Australian Medical Workforce Advisory Committee

THE CARDIOTHORACIC SURGERY WORKFORCE IN AUSTRALIA

SUPPLY AND REQUIREMENTS

2000 - 2011

AMWAC Report 2001.1

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CONTENTS

ABBREVIATIONS

ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
AHMAC	Australian Health Ministers' Advisory Council
AMWAC	Australian Medical Workforce Advisory Committee
AIHW	Australian Institute of Health and Welfare
AN-DRG	Australian National Diagnostic Related Groups
ASCTS	Australasian Society of Cardiac and Thoracic Surgeons
Aust	Australia
CABG	Coronary artery bypass graft operation
CHD	Coronary heart disease
CME	Continuing medical education
DHAC	Commonwealth Department of Health and Aged Care
FRACS	Fellow of the Royal Australasian College of Surgeons
FTE	Full Time Equivalent
GP	General Practitioner
ICD-9-CM	International Classification of Diseases, Ninth Revision
NSW	New South Wales
NT	Northern Territory
Qld	Queensland
RACS	Royal Australasian College of Surgeons
RRMA	Rural, Remote Metropolitan Areas classification
SA	South Australia
SPR	Specialist: Population ratio
Tas	Tasmania
Terr	Territory
TRD	Temporary Resident Doctor
Vic	Victoria
WA	Western Australia

LIST OF TABLES

Appendix B

Appendix C

TERMS OF REFERENCE OF AMWAC AND THE AMWAC CARDIOTHORACIC SURGERY WORKFORCE WORKING PARTY

The Australian Health Ministers' Advisory Council (AHMAC) established the Australian Medical Workforce Advisory Committee (AMWAC) to advise on national medical workforce matters, including workforce supply, distribution and future requirements.

AMWAC Terms of Reference

1. To provide advice to AHMAC on a range of medical workforce matters, including:

   - the structure, balance and geographic distribution of the medical workforce in Australia;
   - the present and required education and training needs as suggested by population health status and practice developments;
   - medical workforce supply and demand;
   - medical workforce financing; and
   - models for describing and predicting future medical workforce requirements.

2. To develop tools for describing and managing medical workforce supply and demand which can be used by employing and workforce controlling bodies including Governments, Learned Colleges and Tertiary Institutions.

3. To oversee the establishment and development of data collections concerned with the medical workforce and analyse and report on those data to assist workforce planning.

AMWAC Cardiothoracic Surgery Workforce Working Party Terms of Reference

As part of its 1999-2000 work plan, AMWAC was asked by AHMAC to prepare a report on the specialist cardiothoracic surgery workforce. The AMWAC Cardiothoracic Surgery Workforce Working Party was established as a sub-committee of AMWAC and was asked to provide a report to AMWAC on the optimal supply and appropriate distribution of cardiothoracic surgeons across Australia, including projections for future requirements.

The Working Party held its first meeting on 26 May 2000 and presented a final report to the 30 April 2001 AMWAC meeting. The report was then presented to the 31 May 2001 AHMAC meeting.

MEMBERSHIP OF AMWAC

Independent Chairman

Professor John Horvath Physician, Sydney

Members

Nominees of the Australian Health Ministers' Advisory Council

Mr Alan Bansemer Commissioner, Health Department of Western Australia

Mr Robert Wells First Assistant Secretary, Health Industry and Investment Division, Commonwealth Department of Health and Aged Care

Dr Jeannette Young Medical Superintendent, Princess Alexandra Hospital, Brisbane

Nominee of Australian Institute of Health and Welfare

Dr Richard Madden Director, Australian Institute of Health and Welfare

Nominee of the Australian Medical Association

Dr Robert Bain Secretary General, Australian Medical Association

Nominee of the Australian Medical Council

Dr Lloyd Toft President, Medical Board of Queensland

Nominee of the Australian Vice Chancellors' Committee

Professor Allan Carmichael Dean, Faculty of Health Science, University of Tasmania

Nominee of the Committee of Presidents of Medical Colleges

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(former President, Royal Australasian College of Surgeons)

Nominee of the Royal Australian College of General Practitioners

Dr Mary Mahoney Director, Queensland Training Program

Nominee of the Commonwealth Department of Education and Training and Youth Affairs

