5 Admissions and in-hospital treatment for acute myocardial infarction

5.1 Introduction

The previous two chapters highlighted the progress made in reducing CHD in the community, and described some clinical measures aimed at improving the risk factor profiles of Australians. Improvements in heart attack survival rates (as shown in Chapter 3) also suggest that medical and surgical treatment for heart attacks is becoming increasingly effective. A recent Australian study argues that for people with established CHD significant reductions in coronary events can be achieved by increasing the use of revascularisation procedures such as PCI and CABG (McElduff et al. 2001). These procedures are very effective for relieving angina and are increasingly being used in patients with AMI, although presently still at a low level. Many factors, such as the severity of the disease, risk factor profile, age and other medical conditions, will influence the choice of procedure in a given patient.

There are two main first-line strategies to restore coronary blood flow during the acute stage of a heart attack: thrombolytic therapy or PCI. Further treatment is often needed to reduce complications and the risk of recurrent attack. This could involve PCI (if not used acutely) or CABG. Diagnostic techniques such as cardiac catheterisation are necessary before either of these procedures can be performed.

This chapter examines these procedures in detail and is divided into three sections:

- hospital admissions for AMI
- acute cardiac procedures
- outcomes of acute care interventions.

The acute cardiac procedures examined in this chapter are cardiac catheterisation, PCI and CABG. Although the benefits of thrombolytic therapy during the acute stage of a heart attack have been well documented, no national data on this treatment are available in Australia. The previous chapter briefly discussed the use of thrombolytic therapy in Perth and Newcastle.

Information on cardiac procedures in this report relates mostly to AMI treatment because of the difficulties in counting the number of people admitted to hospital for angina (see Chapter 2 for further details).

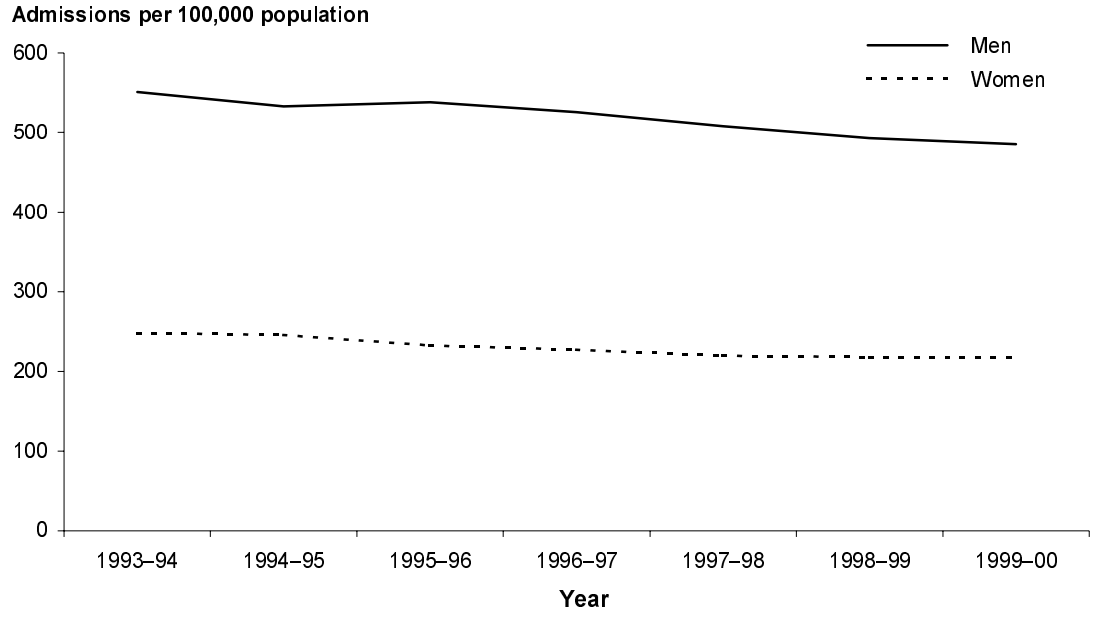
5.2 Hospital admissions for acute myocardial infarction

Data on hospital admissions for AMI are a useful indicator as they may reflect the incidence of AMI as well as both the demand and supply of acute healthcare services for AMI. In 1999–00, among 40–90 year-olds there were 28,002 hospital admissions where AMI was the principal diagnosis and length of stay was greater than 2 days or the patient died within 2 days of admission (17,986 men and 10,016 women). This equates to an admission rate of 351 per 100,000 population aged 40–90 years.

Recent trends

Between 1993–94 and 1999–00 there was a 12% decline in the age-standardised rate of AMI admissions for men and women aged 40–90 years, representing a decline of almost 2% per year (Figure 5.1). This corresponds reasonably well with the decline of about 20% in incidence which occurred over this period. The decline in AMI admission rates occurred in most age groups, with the slowest declines among those aged 75–90 years (5–6%) (Appendix Table A4). Australia, together with the Nordic countries, has experienced the largest declines in AMI admission rates over the last decade, with the majority of OECD countries experiencing relatively stable AMI admission rates over this period (OECD 2002).

While AMI admission rates have been falling over the last decade in Australia, the absolute number of AMI admissions has remained relatively stable due to the increasing average age and overall growth of the population. In 1993–94 there were 27,213 AMI hospital admissions among 40–90 year-olds compared with 28,002 in 1999–00.



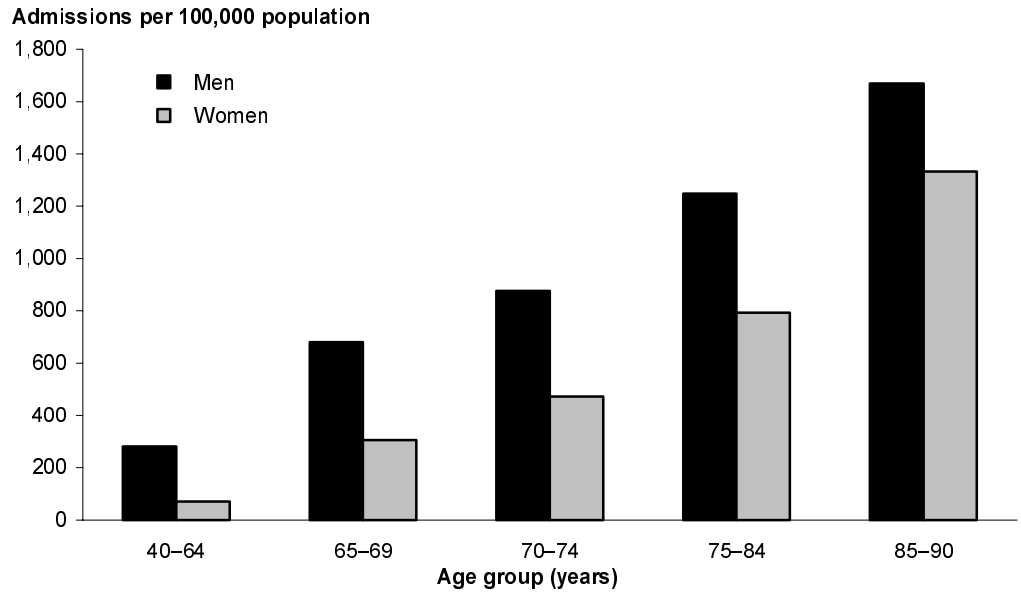
Note: AMI admission rates have been age-standardised to the 1991 Australian population aged 40–90 years.
Source: AIHW National Hospital Morbidity Database.

