics are effective in reducing blood pressure, which reduces the occurrence of strokes and heart disease. Diuretics are also helpful for treating symptoms in people with heart failure. Although diuretics are still very popular, their prescription is falling in favour of more modern drugs such as ACE inhibitors and calcium channel blockers. Frusemide was the most commonly dispensed diuretic in 2000 (22.0 DDD/1,000/day).

Beta-blockers

Beta-blockers are used to treat patients with high blood pressure. But they also have other important uses. Through their lowering of blood pressure, these drugs prevent strokes and heart attacks. Also, in people with angina or history of heart attack, beta-blockers can reduce pain and deaths, and prevent further heart attacks. Certain beta-blockers are often used in the treatment of heart failure. Usage levels have remained relatively unchanged in the 1990s. Atenolol was the most widely prescribed beta-blocker in 2000 (10.9 DDD/1,000/day).

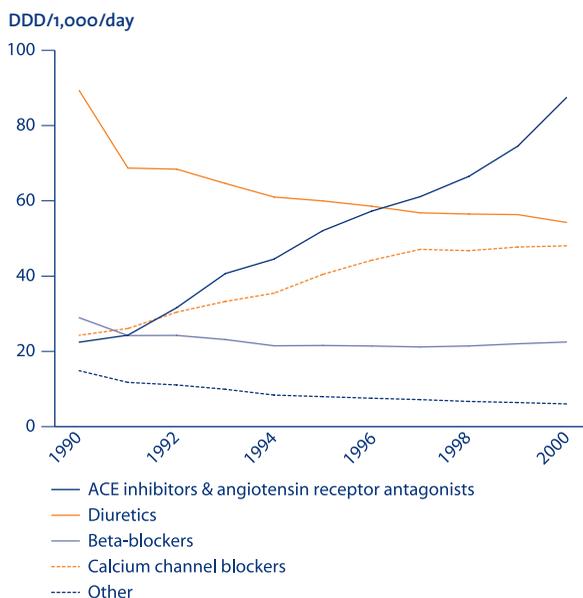
Calcium channel blockers

Calcium channel blockers are effective in reducing blood pressure and angina. Their use has risen over the last decade. Amlodipine and felodipine were the most commonly dispensed calcium channel blockers in 2000 (15.7 and 11.9 DDD/1,000/day, respectively).

ACE inhibitors and angiotensin receptor antagonists

ACE inhibitors are used widely to treat people with high blood pressure or heart failure. These drugs limit the progressive enlargement of the heart that can occur after a heart attack and relieve heart failure symptoms. If given early during a heart attack, they can reduce the risk of death. They have become the most frequently used class of blood pressure-lowering drug. Enalapril was the most used ACE inhibitor in 2000 (15.7 DDD/1,000/day). Irbesartan (14.5 DDD/1,000/day) was the most commonly used of the related group of compounds, the angiotensin receptor antagonists.

Community use of blood pressure-lowering drugs, 1990–00

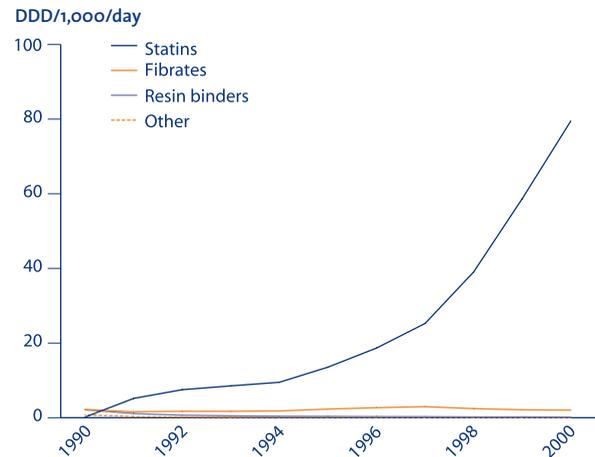


Source: DoHA 2003.

Lipid-lowering drugs

Lipid-lowering drugs are effective in preventing heart attacks and reducing coronary heart disease deaths. HMG CoA reductase inhibitors (statins), resin binders, nicotinic acid, fibrates and probucol all reduce blood LDL cholesterol and possibly increase HDL cholesterol to varying degrees, statins being the most effective. They also have varying effects in lowering blood triglycerides. The use of statins has increased considerably since 1994 when their value was established conclusively, doubling between 1998 and 2000. Atorvastatin is the most widely prescribed lipid-lowering agent (39.2 DDD/1,000/day in 2000), followed by simvastatin (29.7 DDD/1,000/day).