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Health Economist

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Mr Warwick Conn	Head, Labour Force Unit, Australian Institute of Health and Welfare
Dr Colin Feek	Chief Medical Officer, New Zealand Ministry of Health
Mr Paul Gavel	Executive Officer, AMWAC

MEMBERSHIP OF THE CARDIOTHORACIC SURGERY WORKFORCE WORKING PARTY

Chairman

Dr David Theile	Surgeon, Brisbane (former President, Royal Australasian College of Surgeons)

Members

Nominee of State/Territory Health Departments

Dr Luis Prado	Deputy Medical Superintendent Prince Charles Hospital, Brisbane
Dr Mark Newman	Head, Cardiothoracic Surgery, Sir Charles Gairdner Hospital

Nominee of Royal Australasian College of Surgeons

Assoc. Prof. James Tatoulis	Chairman, Board of Cardiothoracic Surgery Royal Australasian College of Surgeons

Nominee of Australasian Society of Cardiac and Thoracic Surgeons

Dr Michael Gardner	Australasian Society of Cardiac and Thoracic Surgeons

Consumer Nominee

Mr Peter Edwards	Deputy Chairman of Wollongong Health Consumers' Advisory Group

AMWAC Officer

Ms Susan Jekel-Sadleir	Policy Officer, AMWAC

The Working Party would like to acknowledge the helpful comments provided by Mr Paul Gavel (AMWAC); and for assistance with data collection: the cardiothoracic surgery units across Australia for completing questionnaires; the cardiothoracic surgery Fellows of the RACS who completed survey forms; the RACS for providing data on cardiothoracic surgery Fellows and trainees; State and Territory health authorities; Graham Angus and Warwick Conn (AIHW); and Mr Ross Saunders (DHAC).

The report was prepared by Susan Jekel-Sadleir, AMWAC secretariat, on behalf of and with the assistance of the Chairman and other members of the AMWAC Cardiothoracic Surgery Workforce Working Party.

INTRODUCTION, GUIDING PRINCIPLES AND METHODOLOGY

Introduction

The main objective of the Working Party has been to promote an adequate supply and appropriate distribution of appropriately trained cardiothoracic surgeons across Australia by the year 2011.

Underlying Principles

In compiling this report, the Working Party adopted the following underlying principles:

- the Australian community should have an adequate number of trained cardiothoracic surgeons, appropriately distributed to provide the surgical services it requires;
- the community is best served when cardiothoracic surgeons have high standards of qualification and work with a high level of ongoing experience matched by appropriate surgical facilities;
- the cardiothoracic surgery workforce must provide a range of individual practices from highly specialised to those covering the full spectrum of cardiothoracic surgery, including service delivery, academia, and research, and interfacing with other surgical specialties;
- all Australian residents must have access to a good standard of cardiothoracic surgery care irrespective of geography and economic status. In achieving this, convenience to the patient must be balanced against the quality of services that can be distributed to meet that convenience; and
- an adequate amount of quality service must be provided by both the public and private sectors.

The Working Party defined a cardiothoracic surgeon as:

A qualified surgeon who is conducting surgical consultations in cardiothoracic surgery, medico legal consultations on cardiothoracic surgical conditions or is in a full time or part time academic position relating to cardiothoracic surgery. The definition will include those working in salaried positions and/or in private practice. It does not include other practitioners who, for one reason or another, undertake some cardiothoracic surgery work as part of their practice; nor does it include training registrars who hold positions in hospitals or service registrars who work in cardiothoracic surgery but are not recognised as being in training positions.

Methodology

In estimating workforce numbers, establishing a profile of the workforce and assessing its adequacy, important sources of data were:

1. The Royal Australasian College of Surgeons (RACS)

The RACS keeps a variety of data, principally on number, age, gender and location

of Fellows, and data on training posts and trainees.

To supplement this data, with information on hours worked, practice patterns, and consultation waiting times, as well as some qualitative information, AMWAC conducted a survey of cardiothoracic surgery RACS Fellows, the results of which are summarised in Appendix B.

2. Australian Institute of Health and Welfare (AIHW)

The principal AIHW data source is the annual medical labour force survey which presents national labour force statistics for registered medical practitioners, principally through a survey collected as part of the annual renewal of registration. The numbers presented in this report are estimates produced from the 1998 survey. In producing these estimates, the AIHW has assumed that non-respondents to the survey had the same characteristics as respondents. Overall the survey had an 81.3% response rate.