Figure 5.1: AMI hospital admission rates among 40–90 year-olds, 1993–94 to 1999–00

Sex and age

Men were twice as likely to be admitted to hospital for an AMI than women in 1999–00 (based on age-standardised rates), consistent with their greater risk of suffering a heart attack. The crude AMI admission rate for men aged 40–90 years was 464 per 100,000 population compared with 244 per 100,000 population among women. Among 40–90 year-olds AMI admission rates were higher for men than women across all age groups (Figure 5.2). This difference in admission rates between men and women has remained consistent since 1993–94 (Appendix Table A4).

The average age for AMI hospital admissions was 65 years for men and 74 years for women.[3] Nearly all hospital admissions for AMI occurred among 40–90 year-olds (98%), with almost two-thirds of these aged 65–90 years. AMI admission rates increase markedly with age, consistent with the association between age and incidence. Admission rates for men aged 75–90 years were almost five times those for 40–64 year-olds, with the age gap in admission rates even greater for women (Figure 5.2).



Source: AIHW National Hospital Morbidity Database.

Figure 5.2: Age-specific hospital admission rates for AMI, 1999–00

3. Includes all persons, including those aged greater than 90.

5.3 Acute cardiac procedures

This section provides information on several cardiac procedures, with a special focus on their use in the acute case of those admitted to hospital for AMI. The procedures covered are cardiac catheterisation, PCI and CABG. Revascularisation procedures, such as PCI and CABG, are important treatment options following a heart attack. Not all patients are appropriate candidates, due to the higher risks associated with surgery for people whose heart muscle was damaged by a heart attack. However, revascularisation may be performed on AMI patients for whom other therapies are not suitable.

Thrombolytic therapy is often a first-line strategy during the acute stage of a heart attack, but as national data are not collected on thrombolytic use they cannot be included. Also for reasons already discussed in Chapter 2, it is not possible to provide clear information on the use of procedures specifically for patients admitted to hospital for angina.

In this section of the report the term 'AMI patients' has commonly been used. This refers to admissions with a principal diagnosis of AMI and length of stay greater than 2 days, and includes those that died within 2 days of admission (for further details see Chapter 2). Furthermore, the analysis includes only those admissions in the acute stage of the heart attack (i.e. the first occurrence of the heart attack during the observation period), which are referred to as acute hospital admissions. Readmissions for the same coronary event are not included in the national analysis, due to data limitations.

General patterns

In 1999–00, 30% of those admitted to hospital for AMI aged 40–90 years (8,317 patients) received either cardiac catheterisation, PCI or CABG. Another third had a variety of services but none of those cardiac procedures, and a further third had no hospital procedures, diagnostic/imaging services or allied health interventions. The National Hospital Morbidity Database does not collect information on thrombolytics or other pharmacological treatment, which may account for the high proportion of AMI patients with no procedures or interventions recorded.

Cardiac catheterisation

Cardiac catheterisation, a minimally invasive diagnostic procedure, is used to identify the location of any coronary blockages by the insertion of a catheter into the bloodstream, threading it back to reach the heart and the coronary arteries, then releasing a dye that outlines the arteries under X-ray. In 1999, there were 57 interventional cardiology laboratories in Australia that performed cardiac catheterisation, with all of these located in acute care hospitals in urban areas.

Aggregate trends in cardiac catheterisation use

In 1999–00, there were 76,125 cardiac catheterisations performed in Australia, an increase from 1993–94 where 55,199 cardiac catheterisations were performed (22% increase based on age-standardised rates). A recent study conducted by the OECD has shown that Australia, together with Germany and Belgium, has the highest overall levels of cardiac catheterisation

procedures among 40–90 year-olds, with these countries performing around five times the number of cardiac catheterisations per capita as Greece, Canada and Italy (OECD 2002).

While the overall use of cardiac catheterisations in Australia has been increasing steadily between 1993–94 and 1997–98, in more recent years there has been a slight decline. This decline coincides with a change in statistical coding practice (i.e. moving from ICD-9-CM to ICD-10-AM), and disappears when cardiac catheterisations are examined among AMI patients only (Appendix Table A5).

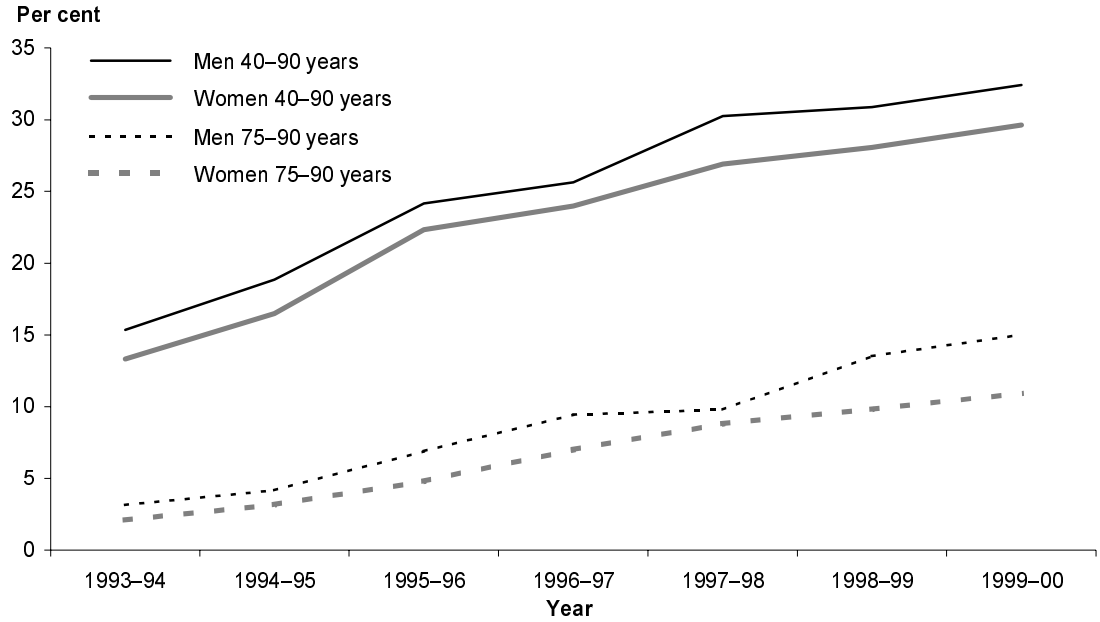
Cardiac catheterisation use during acute admission for acute myocardial infarction

In 1999–00, almost a quarter of AMI patients aged 40–90 years (6,822 patients) underwent a cardiac catheterisation during acute hospital admission (Appendix Table A6).

Recent trends

Cardiac catheterisation use during acute hospital admission for AMI patients aged 40–90 years has been increasing rapidly over the last decade, with age-standardised rates doubling between 1993–94 and 1999–00 (Figure 5.3). The proportion of AMI patients aged 40–90 years undergoing cardiac catheterisation during acute admission has increased from a crude rate of 11% to 24% over this period, representing an increase in the number of cardiac catheterisations from 2,902 in 1993–94 to 6,822 in 1999–00.