Community use of lipid-lowering drugs, 1990–00



Source: DoHA 2003.



Thrombolytic and antithrombotic drugs

Thrombolytic drugs

Thrombolytic drugs dissolve blood clots. They are particularly useful in patients suffering a heart attack, where a clot blocks blood supply to part of the heart, and in people having a stroke caused by a clot impeding blood flow to part of the brain (ischaemic stroke). Thrombolytics are less commonly used in peripheral vascular disease. For best results, the drugs must be given early during the heart attack or stroke. These drugs are generally given only in hospital, under close supervision.

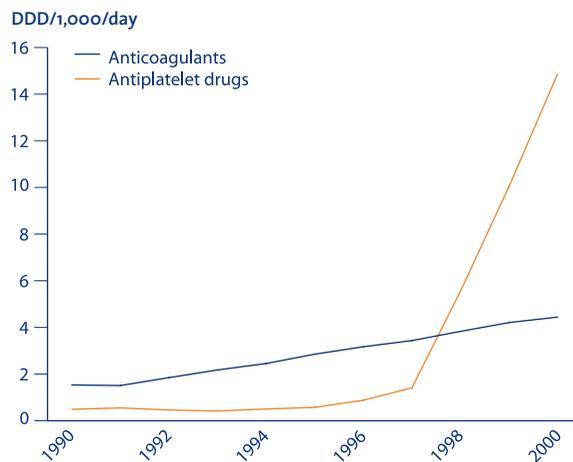
Aspirin and other antiplatelet agents

Antiplatelet drugs interfere with the formation of blood clots that are made of platelets. Among these drugs are aspirin, clopidogrel, dipyridamole and abciximab. If given during a heart attack, aspirin reduces the risk of death. Used long-term, it also reduces deaths and heart attacks among people with coronary heart disease. Given early during an ischaemic stroke (see above), aspirin reduces later similar strokes as well as deaths and disability. Antiplatelet agents used long-term in ischaemic stroke patients also prevent further strokes. These drugs are also routinely used during percutaneous coronary intervention procedures to reduce complications. The use of antiplatelet drugs, particularly aspirin, has risen dramatically in the late 1990s (aspirin 12.4 DDD/1,000/day in 2000, excluding over-the-counter supply without prescription).

Anticoagulants

These drugs prevent the formation of clots that could block blood vessels, by interfering with the clotting process. Anticoagulants are given to certain patients with heart disease, such as those with atrial fibrillation, after some heart attacks or with severe heart failure and less often with stroke or peripheral vascular disease (except previous embolism) to lower their risk of subsequent disease. They are also commonly used during percutaneous coronary intervention. Warfarin and heparin belong to this class of drugs. The use of anticoagulants has steadily increased during the 1990s (warfarin 4.1 DDD/1,000/day in 2000).

Community use of drugs to prevent or dissolve blood clots, 1990–00



Source: DoHA 2003.

Other drugs

Nitrates

Nitrates relieve and prevent angina symptoms by dilating blood vessels. They are commonly prescribed heart, stroke and vascular drugs (nitrates 18.4 DDD/1,000/day in 2000).

Inotropes

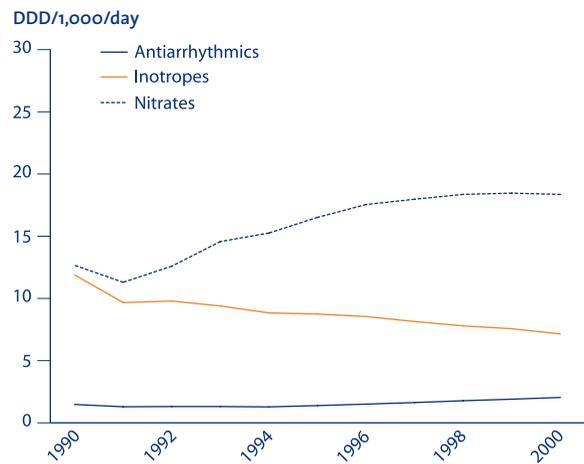
Inotropes increase the force of contraction of the heart muscle. These drugs are useful in people with heart failure. There has been a slow decline in the prescription of these drugs since 1990 (inotropes 7.1 DDD/1,000/day in 2000).

Antiarrhythmics

Antiarrhythmic drugs are given to restore the normal heart rhythm or prevent serious (life-threatening) abnormal heart rhythms (arrhythmias). Amiodarone is the most commonly dispensed drug in this class (1.5 DDD/1,000/day in 2000).

The level of use of these drugs in the community has remained fairly constant during the 1990s.