3. Department of Health and Aged Care (DHAC) Medicare provider database

Medicare provider statistics define medical practitioners according to the predominant services billed to Medicare. The Medicare statistics include all practitioners who have billed Medicare for at least one service during a financial year.

The major deficiency with the use of Medicare data for workforce planning purposes is that it does not provide data on practitioners who are salaried cardiothoracic surgeons in the public hospital system and who do not render services on a fee for service basis. Medicare data thus excludes services rendered free of charge to public hospital patients, to Veterans' Affairs patients and to compensation cases.

4. National Hospital Morbidity Database

The AIHW National Hospital Morbidity database (ICD-9-CM groupings) has been used as a key source of data on service trends. The data are sourced from the AIHW Australian hospital morbidity database for all patients in public and private hospitals in Australia from 1995-96 to 1998-99.

5. Survey of Cardiothoracic Surgery Units

To obtain an accurate count of the exact number of cardiothoracic surgeons currently practising in Australia, as well as some basic information about these surgeons, the Working Party undertook a survey of all of the cardiothoracic surgery units across Australia in February 2001. Information about the cardiothoracic surgeons in 100% of the units surveyed was obtained. The results are summarised in Appendix C.

6. State/Territory Health Departments

AMWAC surveyed State/Territory health departments in 2000 to obtain information about public hospital specialist vacancies for both visiting medical officers and staff specialists. A vacancy was defined as an approved position for which funding is

available and for which active recruitment action had been undertaken, but was unsuccessful. Information was also sought on temporary resident doctors (TRDs) filling vacancies. In addition, the State/Territory health departments were requested to provide, where available, information on current average waiting times for access to cardiothoracic surgery services.

7. Rural, Remote and Metropolitan Areas classification

Wherever possible, distributional data has been interpreted using the rural, remote and metropolitan area (RRMA) classification developed by the Commonwealth Departments of Primary Industries and Energy and Health and Family Services (DPIE & DHFS 1994). A summary of the RRMA classification is provided in Appendix A.

8. Australian Bureau of Statistics

The Australian Bureau of Statistics (ABS) population data and projections are used as the sole source on population data. In making its population projections ABS uses four different series. The population projections in this report are based on Series II, where constant fertility and low overseas migration are assumed (ABS 1999).

Key Assumptions

The Working Party would like to emphasise that the projections for cardiothoracic surgery supply and requirements are based on the assumption that there will be no significant change in existing national health structures. If changes do occur AMWAC recommends the supply and requirements projections be reviewed.

In conducting the projection analysis, the Working Party has assumed that the current length of the cardiothoracic surgery training program will remain unchanged and that the majority of candidates will complete the program within this time frame. The Working Party has also assumed that the pattern of workforce participation and service delivery of the current workforce provides a suitable basis on which to project future workforce requirements.

Finally, it should be appreciated that the report examines the national cardiothoracic surgery workforce and as such the analysis has been focused at the macro level so as to provide conclusions on the national level of trainee intake. In correcting an assessed imbalance between expected workforce supply and estimated requirements AMWAC favours, as a general course of action, adjustment to trainee intake as offering the best long term solution. Hence the conclusions and recommendations are framed in this context.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

This report describes the current cardiothoracic surgery workforce, assesses the adequacy of that workforce, and projects workforce supply and requirements to the year 2011.

The report concludes that the cardiothoracic surgery workforce is meeting current requirements. To ensure requirements continue to be met, the Working Party recommends that the number of trainees entering the advanced cardiothoracic surgery trainee program be maintained at approximately five per year. In recent years an average of five trainees graduated from the training program each year.

Cardiothoracic surgery requirements have been estimated to increase by an average of 1.8% per year. This growth rate is based on the rate of increase in actual (1995 to 1998) number of hospital separations following cardiothoracic surgery procedures. In comparison, the estimated growth in population (0.9%) combined with the effects of ageing (0.4%), is projected to be 1.3% per annum.

Description of the Current Cardiothoracic Surgery Workforce

Number of Practising Cardiothoracic Surgeons

- The Working Party estimated that the current size of the practising cardiothoracic surgery workforce is 107.