While the use of cardiac catheterisations during acute admission declines with age, there has still been substantial increases in the use of this procedure among AMI patients aged 75–90 years (Figure 5.3).



Note: Cardiac catheterisation rates have been age-standardised to the 1991 Australian population aged 40–90 years.
Source: AIHW National Hospital Morbidity Database.

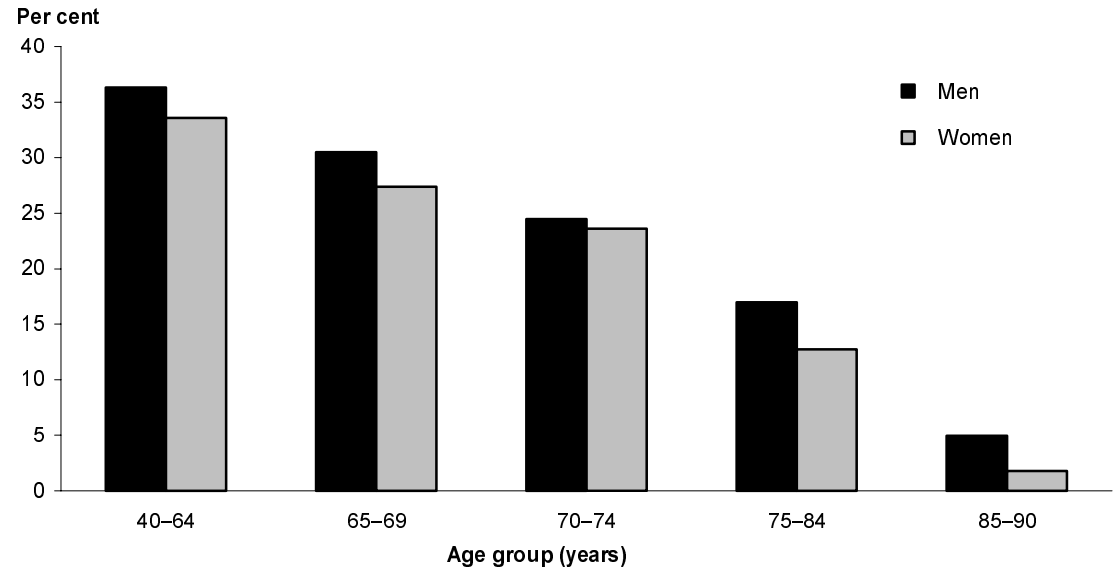
Figure 5.3: Proportion of AMI patients aged 40–90 years undergoing cardiac catheterisation during acute hospital admission, 1993–94 to 1999–00

Sex and age

In 1999–00, men aged 40–90 years admitted to hospital for an AMI were more likely to undergo a cardiac catheterisation during acute admission than women of the same age, with 28% of men and 18% of women undergoing this procedure (based on crude rates). Among 40–90 year-olds, cardiac catheterisation rates were higher for men than for women in all age groups, with the gender gap increasing with age (Figure 5.4 and Appendix Table A6).

Patient-based data from Perth indicate that the use of cardiac catheterisations among AMI patients during acute hospital admission in Perth is even greater than the national crude rates, being 45% for men and 33% for women aged 40–84 years in 1997. The proportion of Perth AMI patients receiving this procedure within 90 days from acute admission increased considerably to 61% of men and 41% of women aged 40–84 years (Appendix Table A7).

Nationally, the average age of AMI patients undergoing cardiac catheterisation during acute admission was 62 years for men and 67 years for women in 1999–00. Cardiac catheterisation use among AMI patients declined with advanced age, with men and women aged 40–64 years three times as likely to have a cardiac catheterisation than those aged 75–90 years. Cardiac catheterisation was performed on 3% of AMI patients aged 85–90 years compared with 36% of 40–64 year-olds (Figure 5.4).



Source: AIHW National Hospital Morbidity Database.

Figure 5.4: Age-specific rates for AMI patients undergoing cardiac catheterisation during acute hospital admission, 1999–00

Percutaneous coronary intervention

Percutaneous coronary intervention (PCI) is a newer term used to encompass all forms of percutaneous revascularisation, including percutaneous transluminal coronary angioplasty (PTCA) and coronary stenting. PTCA involves inserting a catheter with a balloon into a narrowed coronary artery. The catheter is first inserted into a leg or arm artery via the skin (percutaneous) 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. PTCA is used for discrete obstructions in patients with both single- and multi-vessel blockages.

PTCA is used mainly to treat patients with angina and is increasingly being used in the acute AMI setting (in which case it is referred to as primary PTCA). According to the National Angioplasty Register, in 1999 the main uses of PTCA were for stable angina (42% of cases), unstable angina[4] (42% of cases) and AMI (9% of cases). Furthermore, 13% of PTCA procedures were done on patients with previous CABG, and thrombolytic therapy was used before PTCA in 11% of procedures. In 1999, one in five PTCA procedures were repeats, and in 45% of such cases these repeats occurred within 12 months (AIHW: Davies & Senes 2002).

Although success rates for initial PTCA 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 as compared with PTCA 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 narrowing occurs.

The capacity to perform PCI depends on the number of catheterisation laboratories available. According to the National Angioplasty Register there were 122 PCI cardiologists in the 57 interventional cardiology units throughout Australia in 1999, an increase of 14% and 24%, respectively, from 1998 (AIHW: Davies & Senes 2002). This compares with 579 practising cardiologists reported in the Medical Labour Force Survey in 1998 (AIHW 2000).

Aggregate trends in PCI use

In 1999, there were 19,444 PCIs performed in Australia, an increase of 7% from 1998. In 1980 when this procedure was first introduced there where 11 PCIs performed in Australia. A recent study conducted by the OECD has shown that Australia has one of the highest levels of PCI use per capita, exceeded only by the United States, Germany and Belgium (300–400 PCIs per 100,000 population aged 40–90 years). Australia, Norway, Canada and Denmark were performing PCIs at a similar rate in 1998 (around 150–250 PCIs per 100,000 population aged 40–90 years), while Finland, Italy and the United Kingdom have the lowest usage rates for PCIs of the countries included in the study (OECD 2002).

While the overall use of PCIs in Australia has increased dramatically since the 1980s, its growth has slowed in more recent years, based on age-standardised rates (10% increase between 1998–99 and 1999–00 compared with annual rates of increase of around 13–23% between 1993–94 and 1997–98 among 40–90 year-olds) (Appendix Table A5).

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4. Stable angina is where there is no associated blood clot and the heart muscle is not in immediate danger. Unstable angina is marked by clots that tend to resolve but threaten to develop into a full heart attack.

