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Cardiac surgery in Victorian public hospitals, 2009–10

Public report

State Government Victoria

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Foreword

Annual Victorian report of the ASCTS database 2009–10

This report of the Australasian Society of Cardiac and Thoracic Surgeons (ASCTS) database covers the period from 1 July 2009 to 30 June 2010. It presents a record and analysis of all cardiac surgical procedures performed in the participating cardiac surgery units.

As in previous annual reports, an evaluation of the results of units and surgeons revealed that the accustomed high standards of performance continue.

This data is presented in the format of the previous eight reports. Review of the last five years' data reveals some trends that are described in ensuing pages.

Further analyses of unit and surgeon performance in the form of control charts and cumulative sum (CUSUM) plots has been continued this year.

The second biennial review of the dataset and definitions are complete. The major changes were more precise characterisation of preoperative acute myocardial infarction (AMI) and introduction of a section on antifibrinolytic use and a section to record prosthetic details. The web-based communication system commenced in October 2008.

National Death Index (NDI) data linkage, which is a part of our data verification program, has identified a number of probable deaths that were not previously reported to the Data Management Centre. However, this information has to be verified with the units involved before inclusion. Any necessary corrections will therefore be made in next year's report.

In this report (and future reports), intra-operative insertion of a left ventricular (LV) electrode, when performed in conjunction with coronary or valve surgery, will no longer by itself qualify for analysis in the 'other' group. This correction will also be applied retrospectively. Therefore, the numbers of isolated coronary grafts and valve procedures will increase slightly.

Once again, I would like to thank the members of the steering committee, their data managers and the staff of Monash University's School of Public Health and Preventive Medicine for their perceptive and persisting contribution.

This database project is pleased to acknowledge the Department of Health (Victoria) for its encouragement, guidance and funding, which initiated and has assured the continuance of this important and pioneering project.

Gil Shardey
Chairman
Steering Committee

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Data presentation

Data reporting from the ASCTS registry occurs at the end of each financial year. Therefore, data for the 2009–10 financial year includes all cases performed in participating units from 1 July 2009 to 30 June 2010.

Data from previous years (2005–06 to 2008–09) includes all cases from participating units from 1 July 2005 to 30 June 2009.

In this report, mortality includes all deaths in the six participating hospitals prior to discharge at any time plus all deaths after discharge within 30 days of the surgical date.

Cases with missing data fields for ‘operation status’ and ‘procedure type’ were excluded from the analyses. For this year, one case was excluded.

Public report

Introduction

The Australasian Society of Cardiac and Thoracic Surgeons (ASCTS), together with the Victorian Department of Health, developed a program to collect data in reference to, and report on, cardiac (heart) surgery in Victorian hospitals.

This is the ninth report of the program. It describes the data from surgery performed between 1 July 2009 and 30 June 2010 at six specialist cardiac surgery units within Victorian public hospitals. These include:

- Austin Hospital
- Geelong Hospital
- Monash Medical Centre – Clayton
- St Vincent's Hospital
- The Alfred
- The Royal Melbourne Hospital.

This report provides an overview of the patients who underwent surgery, the types of surgery performed, complications encountered, and other details relating to risk and the outcomes of surgery.

Who received cardiac surgery?

For the 12-month reporting period, 2,740 people underwent 2,763 cardiac surgical procedures in the six participating Victorian public hospitals. This represents an increase of 1.8 per cent in patients and 2.2 per cent in procedures on the previous year. Overall, the demographic data in this period is similar to that of the previous years, although there is a further increase in the proportion of patients aged over 80 years.

The risk of heart disease and/or surgical complications is influenced by a number of factors including: age; underlying health conditions such as diabetes; elevated cholesterol levels and high blood pressure; lifestyle choices such as smoking; and previous medical interventions such as a previous heart operation. Table 1 outlines the proportion of patients with several of these risk factors.

Nearly three-quarters of the patients were aged 60 years and over (as shown in Figure 1). The average age was 66 years and approximately 72 per cent of the patients were male. In the group of patients who underwent cardiac surgery in 2009–10:

- one in seven were current smokers
- approximately one in three had diabetes
- approximately three in four had high blood pressure at a level requiring treatment
- almost one in five had had previous heart intervention, of whom around half had a previous angioplasty and the remainder had some type of heart surgery
- the proportion of elective patients being admitted to hospital on the day of their operation (rather than a day or two prior) remained unchanged from the previous year.