Community use of other drugs for heart, stroke and vascular diseases, 1990–00



Source: DoHA 2003.

Drug costs

In 2000, the cost of heart, stroke and vascular drugs sold under the PBS amounted to \$1,546 million. This corresponds to 34% of government and patient costs for all prescription PBS drugs dispensed through pharmacies. Government and patient costs on the dispensing of drugs not listed on the PBS, and the cost of drugs dispensed in public hospitals, are unavailable. Therefore, these figures underestimate the total cost of heart, stroke and vascular drugs.

Over 51 million prescriptions for heart, stroke and vascular drugs were dispensed in 2000. This represents one-quarter of all prescriptions. Simvastatin, a lipid-lowering drug, was the top drug by cost, amounting to \$238 million in 2000. Also ranked in the top ten were atorvastatin and pravastatin, other lipid-lowering drugs.

The following table shows the cost of prescription PBS drugs used in the community in Australia during 2000.



Prescription drugs used in the community in Australia, 2000

Drug	No. scripts ('000) ^(a)	Cost (\$ million) ^(b)
Blood pressure-lowering drugs		
ACE inhibitors	14,764	421
Calcium channel blockers	8,729	213
Beta-blockers	4,542	62
Diuretics	3,525	42
Other	987	18
<i>Total blood pressure-lowering drugs</i>	<i>32,547</i>	<i>755</i>
Lipid-lowering drugs		
Statins	10,744	618
Fibrates	448	20
Resin binders	46	2
Other	21	0.5
<i>Total lipid-lowering drugs</i>	<i>11,259</i>	<i>641</i>
Other drugs		
Nitrates	2,691	56
Antiarrhythmics	532	16
Inotropes	715	6
Peripheral vasodilators	10	0.2
<i>Total other drugs</i>	<i>3,949</i>	<i>78</i>
Antithrombotic drugs		
Anticoagulants	1,911	20
Antiplatelets	1,438	49 ^(c)
Thrombolytics	1	2
<i>Total antithrombotic drugs</i>	<i>3,350</i>	<i>72</i>
Total heart, stroke and vascular drugs	51,104	1,546

(a) Includes prescription drugs subsidised under the PBS and Repatriation Pharmaceutical Benefits Scheme and non-subsidised prescription drugs dispensed through pharmacies.

(b) Includes government and patient costs for drugs listed in the PBS only.

(c) This figure is likely to grossly underestimate the actual cost, as over-the-counter aspirin is not included.

Source: DoHA 2003.

Further reading

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Procedures in hospital

Key points

In 2001–02 there were:

- 81,800 coronary angiograms performed in hospitals—a 50% increase over the last decade
- 16,252 coronary artery bypass grafting (CABG) operations—a 15% decline over the last decade
- 23,949 coronary angioplasty procedures performed—a twofold increase over the last decade. Stents were inserted in 91% of these procedures in 2001–02
- 3,553 carotid endarterectomies performed in Australia, with rates remaining stable over the last few years
- 744 lower limb amputations for people hospitalised with a principal diagnosis of atherosclerosis of the peripheral arteries and arteries of the extremities
- 1,990 abdominal aortic aneurysm operations performed in Australia.

Heart, stroke and vascular diseases are a major cause of illness and death in Australia. Medical services offer a range of procedures to diagnose and treat these diseases. A brief overview of the major procedures performed in hospital for heart, stroke and vascular diseases is presented here.

Procedures for heart disease

Coronary angiography

Coronary angiography (also known as coronary arteriography) gives a picture of the heart's arteries, known as the coronary arteries. It is used to diagnose coronary heart disease and is essential before either coronary artery bypass surgery or coronary angioplasty.

In 2001–02, there were 81,800 coronary angiograms performed in hospitals, an increase in age-

standardised rates of 46% for males and 62% for females since 1993–94.

Males were twice as likely as females to have this diagnostic procedure in 2001–02, and most patients (78%) were aged 55 years and over. The vast majority (71%) of these patients were admitted to hospital with a principal diagnosis of coronary heart disease—comprising 32% with angina, 24% chronic coronary heart disease and 14% acute myocardial infarction (AMI).

Coronary artery bypass grafts

Coronary artery bypass grafting (CABG) usually involves opening a patient's chest and using blood vessel grafts to bypass blockages in the coronary arteries and restore adequate blood supply to the heart muscle. The graft material is usually taken from the chest wall or elsewhere, or veins in the patient's legs, or both. CABG is a treatment and not a cure for coronary artery disease, and there is a risk of recurrent disease. Re-operations are uncommon within the first five years but become more frequent later. According to the National Cardiac Surgery Register in 1999, the average number of bypass grafts per operation was three per patient, and 6% of CABGs were for re-operations.