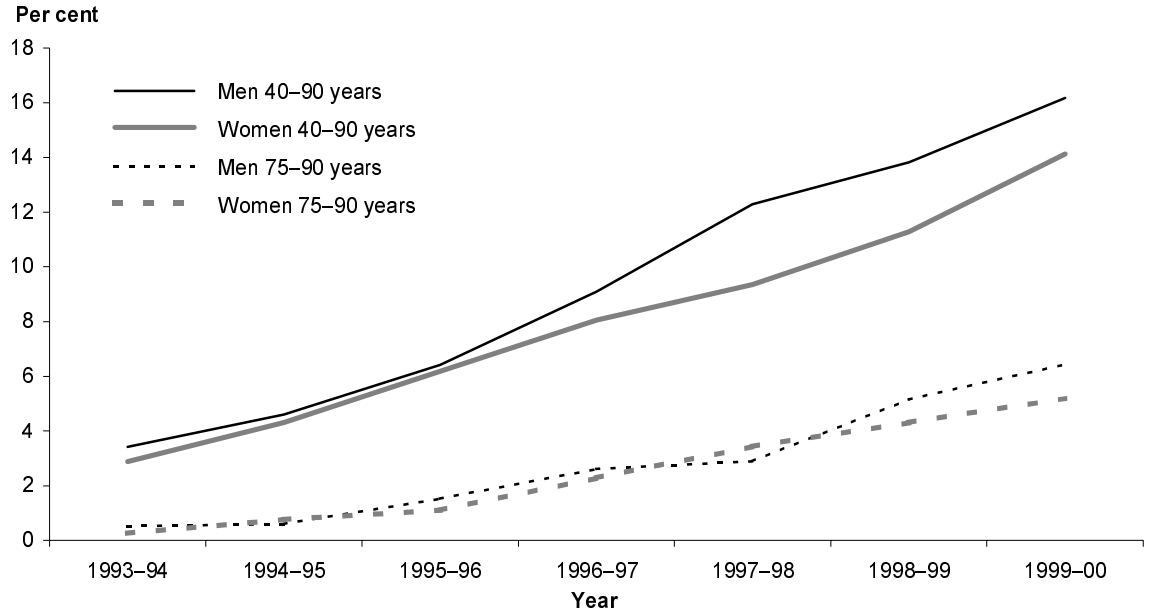
PCI use during acute admission for acute myocardial infarction

In 1999–00, 12% of AMI patients aged 40–90 years (3,260 patients) underwent a PCI during acute hospital admission (Appendix Table A6). The number of AMI patients receiving PCI may in fact be larger, as around 6–10% of AMI patients are treated with PCI and successfully discharged within 2 days of acute admission (AIHW: Davies & Senes 2002).

Recent trends

Between 1993–94 and 1999–00 there has been almost a fivefold increase in the utilisation rates of PCIs during acute hospital admission among AMI patients aged 40–90 years, based on age-standardised rates (Figure 5.5). The proportion of AMI patients aged 40–90 years undergoing PCIs during acute admission has increased from a crude rate of 2% to 12% over this period, which is an increase in the number of PCIs performed from 609 in 1993–94 to 3,260 in 1999–00. The growth in PCIs among AMI patients appears to be slowing in more recent years, with annual rates of increase between 1998–99 and 1999–2000 of 12–25% compared with growth rates of 35–50% in the mid-1990s.

While the use of PCIs during acute admission declines with age, there have still been substantial increases in the use of this procedure among AMI patients aged 75–90 years (Figure 5.5).



Note: PCI rates have been age-standardised to the 1991 Australian population aged 40–90 years.
Source: AIHW National Hospital Morbidity Database.

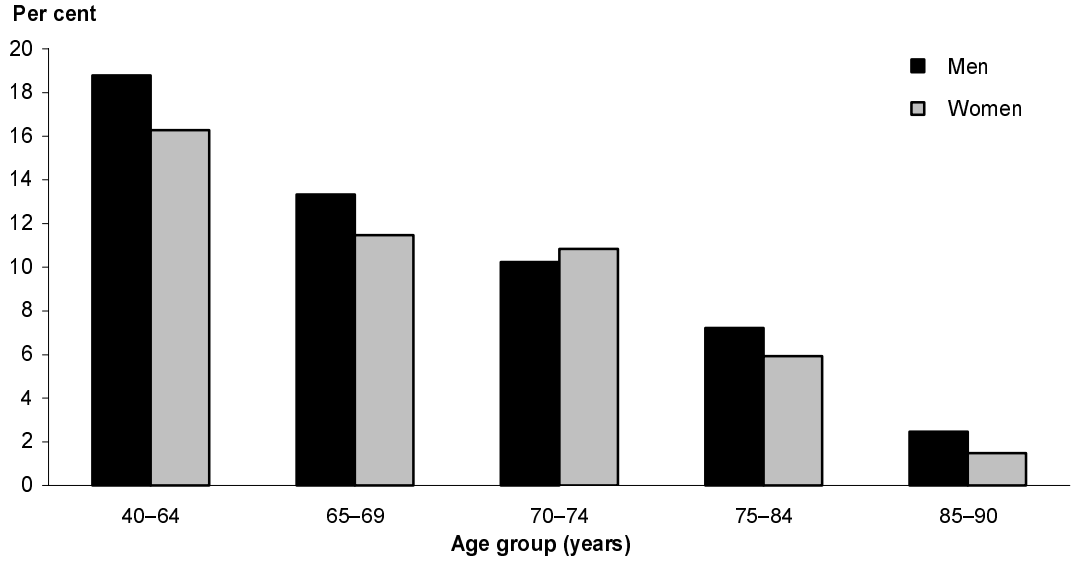
Figure 5.5: Proportion of AMI patients aged 40–90 years undergoing PCI during acute hospital admission, 1993–94 to 1999–00

Sex and age

In 1999–00, men aged 40–90 years admitted to hospital for an AMI were more likely to undergo a PCI during acute admission than women of the same age, with crude rates indicating that 13% of the men and 9% of the women aged 40–90 years had this procedure (Figure 5.6 and Appendix Table A6).

Patient-based data from Perth indicate that the use of PCI among AMI patients during acute hospital admission is even greater than the national crude rates, being 22% for men and 14% for women aged 40–84 years in 1997. The proportion of Perth AMI patients aged 40–84 years receiving this procedure within 90 days from acute admission increased to 27% for men, while for women there was no significant increase in the proportion of such patients (Appendix Table A8).

Nationally, the average age of AMI patients undergoing PCI during acute admission was 60 years for men and 66 years for women in 1999–00. The use of PCI among AMI patients declined with advancing age, being over three times as common among 40–64 year-olds as among 75–90 year-olds. PCI was seldom performed on AMI patients aged 85–90 years (less than 2%) compared with rates of around 18% for those aged 40–64 years (Figure 5.6).