Distribution

- All cardiothoracic surgeons are located in metropolitan areas, with 89.7% in capital cities and 10.3% in other metropolitan areas, with no cardiothoracic surgeons located in rural or remote areas.

- Although the geographic distribution of cardiothoracic surgeons is not consistent with the population distribution, it must be noted that cardiothoracic surgery services are generally not sustainable in rural areas due to the infrastructure required to support cardiothoracic surgery (in terms of clinical and other support services, equipment and staff – see Appendix D) and the population base required to maintain a viable cardiothoracic surgery practice.

- The national cardiothoracic surgeon to population ratio (SPR) is 1:180,347. With SPRs of 1:106,400, 1:139,665, and 1:156,833, respectively, the Australian Capital Territory, Victoria, and Tasmania are more generously supplied with cardiothoracic surgeons when compared with the national SPR. All of the other States/Territories have SPRs below the national average, with Western Australia having the lowest, with an SPR of 1:239,388. No cardiothoracic surgeons are located in the Northern Territory.

Age Profile

- The average age of cardiothoracic surgeons in Australia is 48 years (minimum 33 years, maximum 69 years, mode 46 years). A large proportion of cardiothoracic surgeons were less than 45 years of age (39.6%), and only 25.4% of the workforce were aged 55 years or greater.

- By State/Territory, the average age ranged from a low of 47 years in the Australian Capital Territory to a high of 51 years in South Australia.

Gender Profile

- There are a total of three female cardiothoracic surgeons out of the total workforce of 107 (2.8%), with these three females located in Queensland and Victoria. .

Hours Worked

- The AIHW 1998 survey data show that, on average, cardiothoracic surgeons worked 64.1 hours per week, which is among the highest of any medical specialist workforce. In comparison, all surgeons combined averaged 56.7 hours per week and all specialists combined averaged 51.5 hours per week.

- The high number of hours worked by cardiothoracic surgeons may be related to the nature of their work. Cardiothoracic surgery entails long operations and often the duration of an operation is unpredictable. Operations are increasingly complex and time-intensive due to ongoing changes and advancements in applicable technology. The nature of the work therefore requires that surgeons spend an increasing and often unpredictable length of time in the theatre in order to manage the caseload.

Services Provided

- The two key sources of data for cardiothoracic surgery services are Medicare data and hospital casemix data. The Health Insurance Commission processes all claims relating to private medical services provided out of hospital and medical services for private patients in public and private hospitals, and it is from this claims database that Medicare statistics are derived. For hospital casemix data, the key source of information is the AIHW National Hospital Morbidity database (ICD-9-CM) for cardiothoracic surgery procedures. The collection is based on admitted patient episodes and includes data for both public and private hospitals.

- Between 1995-96 and 1999-00, the number of Medicare services provided by cardiothoracic surgeons increased by 9.0% (2.2% increase per annum), while the number of cardiothoracic surgeons providing Medicare services increased at a similar rate, 2.3% per annum (9.6% increase overall). The average number of services per provider has remained steady, decreasing very slightly (0.6% decrease overall or 0.1% decrease per annum).

- The consultation items (104 – referred consultation, and 105 – subsequent referred consultation) accounted for the largest proportion of all Medicare services provided by cardiothoracic surgeons (approximately 56%, combined).

- To examine hospital service trends using this data source, the Working Party selected a range of AN-DRG codes related to cardiothoracic surgery.

- Between 1995-96 and 1998-99, the average increase for all selected procedures in total was 5.5% (1.8% per annum).

- By State and Territory, between 1995-96 and 1998-99 the largest increase in selected procedures occurred in Queensland (5.3% per annum), while decreases occurred in South Australia, Western Australia, and the Northern Territory.

- Data on cardiothoracic surgery separations by geographic location of the patient suggests that nationally in 1998-99 the proportion of patients from rural and remote areas received cardiothoracic services in line with population share.

- The most common heart operation in Australia is coronary artery bypass grafting (CABGs) (AIHW 2000). Between 1995 and 1998 the total number of CABGs has remained relatively constant (0.6% per annum increase).