In 2001–02, there were 16,252 CABG operations, with an in-hospital death rate of 2%. While the use of this procedure increased rapidly in the 1970s, 1980s and early 1990s, between 1993–94 and 2001–02 the age-standardised rate declined by 16% among males and 13% among females. CABG is increasingly being used to treat older patients and over the last decade procedure rates among people aged 75 years and over increased by 66%.

Males were over three times as likely as females to undergo this procedure in 2001–02, despite the incidence of coronary heart disease in men being only twice that of women. Most patients (73%) were aged 60 years and over. The vast majority of



patients undergoing CABG (86%) were admitted to hospital with a principal diagnosis of coronary heart disease—comprising 45% with angina, 30% chronic coronary heart disease and 11% AMI. Around 6% of patients were admitted for non-rheumatic mitral/aortic valve disorders.

State and territory

During 2000, there was considerable variation in CABG procedures across states and territories, even after accounting for different age structures. Procedure rates varied from 12% above the national average (in Queensland) to 28% below the national average (in Western Australia).

International comparisons

The United States had the highest rates of CABG use of 16 OECD countries compared in 1999—their age-standardised procedure rates were twice those of Australia. Australia was at the higher end of the countries compared and had similar procedure rates to the Netherlands, New Zealand and Finland (around 90–100 CABGs per 100,000 population).

Coronary angioplasty

Coronary angioplasty (also known as percutaneous transluminal coronary angioplasty), as with coronary artery bypass surgery, is used to restore adequate blood flow to blocked coronary arteries. It involves inserting a catheter with a balloon into a narrowed coronary artery. The catheter is first inserted into a leg (or occasionally, arm) artery through the skin and then is threaded through the vessel back towards the heart and into the coronary arteries to the area of vessel blockage. The balloon is then inflated against the blocked area to create a wider passage for blood flow. Together with coronary stenting, which is usually done at the same time, it is referred to as percutaneous coronary intervention (PCI).

Coronary angioplasty avoids the major trauma of CABG surgery because it does not require the

opening of the patient's chest. However, the technique cannot be used to treat all patients with coronary artery obstruction.

In 2001–02, there were 23,949 coronary angioplasty procedures performed, with an in-hospital death rate of 1%. Over the last decade its use has increased rapidly, with age-standardised rates doubling between 1993–94 and 2001–02. Coronary angioplasty is increasingly being used to treat older patients, and among those aged 75 years and over there has been a fourfold increase in the use of these procedures between 1993–94 and 2000–01, compared with an increase of around 60% for those aged 30–64 years. Since 1997–98 coronary angioplasty has replaced CABG as the most common revascularisation treatment for coronary heart disease in Australia.

Males were three times as likely as females to undergo coronary angioplasty in 2001–02, despite the incidence of coronary heart disease in men being only twice that of women. Most patients (77%) were aged 55 years and over. Almost all patients (94%) undergoing coronary angioplasty were hospitalised with a principal diagnosis of coronary heart disease—comprising 42% with angina, 26% AMI and 25% chronic coronary heart disease.

State and territory

During 2000, there was considerable variation in coronary angioplasty procedures across states and territories, even after accounting for different age structures. Procedure rates varied from 20% above the national average (in Victoria) to 13% below the national average (in Queensland).

International comparisons

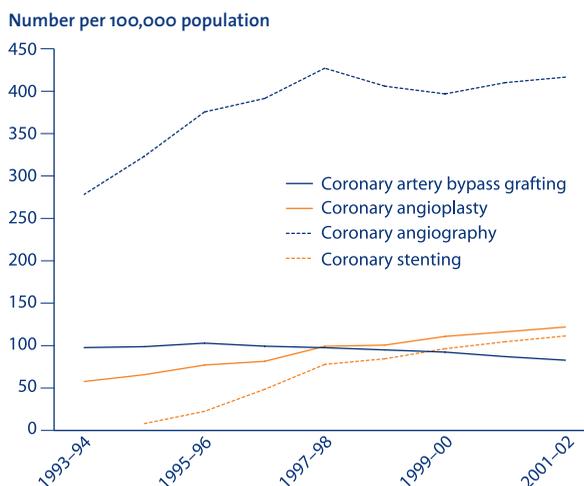
The United States had the highest rates of coronary angioplasty of 16 OECD countries compared in 1999—their age-standardised procedure rates were three times those of Australia. Australia was at the higher end of the countries compared, exceeded only by the United States, Iceland and France.