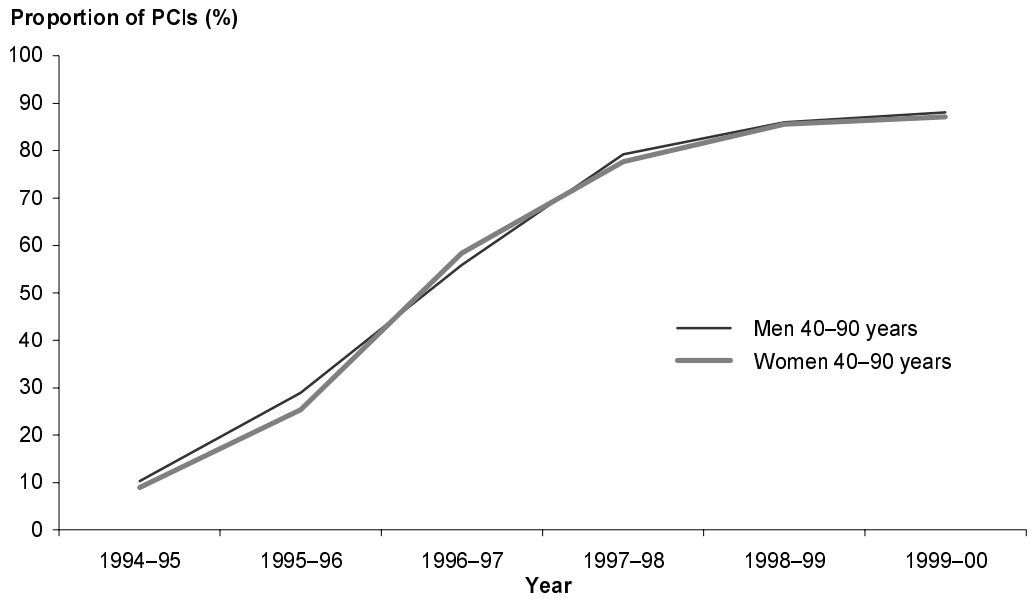
Source: AIHW National Hospital Morbidity Database.

Figure 5.6: Age-specific rates for AMI patients undergoing PCI during acute hospital admission, 1999–00

Coronary stenting

Since the mid-1990s there has been a rapid increase in the use of coronary stenting as an adjunct to coronary angioplasty. In 1999, stents were inserted in 92% of patients undergoing a PCI (11,968 patients), a sharp increase from 1994 where the figure was 11%. Data from the National Angioplasty Register in 1999 indicate that coronary angioplasty, including the use of stents, achieves an adequate reduction in the lesion in 95% of lesions attempted (AIHW: Davies & Senes 2002).

Among AMI patients aged 40–90 years stents were inserted in 88% of PCI procedures in 1999–00. As shown in Figure 5.7, the greatest increase in stent use among AMI patients aged 40–90 years occurred between 1994–95 and 1996–97 where the use of stents increased two- to threefold each year. Since then their rate of use has slowed somewhat, increasing by 9–10% per year between 1997–98 and 1998–99 and 2–3% per year between 1998–99 and 1999–00.



Note: Rates have been age-standardised to the 1991 Australian population aged 40–90 years.
Source: AIHW National Hospital Morbidity Database.

Figure 5.7: Proportion of stents inserted in PCI procedures among AMI patients aged 40–90 years, 1994–95 to 1999–00

Coronary artery bypass grafting

Coronary artery bypass grafting (CABG) involves opening the patient's chest. The obstructions in the coronary vessels are bypassed by veins taken from the patient's legs and/or arteries from the chest wall. According to the National Cardiac Surgery Register, in 1998 the average number of bypass grafts was three per patient, and 6% of CABGs were for re-operations (AIHW: Davies & Senes 2001). CABG is rarely used as a first-line treatment for AMI. However, for some patients it may be needed as an adjunct to other procedures to treat a 'mechanical' complication of the AMI or to reduce symptoms and pain as well as recurrent attack after receiving first-line treatment.

The capacity to perform CABG depends on the number of hospitals equipped to undertake cardiac surgery. According to the National Cardiac Surgery Register, in 1999 there were 74 cardiothoracic surgeons operating in 52 cardiac surgery units throughout Australia, all located in acute care hospitals in urban or metropolitan areas. This compares with 97 practising cardiothoracic surgeons reported in the Medical Labour Force Survey in 1998 (AIHW 2000).

Aggregate trends in CABG use

CABG was developed in the 1960s and since then its use has grown rapidly in Australia. In 1980 there were 3,816 CABG procedures performed in Australia. By 1996 the procedures reached a height of 17,759, falling to 17,321 in 1999. While the use of this procedure increased rapidly in the 1970s and 1980s, in more recent years it has declined, based on age-standardised rates (5–6% decline among 40–90 year-olds between 1993–94 and 1999–00) (Appendix Table A5).

CABG use during acute admission for acute myocardial infarction

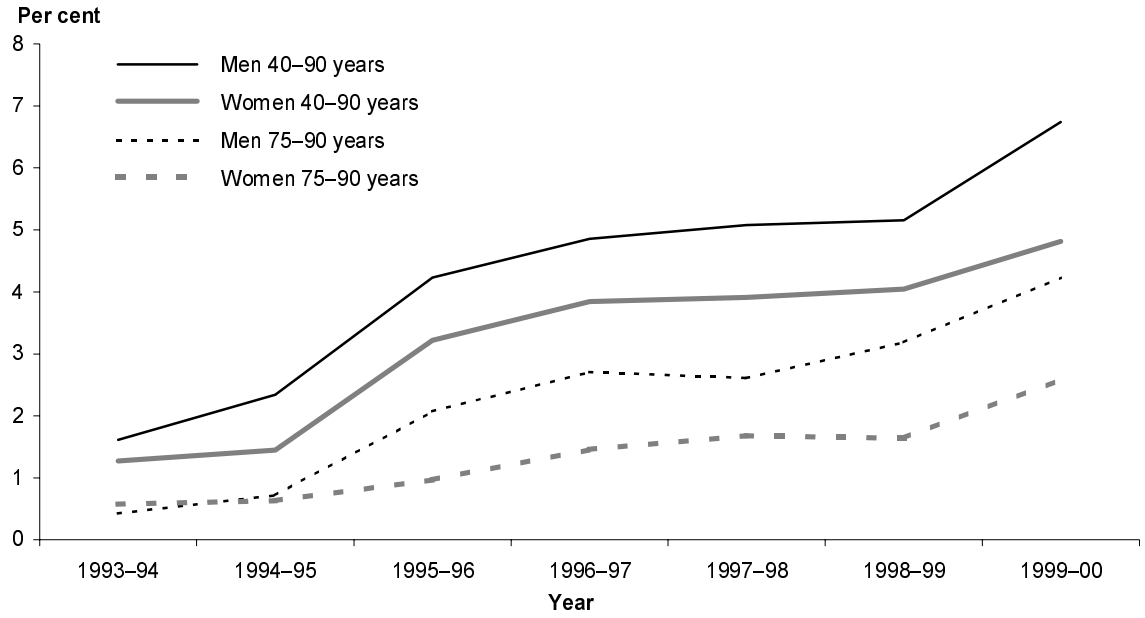
In 1999–00, 5% of AMI patients aged 40–90 years (1,491 patients) underwent a CABG during acute hospital admission (Appendix Table A6). The risk associated with having CABG is generally much greater following an AMI, and PCI is the more frequent choice for revascularisation in this situation. The main use of CABG is still overwhelmingly for patients with significant angina where drug treatment has not improved their condition sufficiently, rather than for those who have suffered a heart attack.

A comparative study on cardiac treatment patterns undertaken by the OECD has shown that the use of CABG in treating AMI in the United States is considerably higher than in all other countries. Such use in Australia, particularly for women, is higher than in Belgium, Canada, Italy, Sweden and Spain across most age groups. The United Kingdom had the lowest rate for this procedure among the seven OECD countries supplying this data (OECD 2002).