Figure 1: Age distribution of patients having cardiac surgery in Victorian public hospitals during 2009–10

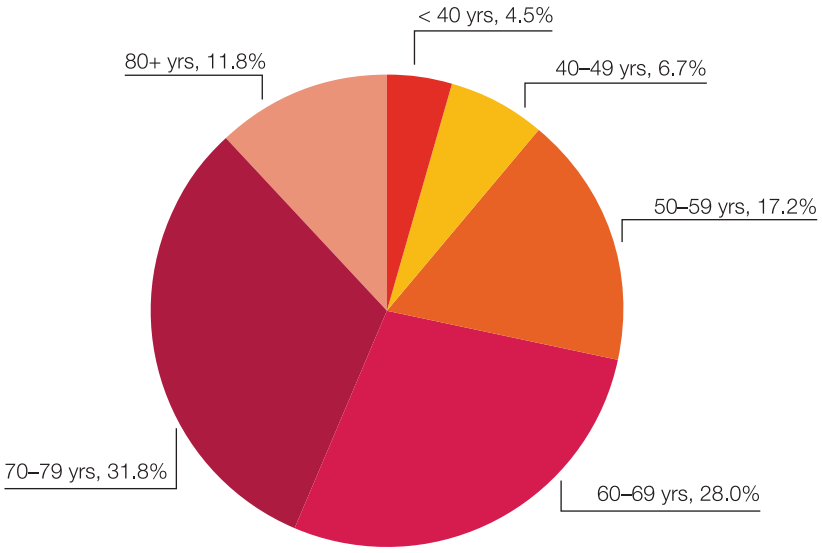


Table 1: Patient demographics and risk factors

	2006–07	2007–08	2008–09	2009–10
Total number of patients included	2,594	2,629	2,692	2,740
Total number of procedures included	2,606	2,642	2,703	2,763
Risk factors	%	%	%	%
Current smoker	15	14	15	14
Diabetes	30	29	30	30
Hypertension (high blood pressure)	70	71	72	73
Cerebrovascular disease (e.g. stroke)	12	13	13	14
Peripheral vascular disease12	9	11	10	
Cardiac history				
Previous cardiac intervention	19	19	21	21
This included:				
previous CABG	3	3	4	4
previous valve repair/replacement	3	3	3	3
previous PTCA/stent	11	11	13	12
Myocardial Infarction	43	42	41	39
This included:				
MI less than 21 days before surgery	19	20	20	20
Congestive heart failure	28	25	21	22
Admission				
Admitted on the day of surgery	54	46	49	49

PTCA = percutaneous transluminal coronary angioplasty

MI = myocardial infarction

What operations were performed?

The main operations were:

- isolated coronary artery bypass graft (CABG) surgery – 55 per cent of procedures
- isolated heart valve repair or replacement – 17 per cent
- a combination of these two procedures – 12 per cent.

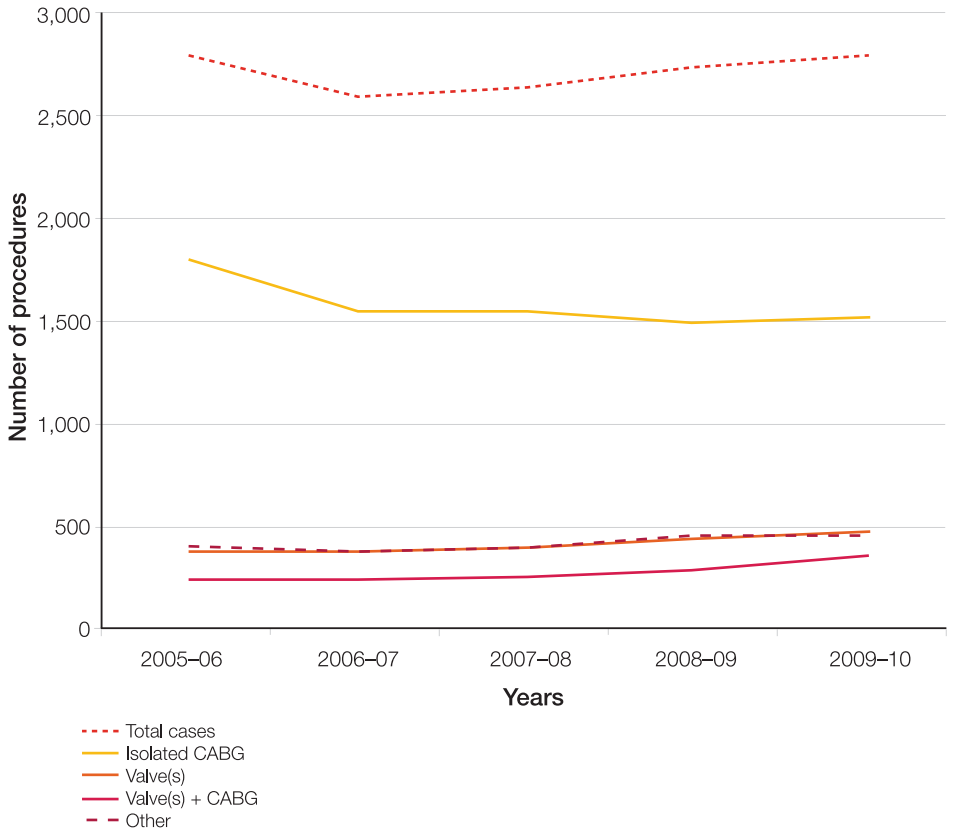
The remaining 16 per cent were less common procedures.