Coronary stenting

Although success rates for initial coronary angioplasty are high, there is a risk of early acute closure of the coronary artery and a high rate of recurrence of obstruction (restenosis). This led to the development of other catheter-based techniques, with coronary stenting being the most successful because it is associated with lower rates of restenosis compared with coronary angioplasty alone. Coronary stenting involves expanding a metal mesh tube within the artery to form a supporting structure to hold the artery open at the point where there is narrowing. Since the mid-1990s there has been a rapid increase in the use of coronary stenting as an adjunct to coronary angioplasty. More recently, drug-eluting stents (also referred to as 'coated stents') have been introduced. They have been shown to more effectively reduce the likelihood of restenosis than bare metal stents.

In 2001–02, stents were inserted in 91% of coronary angioplasty procedures (21,880 procedures), a sharp increase from 1994–95 when the proportion was 12%.

Trends in coronary angiography, coronary artery bypass grafting and coronary angioplasty, 1993–94 to 2001–02



Notes

1. Age-standardised to the 2001 Australian population.
2. Coronary angioplasty includes coronary stenting.

Source: AIHW National Hospital Morbidity Database.

Heart transplants

In 2001–02, there were 72 heart transplants and three combined heart–lung transplants performed in Australia. The rate of these procedures has remained relatively stable between 1998 and 2002.

Heart valve defects

A defective heart valve is one that fails to fully open or close. Valve disease may be congenital, a result of disease such as chronic rheumatic heart disease, or age-related. Valve defects may be repaired with surgery or catheter-based techniques. Valve surgery involves repairing or replacing the mitral, aortic, tricuspid or pulmonary valves. Most valve procedures in Australia consist of replacing the damaged valve with a mechanical device, pig-derived tissue or a human graft. Reconstruction of the damaged valve by stitching techniques is less common.

In 2001–02, there were 6,298 procedures for heart valve defects, with heart valve surgery accounting for 95% of these procedures (6,005 procedures). Surgery was most frequent for the aortic and mitral valves. The number of heart valve procedures has remained relatively stable between 1999 and 2002.

Males were 57% more likely than females to undergo procedures for heart valve defects in 2001–02. Most patients (75%) were aged 55 years and over. Over half of all patients undergoing heart valve defect procedures were admitted to hospital with a principal diagnosis of non-rheumatic valve disorders (16% for mitral valve and 38% for aortic valve), 16% with chronic rheumatic heart disease, 7% with chronic coronary heart disease and 4% with angina.

Cardiac defibrillator implants

Implantable cardiac defibrillators, which monitor the heart rhythm and deliver electrical shocks to the heart when required to eliminate abnormal rhythms, are effective in preventing sudden cardiac death in people at high risk of the life-threatening arrhythmia known as ventricular fibrillation.



In 2001–02, there were 957 such devices implanted in patients around Australia. In the mid-1990s, between 200 and 300 devices were implanted each year and since then there has been a rapid increase in their use (a 26% increase since 1998–99).

Males were four times as likely to receive cardiac defibrillators as females in 2001–02, and most recipients (76%) were aged 55 years and over. Around 49% of patients receiving cardiac defibrillators were admitted to hospital with a principal diagnosis of paroxysmal tachycardia, 9% with other cardiac arrhythmias and 7% with cardiomyopathy.

Procedures for stroke

Carotid endarterectomy

Carotid endarterectomy entails surgically removing atherosclerotic plaque from the carotid arteries in the neck, which supply blood to the brain. This may reduce the risk of blood clots forming and breaking off the atherosclerotic plaque, embolising to arteries in the brain and causing a stroke.

In 2001–02, there were 3,553 carotid endarterectomies performed in Australia, with rates remaining stable over the last few years. The in-hospital death rate for this procedure was 1%.

Males were 2.7 times as likely to undergo this procedure as females in 2001–02, which is consistent with the higher incidence of strokes among men than women. Most patients (80%) were aged 65 years and over. Almost all patients (87%) undergoing carotid endarterectomies were hospitalised with a principal diagnosis of stroke.

International comparisons

A study by the OECD showed carotid endarterectomies are not a common procedure in most OECD countries. Of the countries compared, the United States had the highest number of procedures per population aged 40 years and over (80 per 100,000), followed by Australia

(60 per 100,000) and Canada (45 per 100,000). In Sweden, Norway, Hungary and the United Kingdom the procedure was used more moderately (less than 20 per 100,000 population) and was rarely used in Korea, Italy and Japan.