Training Arrangements

- The advanced training program in cardiothoracic surgery comprises a minimum of six years, with some variation as to how the six years are spent. The most common path is two years of advanced general surgery training followed by four years of cardiothoracic surgery training. Alternatively, candidates may complete the full general surgery training (four years) followed by at least three years of cardiothoracic surgery training. This choice is rare and will be outmoded with the College's new plan to have a common two year general surgery component. There are other variations possible which include a year for research, which is recognised, or hybrid programs, where the middle year (fourth year) may qualify for both general surgery and cardiothoracic surgery training.

- New South Wales and Victoria had the highest proportion of trainees (35.0% and 30.0% of trainees each, respectively), while the Australian Capital Territory, the Northern Territory, and Tasmania had no trainees. Tasmania has one training position, but it is currently not filled.

- The majority of cardiothoracic surgery trainees were between 31 and 34 years old (42.9%). The average age of trainees was 33 years.

Adequacy of the Current Cardiothoracic Surgery Workforce

The Working Party concluded that the current cardiothoracic surgery workforce is adequately meeting current requirements.

Cardiothoracic Surgeon to Population Ratio

- Based on the AIHW annual medical labour force surveys, the national cardiothoracic surgeon to population ratio increased from 1:212,789 in 1993 to 1:193,087 in 1998. By 2001, based on the survey of cardiothoracic surgery units, the SPR increased to 1:180,347.

- By State/Territory, Queensland showed the most significant change in SPR between 1993 and 1998, from one cardiothoracic surgeon per 518,767 persons in 1993 to one per 230,560 persons in 1998. The SPR for Queensland increased even further to 1:182,000 in 2001. The SPR for Tasmania showed the greatest increase between 1998 and 2001, from 1:472,400 in 1998 to 1:156,833 in 2001. While the SPR in Western Australia appeared to decrease between 1993 and 1998, it returned to the 1993 level in 2001. The Northern Territory no longer has a cardiothoracic surgeon, having been recorded as having one in 1993.

- The Australasian Society of Cardiac and Thoracic Surgeons' recommended population catchment for a sustainable cardiothoracic surgery service is 150,000 to 200,000 per surgeon. Comparing this suggested catchment with the actual SPR based on the AMWAC survey of cardiothoracic surgery units shows that the national SPR (1:180,340) is within the recommended range.

Public Hospital Vacancies

- The 1997 AMWAC survey of all public hospital specialist vacancies, across all specialties and sub-specialties, found that there was one cardiothoracic surgery vacancy, located in New South Wales, and that a further three cardiothoracic surgery vacancies were being filled by temporary resident doctors.

- To obtain more current information, in AMWAC surveyed the State/Territory Health Departments in mid 2000 to gain a snapshot of current vacancy rates in public hospitals. The results showed that there were no vacancies.

Hours Worked and Workload

- The 1998 AIHW medical labour force survey results showed that cardiothoracic surgeons worked among the highest average hours per week of any medical specialist workforce, including other surgeons. While all surgeons combined reported working an average of 56.7 hours per week, cardiothoracic surgeons averaged 64.1 hours per week.

- The AIHW survey provides information on the proportion of the workforce working excessive hours (more than 65 hours per week). For the cardiothoracic

surgery workforce, 42.8% worked more than 65 hours per week. In comparison, 31.6% of all surgeons combined worked more than 65 hours per week and 20.4% of all specialists worked more than 65 hours per week.

- In the AMWAC 2000 survey of the cardiothoracic surgery workforce, 65.5% of respondents indicated that their workload was about right, 23.6% felt that their workload was too much and 10.9% felt that it was too little.

- The Working Party concluded that while the high number of hours worked by cardiothoracic surgeons may be considered to be excessive, it is not likely to be indicative of an overall shortage in the total number of cardiothoracic surgeons. The high number of hours may, certainly in some cases, be due to factors beyond the surgeons' control (such as the nature of cardiothoracic surgery practice and travel requirements) and may also, in some instances, be considered to contribute to a quality outcome for patients.

Cardiothoracic Surgery Waiting Times

- Based on the most recently published national data (1995-96) on elective surgery waiting times by speciality, the median waiting time for cardiothoracic surgery was 7 days for urgent patients (category 1) and 27 days for non-urgent (category 2 and 3) patients.