Figure 2 shows the trends of cardiac operations over the past five years.

A **CABG** is a surgical procedure where new channels are created around blocked or narrowed arteries to allow blood to reach the heart muscle again.

A **heart valve operation** is performed on a valve that is too narrow to allow sufficient blood to flow through the valve opening or on a valve that cannot close tightly enough to prevent blood from flowing in the wrong direction in the heart. When a valve cannot be repaired, it can be replaced with a substitute valve.

Figure 2: Total cardiac operations in the six Victorian hospitals, 2005–06 to 2009–10



How successful was surgery?

The data collected show that cardiac surgery in Victorian hospitals is very safe by world standards. Short-term success can be measured as the number of complications and deaths that occur. In both these areas the Victorian outcomes were comparable to, or in some cases better than (lower), those from the United States (US) and the United Kingdom (UK).

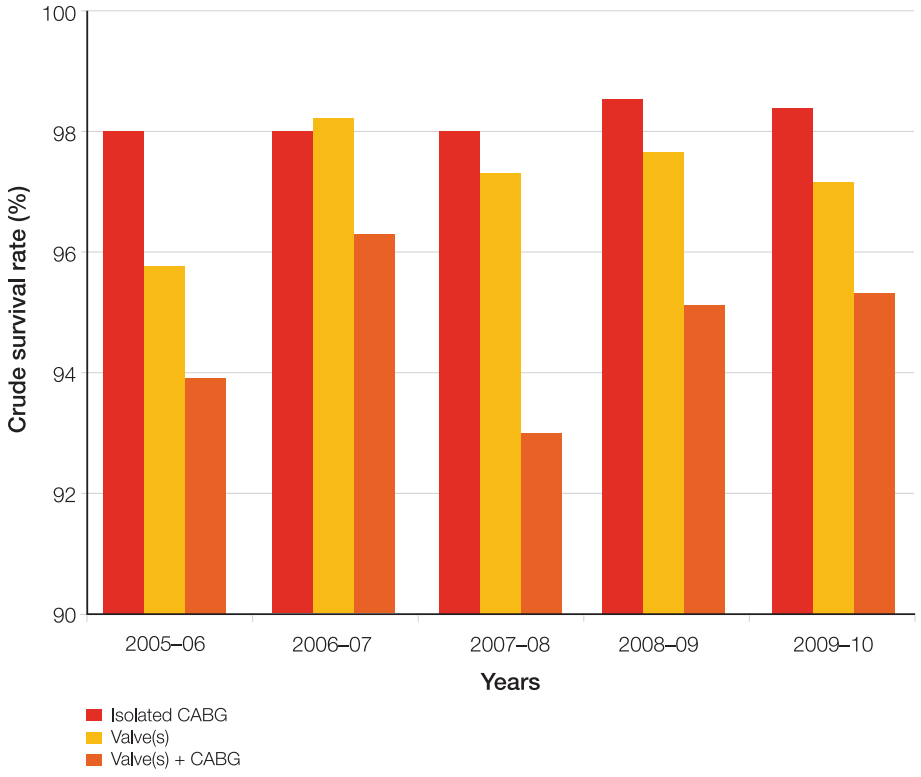
It is important to remember that individuals undergoing these operations have serious heart conditions and are generally in poorer health. They are at greater risk of complications following surgery compared with people in good health. Additionally, older age increases the risk of surgery.

Survival rates from cardiac surgery

The survival rate associated with cardiac surgery is calculated based on the number of deaths in hospital or within 30 days following surgery. Of the patients who had isolated CABG or isolated valve surgery this year, approximately 99 per cent survived, while approximately 97 per cent of patients who had a combination of valve and coronary operations survived after surgery.

This year there was no significant change in survival rates. This information is presented in Figure 3.

Figure 3: Survival rates for different cardiac operations in the six Victorian public hospitals, 2005–06 to 2009–10



Factors affecting the outcomes of CABG

The remainder of this report focuses on the risk factors and outcomes of patients undergoing isolated CABG procedures. CABG is the most common operation performed annually and detailed information is available from each hospital.