CT brain scan

A computerised tomographic (CT) scan of the brain uses X-rays to generate an image of the brain and is a diagnostic procedure used in acute stroke to distinguish between the major stroke types (ischaemic stroke, caused by blocked blood supply to a part of the brain, or haemorrhagic stroke, caused by bleeding within a part of the brain or on a part of its surface). This distinction guides treatment. The test may also help to confirm a clinical diagnosis of stroke, or its likely cause, when it is difficult to make otherwise.

In 2001–02, there were 29,532 CT scans of the brain for people hospitalised with a principal diagnosis of stroke or TIA. This is an underestimate of the total number of CT scans of the brain performed in Australia, as this imaging procedure is also performed outside hospital. In recent years, the rate of CT scans of the brain for those hospitalised with a stroke has remained relatively stable.

Males were more likely than females to undergo CT scans of the brain in hospital for a diagnosis of stroke in 2001–02, which is consistent with the higher incidence of strokes among men than women. Most patients (76%) were aged 65 years and over.

Magnetic resonance imaging scan and ultrasound of carotid arteries

Magnetic resonance imaging (MRI) of the brain and ultrasound of the carotid arteries are non-invasive investigations done to help diagnose stroke and its cause, or assess the risk of stroke, respectively.

In 2001–02, there were 3,769 MRI scans of the brain for people hospitalised with a principal diagnosis of

stroke. This is an underestimate of the total number of MRI scans of the brain performed in Australia, as this imaging procedure is also done outside hospital. In recent years, the rate of MRI scans of the brain for those hospitalised with a stroke has remained relatively stable.

Procedures for peripheral vascular disease

Lower limb amputations

In severe cases of peripheral vascular disease the reduced blood supply to the lower limbs can result in an amputation. In 2001–02, there were 744 lower limb amputations for people hospitalised with a principal diagnosis of atherosclerosis of the peripheral arteries and arteries of the extremities. Since 1999–00 there has been a general decline in the age-standardised rates of these procedures, 24% for males and 18% for females. Males were twice as likely as females to undergo this procedure in 2001–02, and most (78%) were done in people aged 70 years and over.

Surgery for abdominal aortic aneurysm

Abdominal aortic aneurysm is an abnormal widening of the aorta (the main artery leading from the heart) below the level of the diaphragm. It is life-threatening if it ruptures, so surgery is performed in severe cases. In 2001–02, there were 1,990 abdominal aortic aneurysm operations performed in Australia. Since 1998–99 there has been a steady decline in the rate of these procedures, 23% among males and 5% among females. Males were five times as likely as females to undergo this procedure in 2001–02, and most (70%) were done in people aged 70 years and over.

Number and rate of procedures, 2001–02

Procedure	Number	Rate
For heart disease		
Coronary angiography	81,800	416.6
Coronary artery bypass grafting	16,252	82.8
Coronary angioplasty (includes coronary stenting)	23,949	121.9
Coronary stenting	21,880	111.4
Heart transplants	72	0.37
Heart valve defects	6,298	32.1
Cardiac defibrillator implants	957	4.9
For stroke		
Carotid endarterectomy	3,553	17.2
CT brain scan	29,532	150.0
Magnetic resonance imaging	3,769	19.2
For peripheral vascular disease		
Abdominal aortic aneurysm	1,990	10.1
Lower limb amputation for peripheral vascular disease	744	3.8

Note: Rates are per 100,000 population and are age-standardised to the 2001 Australian population.

Source: AIHW National Hospital Morbidity Database.

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Rehabilitation and secondary prevention

Key points

- Rehabilitation programs help heart and stroke patients reduce their risk of recurring events and help them return to daily life by offering risk factor education, counselling, support and physical activity.
- Although there are no national figures available, it appears that only a minority of eligible patients participates in a cardiac rehabilitation program.
- The proportion of stroke patients who participate in a rehabilitation program is unknown. It is estimated that in Perth in 1989–90 about 25% of hospitalised stroke patients underwent rehabilitation, and in north-east Melbourne in 1996–97 the proportion was about 39%.
- Without preventive treatment, the average death rate from heart disease in people who have had a heart attack is about 5% per year for the rest of their life. The death rate from stroke in people who have had a stroke is similar.
- Although the effectiveness of certain preventive measures is well established, they are currently underused. However, there is evidence that the care of people with heart disease and stroke improved during the 1990s, with more effort being directed to prevention.