- To obtain more current data, the AMWAC 2000 survey of the cardiothoracic surgery workforce collected information on average waiting times. The average waiting time prior to operation for patients with a clinically urgent condition was 10.5 days for a public sector service and 4.4 days for a private sector service. The average waiting time prior to operation for patients with a non-urgent condition was 48.1 days for a public sector service and 13.9 days for a private sector service.

Consultation Waiting Times

- The AMWAC 2000 survey of the workforce showed that the average waiting time for a consultation for a non-urgent condition (eg*.,* stable angina pectoris) with a cardiothoracic surgeon in his/her private rooms was 9.4 days while for a patient presenting to a public sector service the average waiting time was 16.6 days.

- For a clinically urgent condition (eg., severe left main lesion), the average waiting time to see a cardiothoracic surgeon in his/her private rooms was 2.3 days while for a patient presenting to a public sector service the average waiting time was 3.5 days.

- In considering these waiting times, it should be remembered that patients who ultimately become cardiothoracic patients have a spectrum of urgency and a variety of intermediate steps including investigations and consultations with other

specialists. The various steps each apply judgement about urgency and each have their own waiting times, which may affect the overall waiting time for a patient to eventually see a cardiothoracic surgeon.

Projections of Requirements

Population

- Australia has a growing and an ageing population. The 2000 population was estimated at 19.1 million, and the population is estimated to increase by 0.9% per annum between 2000 and 2011, with ageing of the population expected to add a further 0.4% to the demand for medical services, for a combined growth rate of 1.3%.

Trends in Services

- Between 1995-96 and 1999-00, total Medicare services performed by cardiothoracic surgeons increased an average of 2.2% per annum, an increase of 9.0% in total.

- The Working Party analysed hospital separations following cardiothoracic surgery procedures of public and private patients and found that between 1995-96 and 1998-99 the average increase for all selected procedures in total was 1.8% per annum (5.5% increase in total).

- Forecasts of future trends in cardiothoracic surgery procedures were calculated by applying population projections for 2008 and 2018 to hospital separation data for 1998-99, by age group and gender. Forecasts of cardiothoracic surgery procedures for the period 1998-99 to 2008 indicate an overall growth rate of 2.1% per annum, across all age groups. For the period 1998-99 to 2018, the forecasts indicate a per annum growth rate of 2.2% for all age groups.

- The increasing trend in the number of coronary angioplasties (performed by cardiologists) in recent years may impact on the number of CABGs procedures performed in the future and therefore impact on cardiothoracic surgeons' workload.

Projections of Supply

- During the last five years the RACS has admitted an average of five cardiothoracic surgery Fellows per year. Based on the current number of trainees currently in the cardiothoracic surgery advanced training program, it is anticipated that this trend will continue, resulting in an average of approximately five new Fellows per year until 2006.

- Assuming the average retirement age indicated by the AMWAC 2000 workforce survey, 62.6 years, it can be estimated that approximately two to three (average 2.7) cardiothoracic surgeons per year will retire during the next ten years.

- There are relatively few women in the cardiothoracic surgery workforce (three, or 2.8% of the workforce). Although the current proportion of female trainees (9.5%) is somewhat higher than that represented in the cardiothoracic surgery workforce, the impact of a slight increase in the number of women graduating from the cardiothoracic surgery training program on the workforce is expected to be minimal because currently there are few female cardiothoracic surgeons.

Balancing Projected Supply with Projected Requirements

- The Working Party assessed various indicators as the basis for estimating future requirements for cardiothoracic surgeons. These indicators included population growth, actual and projected growth in hospital separations following cardiothoracic surgery procedures, and Medicare service provision trends.

- Each selected requirement indicator was projected over the period 2000 to 2011, and the projections converted to FTE hours per week using the estimated average hours worked by cardiothoracic surgeons. This allowed comparisons to be made with projected supply data, which was similarly converted.

- The Working Party concluded the best indicator of likely future cardiothoracic surgery service requirements is the growth trend, between 1995 and 1998, in the actual number of hospital separations relating to cardiothoracic surgery, 1.8% per annum.

- The supply of cardiothoracic surgeons was projected by ageing the estimated number of cardiothoracic surgeons through each year of age, subtracting expected retirements (estimated to average approximately 2.7 per year) and adding expected new graduates (approximately five per year).