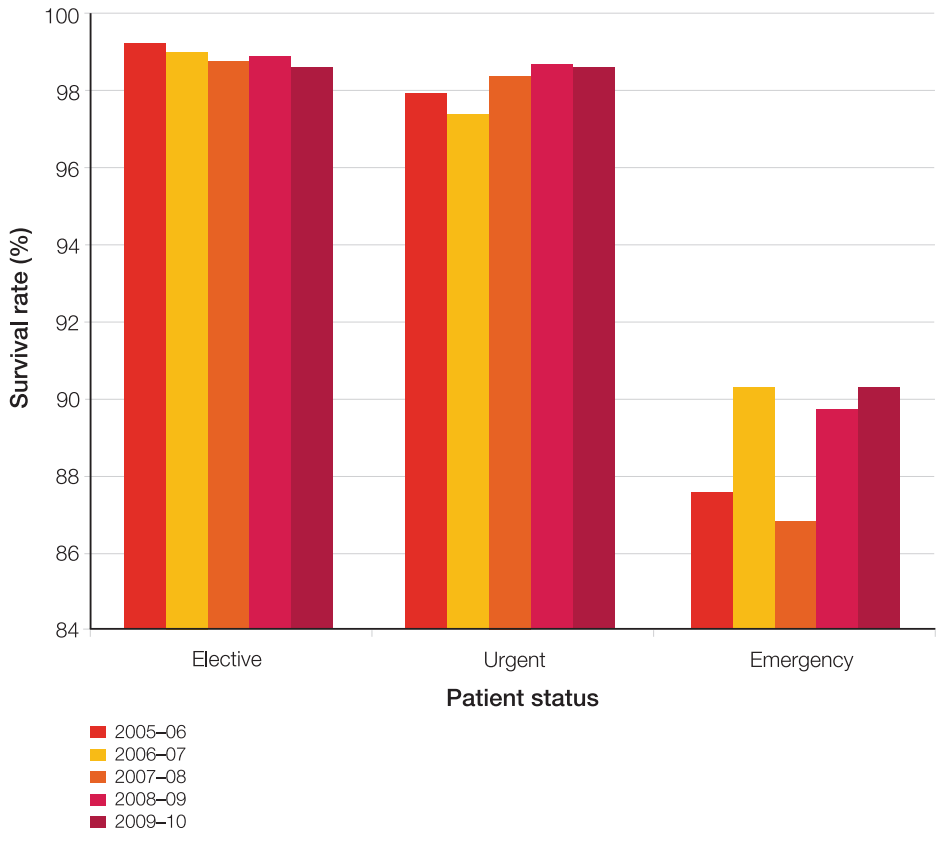
Clinical urgency

Patients who undergo cardiac surgery present with varying degrees of clinical urgency. Ideally, a heart condition should be diagnosed at a time when surgery can be planned at a convenient (or elective) time. However, this is not always the case and there is a proportion of patients who require almost immediate surgery from the time of clinic presentation. The urgency of cases presented to Victorian public hospitals for cardiac surgery in 2009–10 is described below.

- A little more than two-thirds of the patients (70 per cent) were classified as elective cases.
- One-quarter of all cases were classified as urgent (needing surgery for clinical reasons during the presenting admission).
- Approximately 3.4 per cent presented as an emergency (necessitating surgery on the same day).
- Only two cases or 0.1 per cent of total patients were classified as salvage procedures (patients being resuscitated en route to theatre).
- The overall survival rates for isolated CABG for the past five years for elective surgery have not changed dramatically.

Though the overall survival rate for patients who undergo cardiac surgery is high, it is observed that survival rates decrease with increasing clinical urgency. Patient survival was highest in elective cases (99 per cent). Survival was slightly less in urgent cases and significantly less in emergency cases (90 per cent). This trend is illustrated in Figure 4, using data from the past five years.

Figure 4: Survival rate for isolated CABG in relation to the urgency of surgery, 2005–06 to 2009–10