Heart, stroke and vascular diseases have a major impact on the Australian community. In 2001, an estimated 3.67 million Australians, or 19% of the population, reported experiencing heart, stroke and vascular conditions. For those who already have such conditions, it is important to try to prevent the occurrence of further heart, stroke and vascular events (known as secondary prevention). Rehabilitation programs help heart and stroke patients reduce their risk of a recurrence of such events and help them return to daily life by offering risk factor education, counselling, support and physical activity.

Cardiac rehabilitation

What is cardiac rehabilitation and who provides it?

Cardiac rehabilitation encompasses all measures used to help heart patients return to an active life. It aims to:

- 1 maximise physical, psychological and social functioning to enable patients to live productively and with confidence; and
- 2 assist and encourage behaviours that are likely to reduce the risk of further heart, stroke and vascular events and conditions, such as identifying and modifying risk factors and encouraging adherence to recommended medical therapies.

Cardiac rehabilitation services usually include physical activity, health education and counselling programs tailored to meet the individual needs of the patient and family.

The WHO and the NHFA recommend that cardiac rehabilitation services be available, and routinely offered, to everyone with heart, stroke and vascular diseases, and be delivered by trained health professionals. Most programs in Australia are aimed at patients who have had a heart attack, heart surgery or coronary angioplasty. Some programs also cater for patients with stable angina or chronic heart failure.

Cardiac rehabilitation ideally begins in hospital as soon as possible after admission. With the trend toward shorter hospital admissions, there is a greater need for patients to continue rehabilitation services as outpatients.

Group outpatient programs, conducted in hospitals and community health centres, are the main models operating throughout Australia, but programs vary across the country. Programs generally consist of weekly or twice-weekly sessions of group education and discussion in addition to light to moderate physical activity. They are conducted by multidisciplinary groups of health professionals. Involvement by partners and other family members is encouraged. Home-based and outreach programs are also being developed in rural and remote areas of Australia.

Use of programs

There are no national figures on the proportion of patients who enter and complete a cardiac rehabilitation program. Some indication of use can be obtained from particular state programs.

In Victoria in 1998–99, 43% of patients discharged from hospital following coronary artery bypass surgery participated in a cardiac rehabilitation program, compared with 25% of patients with heart attack and 26% of patients after coronary angioplasty. Overall, only one in three eligible patients joined a cardiac rehabilitation program. In Western Australia in 2000, less than one in five patients admitted to hospital for a cardiac condition were likely to receive rehabilitation. In the Hunter region of New South Wales in 1998, 43% of eligible patients reported being invited to attend outpatient cardiac rehabilitation and, overall, 19% of eligible patients completed a program following discharge from a public hospital. In Queensland in 1999–00, 49% of eligible patients were referred for cardiac rehabilitation and fewer than one in three patients referred completed the program, resulting in only 39% of available cardiac rehabilitation places being fully used.

Health outcomes of patients attending outpatient cardiac rehabilitation

There is good research evidence that cardiac rehabilitation confers benefits on capacity for physical activity, blood lipid levels, reduction in smoking, physical activity habits, use of medications, social adjustment, use of health care services and risk of recurrence of cardiac events or deaths.

There are no reliable national data on outcomes for patients who undergo cardiac rehabilitation. A recent state-wide Victorian study showed that people who attend cardiac rehabilitation programs had better survival after five years than non-attendees. This study, involving 1,570 patients from 15 cardiac rehabilitation programs, showed significant improvements in physical and mental health-related quality of life scales.

Stroke rehabilitation

What is stroke rehabilitation and who provides it?

Rehabilitation is an integral part of the acute and long-term care of those who have had a stroke. It:

- 1 helps each affected individual to recover and provides practical ways of dealing with ongoing disability;
- 2 supports and trains family members and friends to help care for stroke survivors in the community; and
- 3 helps prevent recurrent stroke through medication and behavioural modification.

Rehabilitation can benefit most people who have suffered a stroke, from the most mildly affected to the severely disabled. Rehabilitation begins in the acute hospital environment as soon as possible after stroke. It may continue in a specialised admitted patient rehabilitation unit or be provided as a hospital outpatient service, in the patient's home, at a community rehabilitation facility, or in a hostel or a nursing home. The type of services available varies across Australia.

Rehabilitation involves retraining and practice in performing everyday tasks, and providing psychological support, education and healthy lifestyle advice to those with stroke and to their family and friends. A successful return home and resumption of previous activities may require the support of community services, e.g. Meals on Wheels or home nursing services. The duration of formal rehabilitation varies, from one or two weeks to several months.

A multidisciplinary team approach is often used, involving doctors, nurses and allied health professionals.