- The number of cardiothoracic surgeons was converted to hours per week by applying the average number of hours worked to head counts in each major age cohort. These supply projections show that, based on the current estimated annual intake of trainees of five per year, supply is projected to increase from the estimated 2000 level of approximately 6,884 FTE hours per week to an estimated 8,418 FTE hours per week in 2011.

- It is estimated that projected workforce supply will continue to be in balance with the estimated cardiothoracic surgery service requirements level, assuming a growth in requirements of 1.8% per annum. With a growth rate of 1.8%, maintaining approximately five graduates per year results in a slight notional oversupply, peaking at 2.2% in 2006 and then steadily decreasing thereafter to 0.5% in 2011.

- Based on the results of the projection modelling the Working Party recommends that the number of graduates be maintained at approximately five per year. A

total of five graduates per year is unchanged from the average number of trainees who have graduated from the cardiothoracic surgery training program in recent years, and this is also the average number per year who are expected to graduate during the next several years.

- It should be noted that the projection model is sensitive to the chosen requirement growth indicator, number of retirements per year, average hours worked and the age and gender profile of the workforce. If the expected requirement growth for cardiothoracic surgery varies from the projected trend of 1.8% per annum, or if any of the other factors mentioned changes significantly, then the model will need to be updated with these scenarios. The cardiothoracic surgery workforce is particularly sensitive to changes in these factors due to its relatively small total size.

RECOMMENDATIONS

The Working Party recommends:

1. To achieve an appropriate supply of cardiothoracic surgeons the annual intake to the cardiothoracic surgery training program should be maintained at approximately five per year. (Currently an average of five trainees graduate from the training program each year.).

   The aim of maintaining first year advanced trainee numbers within this range is to match workforce supply with an expected future growth in cardiothoracic surgery requirements of 1.8% per annum.

2. That the coordination of the cardiothoracic surgery trainee placements continue to be overseen by the Royal Australasian College of Surgeons (RACS) Board of Cardiothoracic Surgery, in consultation with State/Territory health departments.

3. That cardiothoracic surgery requirements and supply projections continue to be monitored regularly so that they can be amended if new trends in any of the workforce characteristics emerge or projection assumptions change. That this monitoring be coordinated by the RACS and AMWAC and the results incorporated into the AMWAC annual report to AHMAC. AMWAC will provide necessary support.

4. That an update of this review of the cardiothoracic surgery workforce be undertaken in 2005-2006.

DESCRIPTION OF THE CURRENT CARDIOTHORACIC SURGERY WORKFORCE

As discussed in the Introduction, there are a variety of data sources on the numbers, attributes and distribution of cardiothoracic surgeons across Australia. While each of these data collections has some deficiency, it is possible to piece together a reasonably accurate, up-to-date and coherent profile of the workforce.

In establishing the profile of the current cardiothoracic surgery workforce the Working Party defined:

- the number of cardiothoracic surgeons;
- growth in the cardiothoracic surgery workforce;
- distribution of the cardiothoracic surgery workforce by State/Territory and geographic location using the RRMA classification;
- age and gender profiles of the workforce;
- hours worked; and
- services provided.

The Number of Practising Cardiothoracic Surgeons in Australia

The data sources used to estimate the size of the cardiothoracic surgery workforce were the records of the RACS, the Health Insurance Commission Medicare database, the AIHW medical labour force survey, and information obtained from a survey of all cardiothoracic surgery units in Australia.

The RACS records indicate that in 2000, there were 104 practising Fellows in the specialty of cardiothoracic surgery. This figure included those who undertake mainly medicolegal work, excluded those who were listed as cardiothoracic surgery Fellows but retired and no longer practising, and also excluded those who were practising outside of Australia.

Medicare data for 1999-00 identified 103 practising cardiothoracic surgeons. These data refer to specialists whose main Medicare billing activity was cardiothoracic surgery.

The AIHW 1998 Annual Medical Labour Force Survey reported 104 specialists practising in cardiothoracic surgery. For most of these specialists (97) cardiothoracic surgery was their main specialty of practice. The survey also reported that three specialists practising in cardiothoracic surgery did not report a qualification in cardiothoracic surgery, and two specialists qualified in cardiothoracic surgery reported that they were not practising in cardiothoracic surgery.