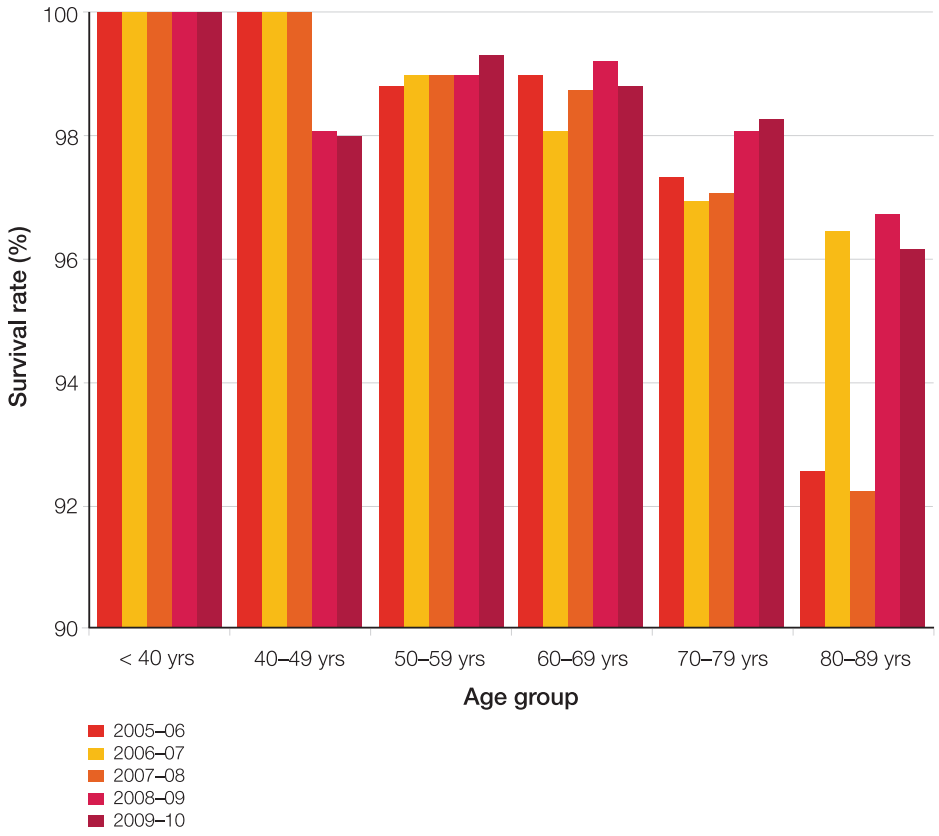


Age

Age influences a patient's survival following surgery. Figure 5 shows survival rates for patients who had isolated CABG as an elective procedure (the most common level of urgency).

Over the past five years, survival rates within each age group fluctuated slightly. However, there was a general trend showing decreasing survival rates with increasing age. Figure 5 illustrates this trend.

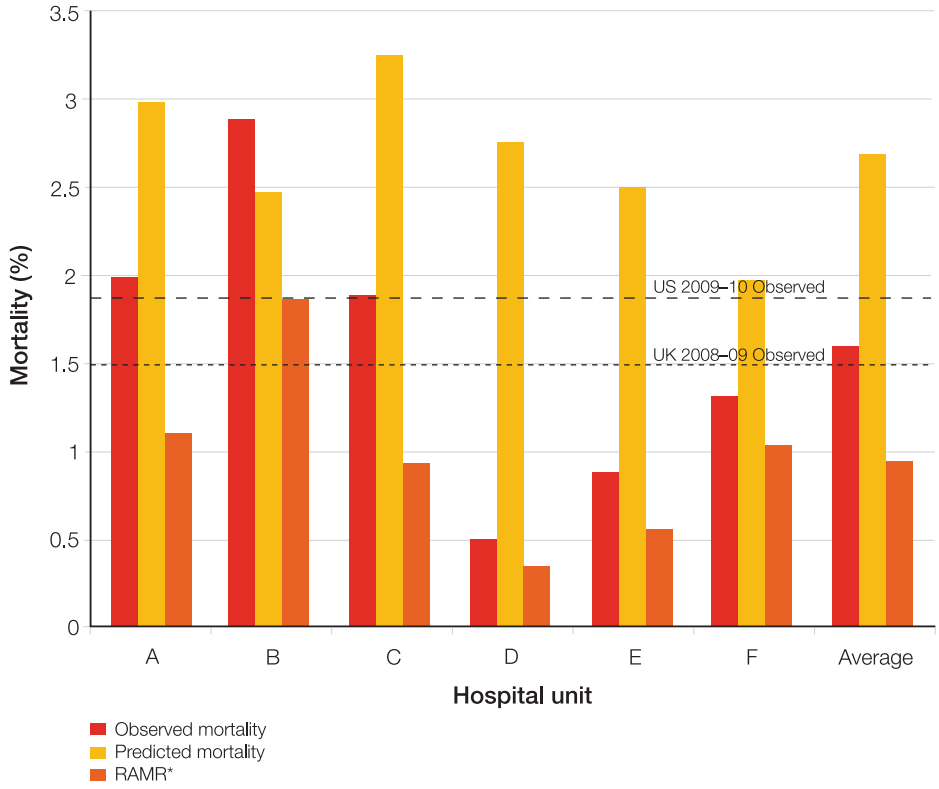
Figure 5: Survival rates for elective isolated CABG in relation to patient age, 2005–06 to 2009–10



Do outcomes differ at different hospitals?

For isolated CABG procedures, the observed mortality rates in hospital prior to discharge at any time plus all deaths after discharge within 30 days of the surgical date for four out of the six Victorian public hospitals are below that of the US benchmark and three hospital units below that of the UK benchmark.

Figure 6a: Mortality rate following Isolated CABG, for the six Victorian public hospital cardiac surgery units during 2009–10



*Risk-adjusted mortality rate using the AusSCORE model (see Appendix 1)