Recent trends

Between 1993–94 and 1999–00 there was a fourfold increase in the rate of CABGs for AMI patients aged 40–90 years during acute hospital admission (based on age-standardised rates) (Figure 5.8). The crude rates are still, however, relatively low at 5% in 1999–00 and have come from a very low base of 1% in 1993–94. This is an increase in the number of CABGs from 341 in 1993–94 to 1,491 in 1999–00.

While CABG use during acute admission declines with age, there have still been significant increases in the use of this procedure among those aged 75–90 years (Figure 5.8).



Note: CABG rates have been age-standardised to the 1991 Australian population aged 40–90 years.
Source: AIHW National Hospital Morbidity Database.

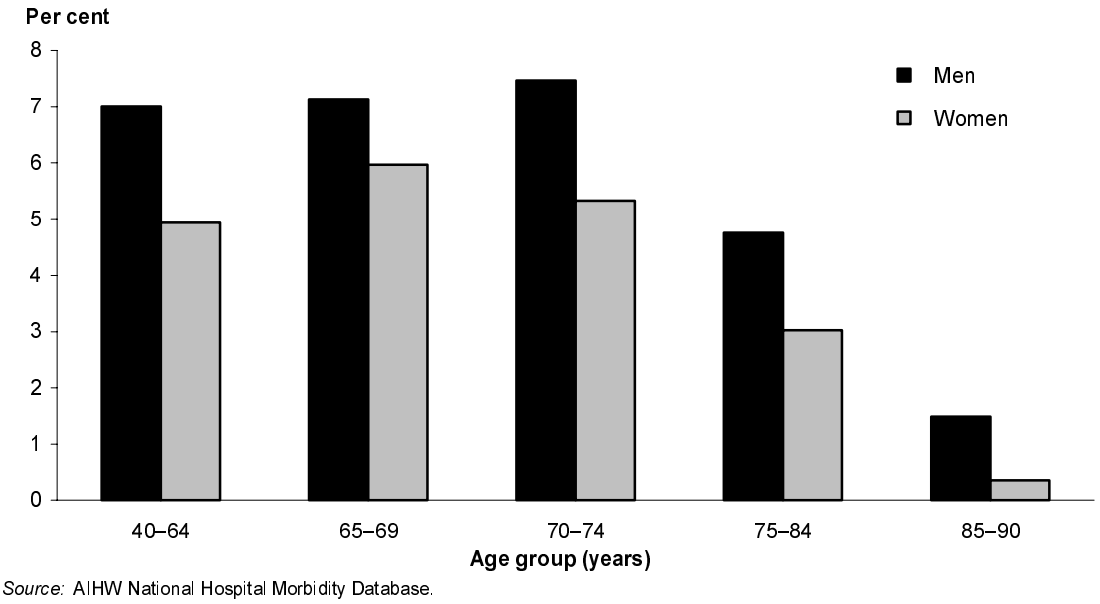
Figure 5.8: Proportion of AMI patients aged 40–90 years undergoing CABG during acute hospital admission, 1993–94 to 1999–00

Sex and age

In 1999–00, men aged 40–90 years admitted to hospital for an AMI were more likely to undergo CABG during acute admission than women of the same age, with crude rates indicating that 6% of men and 4% of women had this procedure. Among 40–90 year-olds CABG rates were higher for men than women across all age groups (Figure 5.9 and Appendix Table A6).

Given that CABG is a very intensive procedure that requires considerable planning, time after admission is an important factor to consider. Patient-based data from Perth indicate that the proportion of AMI patients aged 40–84 years receiving CABG increased significantly between acute admission and within 90 days and 1 year from acute admission. For men the proportions increased from 6% to 12% to 16% respectively, and for women the corresponding proportions were 4%, 7% and 9% in 1997 (Appendix Table A9).

Nationally, the average age of AMI patients undergoing CABG during acute admission was 64 years for men and 69 years for women in 1999–00. Among AMI patients aged 40–74 years, CABG use remained relatively stable and declined thereafter, a different pattern to that observed for cardiac catheterisation and PCI where use of these procedures declines with age. AMI patients aged 40–64 years were twice as likely to receive a CABG as those aged 75–90 years. In fact, CABG was rarely performed on AMI patients aged 85–90 years (less than 1%) while for 40–74 year-olds utilisation rates were approaching 7% (Figure 5.9).



Source: AIHW National Hospital Morbidity Database.

Figure 5.9: Age-specific rates for AMI patients undergoing CABG during acute hospital admission, 1999–00

5.4 Outcomes of acute care interventions

Health outcomes are often used to monitor the performance of the health system. Outcomes are measured in terms of a variety of indicators, including mortality and morbidity through to quality of life measures. As with most diseases, CHD outcomes are difficult to measure and as a result there are limited data. Case-fatality is often used to measure health outcomes, as it is relatively easy to measure. It is a suitable outcome indicator for AMI because the high death rate from heart attacks allows scope to detect improvements.

Among Australians having a heart attack, about one in four will die within an hour of their first-ever symptoms and almost nine in ten coronary deaths will occur before the person reaches hospital (see Chapter 3). In measuring the outcomes for acute care interventions for AMI, deaths that occur after admission to hospital (in-hospital case-fatality) are of interest. In this report in-hospital case-fatality is defined as the number of AMI deaths in hospital divided by the number of AMI hospital admissions. Estimates of case-fatality for any subgroup only include those events that belong to that subgroup.

Note that in-hospital case-fatality based on cross-sectional data may underestimate case-fatality due to double-counting of individuals readmitted for AMI. In addition, in-hospital case-fatality based on acute admission should be interpreted with caution as differences in length of stay may account for some differences in case-fatality.

In 1999–00, 3,258 AMI patients (or 12% of AMI patients) died in hospital.

Recent trends

Over the last decade, in-hospital case-fatality during acute admission for AMI patients aged 40–90 years has been declining steadily, with age-standardised rates falling by 19% for men and 17% for women between 1993–94 and 1999–00 (Figure 5.11). The number of in-hospital deaths during acute admission for AMI patients aged 40–90 years has declined from 3,520 in 1993–94 to 3,258 in 1999–00.