Informal carers (family members, neighbours, friends and volunteers) play an important part in the lives of disabled stroke survivors. Carers provide assistance



with a wide range of daily activities, some carers helping with personal tasks such as bathing and dressing. Carers themselves may face considerable psychological strain and require both emotional and practical support.

Use of programs

It is not known what proportion of stroke patients participate in a rehabilitation program (admitted patient or outpatient). It has been estimated that in Perth during 1989–90, about 25% of hospitalised stroke patients underwent a period of admitted patient rehabilitation in a specialised rehabilitation unit. In north-east Melbourne during 1996–97, it is estimated that about 39% of hospitalised stroke patients were admitted for a period of admitted patient rehabilitation.

Health outcomes of patients attending stroke rehabilitation

Rehabilitation, whether provided as an admitted patient in hospital, at a community rehabilitation centre (day hospital), a hospital outpatient clinic or in the patient's home, is effective in reducing the risk of death, dependency, institutionalisation or deterioration.

Secondary prevention

Preventing recurrences of heart attack or stroke can be a powerful way of reducing the burden of heart, stroke and vascular diseases. Without preventive treatment, the average death rate from heart disease in people who have had a heart attack is about 5% per year for the rest of their life. The death rate from stroke in people who have had a stroke is similar. These rates are much higher (about 10 times) than in people without heart, stroke and vascular diseases but with unfavourable risk factors.

It is now recognised that there is no threshold of biomedical risk factors above which people are at risk. Rather, there is a continuous relationship between risk factor levels and risk of disease—the lower the blood pressure or blood cholesterol, the less likely a person is to develop heart, stroke and vascular diseases or have a further heart attack or stroke. This is the case down to levels well below average values in Western societies and challenges the concept of what are considered 'normal' values. So there is an argument for intervening to reduce all risk factors, irrespective of their level, in anyone with existing heart, stroke and vascular diseases. Preventive measures need to be maintained indefinitely in such persons.

Rehabilitation and secondary prevention should begin soon after a cardiac event or stroke since the risk of further events is greatest in the first few months after the first event. Starting these therapies in hospital can lead to better long-term use and better clinical outcomes.

Prevention of recurrent coronary events

Measures that may be used to reduce the risk of further coronary events in people with established coronary heart disease include:

- modification of risk factors and behaviours (lowering high blood pressure, stopping smoking, controlling weight if appropriate, eating a healthy diet, undertaking regular physical activity);
- drug use (using antiplatelet drugs (aspirin) long-term; lowering blood cholesterol with drugs (statins), even when cholesterol levels are in the 'normal' range in patients with heart attack or unstable angina; using beta-blockers in patients with heart attack or heart failure; using ACE inhibitors in patients with heart attack or heart failure); and
- tight control of diabetes.

Prevention of recurrent stroke

Measures that may be used to prevent the occurrence of subsequent stroke events include:

- modification of risk factors and behaviours (lowering high blood pressure, stopping smoking, controlling weight if appropriate, eating a healthy diet, undertaking regular physical activity);
- medication use (using antiplatelet drugs (aspirin, aspirin + dipyridamole, or clopidogrel) long-term for patients with ischaemic stroke or TIA and a normal heart rhythm; using anticoagulation drugs (warfarin) long-term for patients with ischaemic stroke or TIA and atrial fibrillation; lowering blood pressure; lowering blood cholesterol with drugs (statins) in patients with established coronary heart disease);
- carotid endarterectomy for patients with recent ischaemic stroke or TIA and severe narrowing of the internal carotid artery on the symptomatic side and who are fit for surgery; and
- tight control of diabetes.

Uptake of secondary prevention measures

Although the effectiveness of certain preventive measures is well established, they are currently underused. Stroke unit care is appropriate for all patients, but appears not to be currently widely available in Australia. Similarly, only about one in four patients with TIA or ischaemic stroke in whom long-term anticoagulant drugs are indicated actually receive this treatment. Cardiac rehabilitation programs are underused. Medications including aspirin and statins are likewise underused for secondary prevention of vascular disease. High blood pressure remains untreated in a large proportion of people in whom treatment is warranted.

However, there is evidence that the care of people with heart disease and stroke improved during the 1990s, with more effort being directed to prevention. There have been significant rises in the prescription of blood pressure-lowering drugs,

aspirin, anticoagulants and blood cholesterol-lowering drugs. GPs are also more likely than in the past to perform check-ups and to provide counselling and advice to their patients with a history of heart disease or stroke. It is reasonable to assume that this involves discussions about the patients' lifestyle and suggestions to change risk behaviours if indicated.

Further reading

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