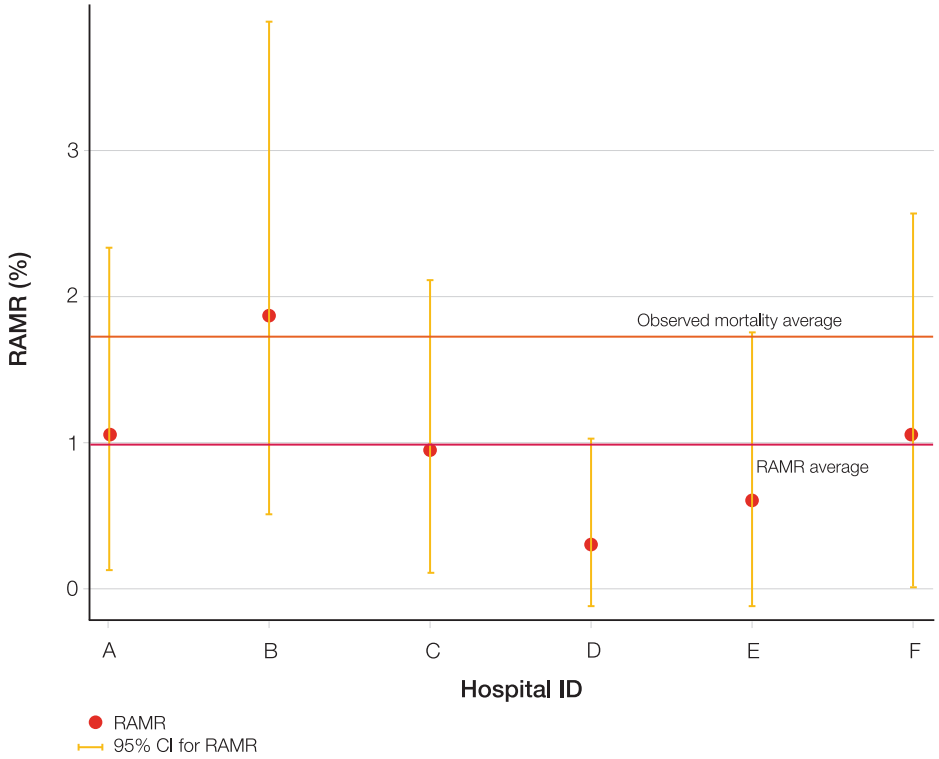
Figure 6a includes both 'observed or actual' mortality and 'predicted or risk-adjusted' mortality. The degree of risk associated with the operation varies widely for different patients who undergo cardiac surgery. Factors including age and urgency of surgery should be considered because the frequency of those characteristics will vary between hospitals. Risk adjustment provides a method of predicting mortality, taking into account the characteristics of the patients in each unit. It also provides a method of comparing mortality between hospitals.

A predicted mortality greater than the observed mortality implies the unit's results are better than predicted on the basis of their patient group. This was the case for all Victorian units this year with the exception of unit B.

The risk-adjusted mortality ratio (RAMR) compares the mortality rates for the units involved in this analysis. When a unit's RAMR is lower than the average RAMR it means that the unit has performed better; a higher RAMR than the average means that it performed poorer than the average (see also Appendix 1).

Figure 6b indicates that, statistically, the performance of all six Victorian public hospitals was within acceptable limits and that there are no differences between them (at the 95 per cent confidence limit level).

Figure 6b: 95 per cent confidence intervals for RAMR at all six Victorian units during 2009–10

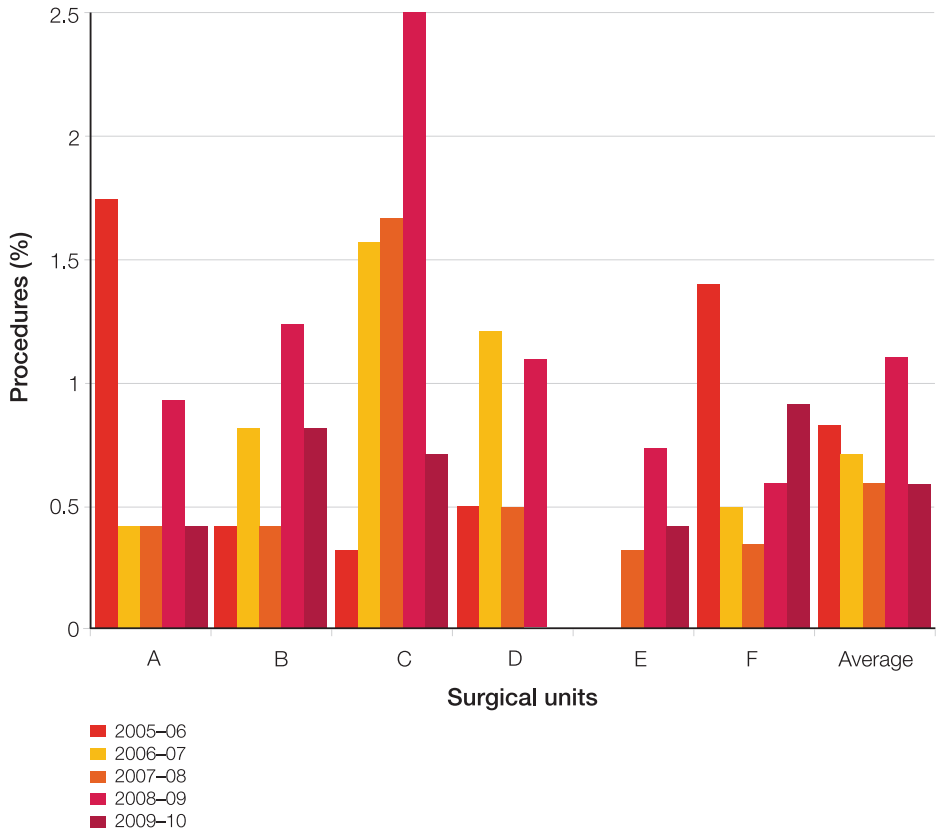


This analysis indicates that the performance of all six Victorian public hospitals is not different (at the 95 per cent confidence level) from the state average. See Appendix 2 for further information.