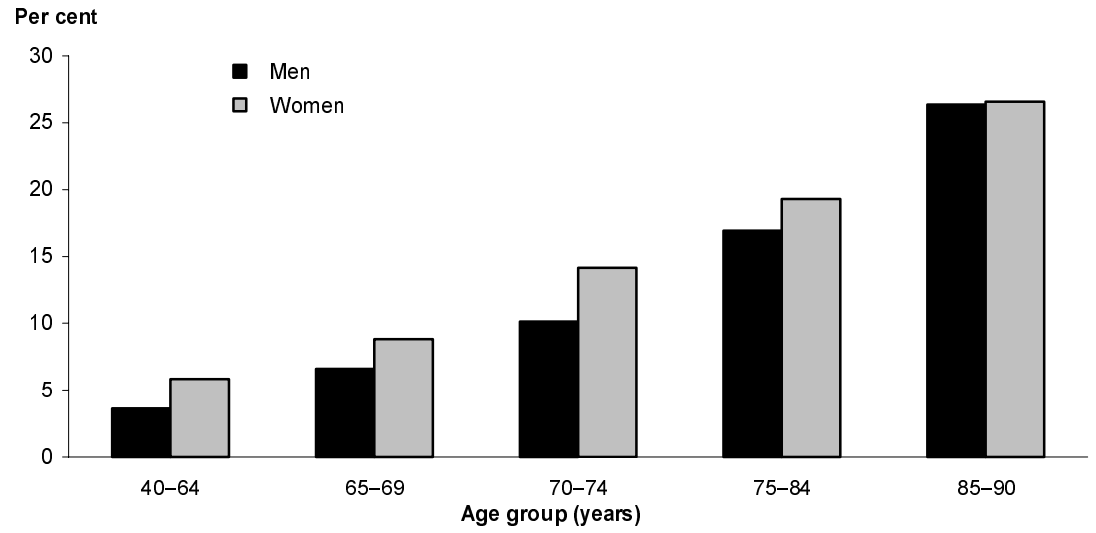
For AMI patients aged 40–90 years undergoing cardiac catheterisation, PCI or CABG during acute admission, the trend in in-hospital case-fatality rates over the last decade has not been as stable as for AMI patients overall, as illustrated in Figure 5.11. For both men and women there has been no significant decline in in-hospital case-fatality rates for those receiving these interventions between 1993–94 and 1999–00.

Sex and age

AMI patients overall

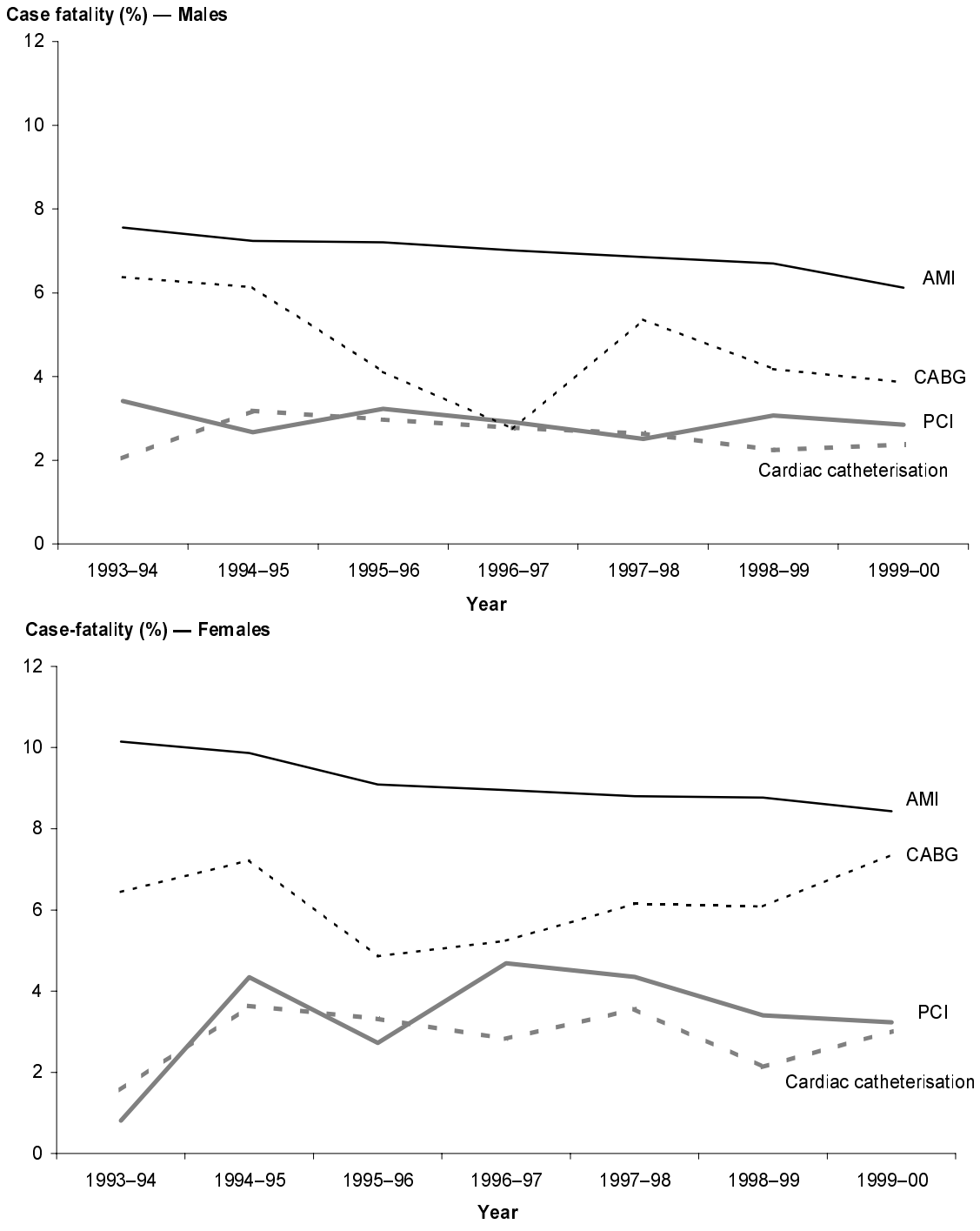
In 1999–00, women aged 40–90 years admitted to hospital for an AMI were more likely to die during their acute admission than men of the same age, after adjusting for age. Crude in-hospital case-fatality rates were also higher for women than for men, with 16% of women and 9% of men dying in hospital following an AMI. Among 40–84 year-olds, in-hospital case-fatality rates were higher for women than men across all age groups. However, among 85–90 year-olds rates were generally similar for men and women (Figure 5.10).

In 1999–00, the average age of AMI patients who died during their acute hospital admission was 75 years for men and 79 years for women, with these patients on average 6–9 years older than those who survived. In-hospital case-fatality rates increase rapidly with advanced age, from around 4% among 40–64 year-olds to 10% among 65–74 year-olds and 20% among 75–90 year-olds. Over a quarter (26%) of AMI patients aged 85–90 years died during their acute hospital admission (Figure 5.10).



Source: AIHW National Hospital Morbidity Database.

Figure 5.10: Age-specific in-hospital case-fatality rates for AMI patients during acute hospital admission, 1999–00



Note: Rates have been age-standardised to the 1991 Australian population aged 40–90 years.

Source: AIHW National Hospital Morbidity Database.

Figure 5:11: In-hospital case-fatality rates for AMI patients aged 40–90 years during acute hospital admission, 1993–94 to 1999–00

AMI patients undergoing cardiac catheterisation, PCI or CABG

In 1999–00, AMI patients aged 40–90 years undergoing cardiac catheterisation, PCI or CABG during acute admission were less likely to die in hospital than AMI patients overall (3.1%, 3.5%, 5.4% and 11.6% respectively) (Table 5.1). AMI patients undergoing these interventions were younger than AMI patients overall; however, it is not known whether these patients had more severe disease than those not receiving these interventions. In-hospital case-fatality rates were significantly higher for AMI patients undergoing CABG (5.4%) than for those who had PCI or cardiac catheterisation (3.1% and 3.5% respectively) during acute admission. According to the National Cardiac Surgery and Angioplasty Registers, overall mortality rates for PCI and CABG were 0.8% (in 1999) and 2.1% (in 1998), respectively, a considerably lower death rate than for AMI patients undergoing these procedures (AIHW: Davies & Senes 2002; AIHW: Davies & Senes 2001).