Complications of surgery

Deep sternal wound infection is a rare but serious complication of CABG surgery. In the past year, deep sternal wound infections were reported at a rate of 0.6 per cent for patients who underwent cardiac surgery (nine cases reported before discharge and a further nine cases after discharge but within 30 days of surgery). The rates are depicted in Figure 7 and Figure 8 respectively.

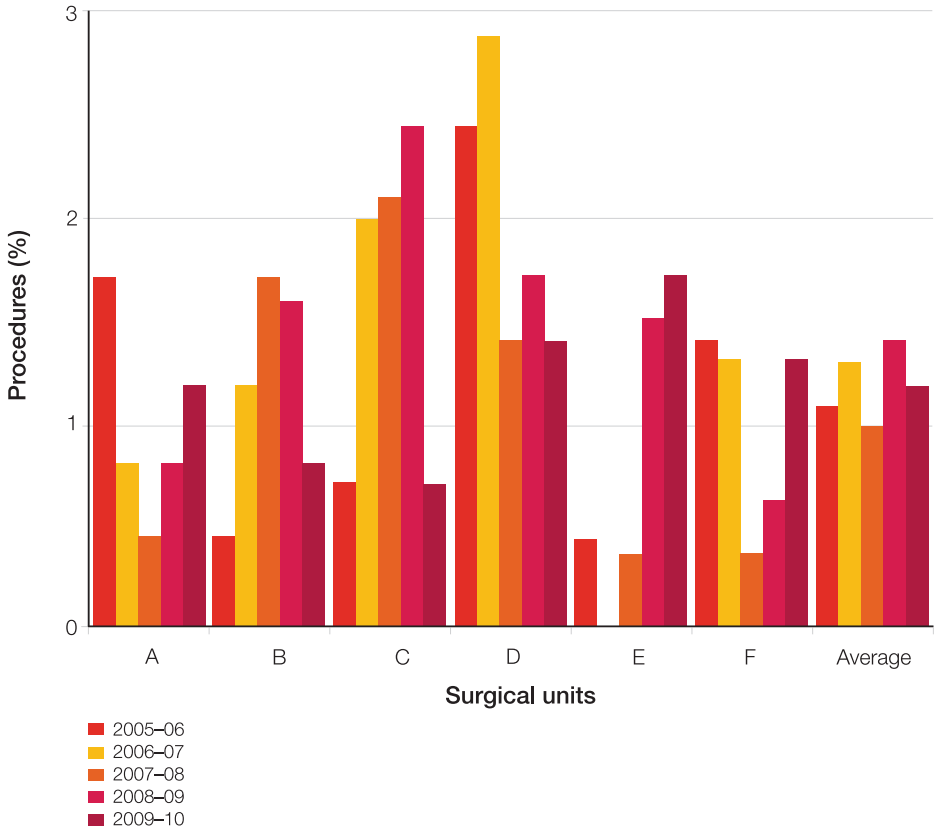
Figure 7: Deep sternal infections at hospital discharge following isolated CABG, 2005–06 to 2009–10



*Missing bars represent no cases of deep sternal infections

Number of cases	A	B	C	D	E	F	**Total**
2009–10	1	2	2	0	1	3	**9**

Figure 8: Deep sternal infections within 30 days following isolated CABG, 2005–06 to 2009–10

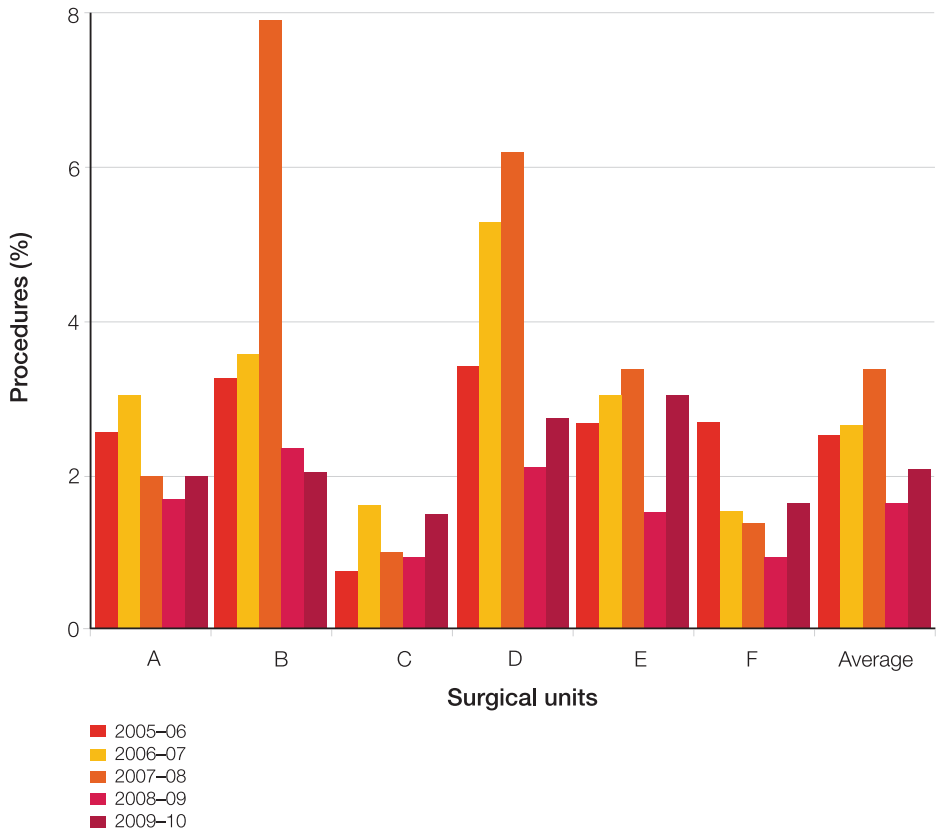


*Missing bars represent no cases of deep sternal infections

Number of cases	A	B	C	D	E	F	**Total**
2009–10	3	2	2	3	4	4	**18**

Postoperative haemorrhage necessitating return to the operating theatre occurred in 32 out of 1,528 cases, or 2.1 per cent of patients having CABG surgery in 2009–10. The incidence of postoperative haemorrhage over the past five financial years is shown in Figure 9.

Figure 9: Return to theatre for bleeding within 30 days following isolated CABG, 2005–06 to 2009–10



Number of cases	A	B	C	D	E	F	Total
2009–10	5	5	4	6	7	5	32

Mechanical ventilation and length of stay

Mechanical ventilation (mechanical support and assistance for breathing) is required temporarily after cardiac surgery. In 2009–10 the median ventilation time following an isolated CABG procedure was nine hours. The duration of ventilator assistance is influenced by the extent and complexity of the cardiac surgery performed, the patient's age, and the presence of factors such as obesity and pre-existing respiratory disease.

Following cardiac procedures, patients will usually spend a period of time in an intensive care unit (ICU). In 2009–10, the median time spent in an ICU following a CABG procedure was 25 hours. The time that a patient spends in an ICU is also influenced by the patient's condition. The most common reason for an extended stay in an ICU is the need for extended or 'longer-than-usual' mechanical ventilation and support of heart function.

Summary

Over the past five years, cardiac surgery in all of Victoria's public hospitals remains consistent and safe, more so than overseas hospitals. In spite of superficial appearances, there are no statistically significant differences for any of the outcomes between hospitals or from year to year.

Appendices

Appendix 1

AusSCORE risk adjustment

The AUS-SCORE is the first validated model for risk-adjustment and risk prediction for 30-day mortality for isolated CABG surgery in Australia. The model has been developed on a large number of procedures using standardised data collection methodology and the subsequent validation of the model shows that it is a good fit for Australian data and has correctly classified a large number of procedures. The risk-adjusted mortality takes into account a number of risk factors, selected as independent predictors of mortality, which includes age, ejection fraction estimate, New York Heart Association (NYHA) class, cerebrovascular disease, urgency of procedures, previous CABG, hypercholesterolaemia, peripheral vascular disease, cardiogenic shock, gender, smoking status and inotrope use. The ratio of the actual mortality to the expected mortality indicates the relative performance adjusted for the severity of illness or risk: a ratio of one indicates results as expected; less than one indicates results better than expected; and greater than one indicates results worse than expected. This ratio is then multiplied by the observed average mortality rate to yield a risk-adjusted mortality ratio (RAMR), which normalises the individual unit to the case mix.

The RAMR is calculated as follows:

$$\text{RAMR} = \left[\frac{\text{Observed Mortality Rate}}{\text{Predicted Mortality Rate}} \right] \textbf{X} \text{ Average Observed Mortality Rate}$$

The RAMR is, therefore, a predictor of mortality for a given patient set that takes into account the risks for those patients.

Appendix 2

Analysis of 95 per cent confidence intervals for risk-adjusted data used in this report

An example of 95 per cent confidence interval (CI) representation is shown in Figure 6B, describing the risk-adjusted mortality rate for 2009–10 for each Victorian unit for isolated CABG. The red horizontal line represents the RAMR state average (percentage) and the green horizontal line represents the observed mortality rate state average (percentage). The black dot represents the RAMR for each unit, with a vertical red line striking through representing the 95 per cent CI. There are upper and lower intervals (the vertical red line) for each unit that are above and below each black dot, respectively. To compare each unit's mortality rate (percentage) with the state average, one would interpret the upper and lower intervals as follows: If the upper interval is below the state average then the hospital would be deemed to have performed better than the state average. Alternatively, if the lower interval is above the state average, then the hospital would be deemed to have performed poorer than the state average. If the interval includes the state average, there is no difference between the unit and the state performance.