In-hospital case-fatality rates during acute admission vary considerably between men and women depending on the procedure performed. For example in 1999–00, after adjusting for age, women aged 40–90 years undergoing CABG were twice as likely to die after this procedure as men of the same age, while for cardiac catheterisation the gender difference, although still higher among women, was not as marked (the female rate was 1.3 times the male rate). For PCI there was no significant difference in in-hospital case-fatality rates between men and women (Table 5.1).

In-hospital case-fatality rates for cardiac catheterisation, PCI and CABG during acute admission increase markedly with age, a similar pattern to that for AMI patients overall. Mortality rates among 75–90 year-olds were 3–4 times higher than for 40–64 year-olds (Table 5.1).

Table 5.1: In-hospital case-fatality rates for AMI patients during acute admission, 1999–00

	40–64	65–69	70–74	75–84	85–90	40–90	40–90
	Per cent						Number
Men							
AMI patients overall	3.7	6.6	10.1	16.9	26.4	9.3	1,665
AMI patients undergoing:							
cardiac catheterisation	1.5	2.9	4.0	6.3	6.0	2.7	136
PCI	2.0	3.3	5.3	5.7	8.0	3.0	73
CABG	2.5	6.2	5.2	8.7	13.3	4.7	53
Women							
AMI patients overall	5.8	8.8	14.2	19.3	26.6	15.9	1,593
AMI patients undergoing:							
cardiac catheterisation	2.2	3.1	3.5	7.9	6.7	4.1	76
PCI	2.1	2.5	7.7	7.8	8.0	4.9	42
CABG	7.0	3.2	6.0	10.7	33.3	7.7	28
Persons							
AMI patients overall	4.1	7.3	11.7	18.1	26.5	11.6	3,258
AMI patients undergoing:							
cardiac catheterisation	1.6	3.0	3.8	6.9	6.3	3.1	212
PCI	2.0	3.1	6.3	6.6	8.0	3.5	115
CABG	3.2	5.4	5.5	9.4	19.0	5.4	81

Notes

1. AMI patients are defined as those admissions with a principal diagnosis of AMI and length of stay greater than 2 days, and includes those that died within 2 days of admission.
2. In-hospital case-fatality defined as number of AMI deaths in hospital divided by the number of AMI hospital admissions.

Source: AIHW National Hospital Morbidity Database.

5.5 Discussion

This chapter has highlighted the rapid increases in the use of cardiac catheterisation, PCI and CABG among AMI patients over the last decade. Men are far more likely than women to be admitted to hospital for an AMI; although once admitted the gender-based differences in treatment reduce. In-hospital case-fatality rates for AMI have improved, but the mortality rate is significantly higher in women than in men. In-hospital case-fatality rates for AMI patients undergoing CABG are considerably higher than for PCI and cardiac catheterisation, but still lower than for AMI patients overall.

Trends in AMI admissions and cardiac procedures

While age-adjusted hospital admission rates for AMI have been declining gradually over the last decade, the total number of AMI admissions has not declined due to the growing number of elderly, at-risk individuals. However, the use of cardiac procedures among AMI patients, both in numbers and rates, has increased considerably over this same period.

Among AMI patients aged 40–90 years, rates of cardiac catheterisation use has doubled, PCI use has increased fivefold and CABG use has quadrupled.

The rapid increase in the use of PCIs may be due to the dramatic increase in the use of coronary stents in the mid-1990s. Stenting has been shown to improve outcomes by reducing the incidence of recurrent ischaemia and the need for subsequent target-vessel revascularisation (Grines et al. 1999). Recent clinical trials have also found that primary PCI decreases short-term mortality and incidence of recurrent infarction at least as effectively as thrombolytic therapy (Berger et al. 1999). The greater increase in the use of PCIs compared with CABGs may be due to the lower risk involved with PCI procedures, and also to the refinement of the PCI procedure in recent years, so that patients who previously would have undergone CABG are perhaps now receiving the less invasive PCI procedure.

Age and sex

In 1999–00, there were 28,002 hospital admissions for AMI among 40-90 year-olds. At least one in eight AMI patients received PCI during their acute hospital admission, one in twenty had CABG, and one in four underwent the diagnostic procedure of cardiac catheterisation during their acute hospital admission.

Men are twice as likely as women to be admitted to hospital for an AMI. Data from the Framingham study has indicated that women with CHD are more likely to present with angina pectoris initially, whereas men more often first present with myocardial infarction. It has also been shown that diagnosing CHD is more difficult in women than in men even with the aid of non-invasive tests (Mark 2000). However, when severity is taken into account (i.e. by including only AMI patients) sex-based differences in these cardiac procedures tend to diminish.

Compared with AMI patients overall, those receiving cardiac catheterisation, PCI and CABG tend to be 4–8 years younger. Older Australians (75–90 year-olds) are far more likely to be admitted to hospital for an AMI than 40–64 year-olds, but once admitted the younger AMI patients are far more likely to undergo cardiac catheterisation, PCI or CABG than older patients. Low use of these treatments among the very old is not a surprising finding since procedure use for most treatments declines with advanced age because of increased comorbidities and the greater likelihood of postoperative complications.

In-hospital case-fatality

Almost one in eight people admitted to hospital for an AMI die in hospital. In-hospital case-fatality rates for AMI patients undergoing cardiac catheterisation, PCI and CABG were less than 6% in 1999–00.

Over the last decade in-hospital case-fatality rates for AMI have improved, with Australia experiencing declines in case-fatality in the vicinity of 17–19%. Major advances in diagnosis and treatment of cardiac patients have contributed to this decline. Hunink and others estimated that improvements in the treatment of patients with CHD explained about 71% of the decline in overall CHD mortality in the United States between 1980 and 1990. This chapter has shown that, while there have been rapid increases in the use of cardiac catheterisation, PCI or CABG among AMI patients, there has been no significant improvement in in-hospital case-fatality rates for these procedures over the last 7 years. This could reflect a trend to intervene with PCI or CABG in sicker patients who would otherwise have higher mortality. There is a need for risk-adjusted data to examine questions such as these.

Women are more likely to die in hospital following an AMI than men. The difference in case-fatality rates between men and women is even greater for AMI patients undergoing CABG, where the female death rate is twice the male rate. For cardiac catheterisation the gender difference is not as marked and for PCI there is no significant difference in in-hospital mortality rates between men and women. The higher mortality rates among women have been attributed to less intense use of both pharmacological and device-based therapies, biological factors and perhaps presentation later in the course of the disease process, older age, and more severe cardiovascular risk profiles (Mehilli et al. 2002). The considerably higher in-hospital case-fatality rates for women undergoing CABG could be due to the smaller size of coronary arteries in women, which could increase the likelihood of perioperative and postoperative complications (Vaccarino et al. 2002).

In-hospital case-fatality rates increase markedly with age with one in five AMI patients aged 75 years and over dying in hospital, compared with around 4% among 40–64 year-olds.