The survey of units showed that as of February 2001, there were 107 cardiothoracic surgeons practising in Australia, and that many of these surgeons practise in more than one unit. Of these, the majority perform cardiac surgery and some thoracic surgery (61.7% or 66 surgeons), with 23.4% (25 surgeons) performing almost

exclusively cardiac surgery, and 15.0% performing predominantly thoracic surgery (16 surgeons). Out of the 107 cardiothoracic surgeons, 11 (10.3%) perform some paediatric surgery.

The data from the RACS, Medicare, the survey of the units, and the AIHW are summarised in Table 1.

Table 1: Number of cardiothoracic surgeons (various sources), selected years

RACS (2000)	Survey of Units (2001)	Medicare (1999-00)	AIHW (1998)
104	107	103	97

Sources: RACS, DHAC, AMWAC survey of units, and AIHW

The Working Party considered that the results of the AMWAC 2001 survey of cardiothoracic surgery units provided the most accurate count of the current number of practising cardiothoracic surgeons in Australia. The workforce size was therefore estimated to be 107.

Growth in the Cardiothoracic Surgery Workforce

Data from the annual AIHW surveys indicate that the total number of cardiothoracic surgeons has increased since 1993. As shown in Table 2, the compound annual increase between 1993 and 1998 was 3.2%. In the three years up to and including 1998, the workforce size remained steady. In 1996 there were 97 specialists whose main specialty of practise was cardiothoracic surgery, in 1997 there were 95, and in 1998 there were 97.

Medicare data show that the number of cardiothoracic surgeons have increased by 3.7% per annum, an overall increase of 19.8%.

Table 2: Number of cardiothoracic surgeons, selected years 1993-94 to 1998-99

Source	1993-94	1996-97	1998-99	% increase*
Medicare	86	99	103	3.7
AIHW	83	97	97	3.2

* compound annual increase
Sources: DHAC and AIHW

Among the States/Territories, the largest increase in the number of cardiothoracic surgeons occurred in Queensland, based on the AIHW annual medical labour force surveys. The 1993 survey showed that in Queensland there were six specialists with a main specialty of practise of cardiothoracic surgery, and, based on the 1998 survey there were 15, an increase of 20.1% per annum. Western Australia was the only State/Territory with a decrease in the number of cardiothoracic surgeons, with 7 in

1993 and 6 in 1998. Within each State/Territory, with the exception of Western Australia and the Northern Territory, the increase in the number of cardiothoracic surgeons was greater than the population growth in that State/Territory.

Table 3: Number of cardiothoracic surgeons by State/Territory, 1993 and 1998

Year	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Aust
1993	29	32	6	5	7	1	1	2	83
1998	32	34	15	6	6	1	0	3	97
% workforce increase*	2.0	1.2	20.1	3.7	-3.0	-	-	8.4	3.2
% population increase*	1.1	0.9	2.1	0.3	1.8	0.0	2.5	0.6	1.2

* - compound annual increase
Sources: AIHW and ABS

Distribution of the Cardiothoracic Surgery Workforce

Based on the various data sources (the AIHW 1998 medical labour force survey, the 2000 AMWAC cardiothoracic surgery workforce survey and the 2001 AMWAC survey of cardiothoracic surgery units) all of the cardiothoracic surgeons across Australia practise in metropolitan areas. Although this distribution is not consistent with the population distribution (Table 5), it must be noted that cardiothoracic surgery services are generally not sustainable in rural areas due to the infrastructure required to support cardiothoracic surgery (in terms of clinical and other support services, equipment and staff – see Appendix D) and the population base required to maintain a viable cardiothoracic surgery practice. These requirements place a constraint on both the location and the size of the cardiothoracic surgery workforce, and, generally limit cardiothoracic surgeons to practising in metropolitan locations.

The results of the AMWAC 2001 survey of cardiothoracic surgery units showed that, in Australia as a whole, 96 out of the total 107 cardiothoracic surgeons (89.7%) practised in hospitals located in capital cities, and the remaining 11 (10.3%) practised in other metropolitan locations. By State/Territory, the survey results showed that all cardiothoracic surgeons in South Australia, Western Australia, Tasmania and the Australian Capital Territory practised in hospitals located in capital cities. In the other States, the majority of cardiothoracic surgeons also practised in capital city locations, with only a small proportion in each State practising in other metropolitan locations. In Queensland, five out of the total 20 cardiothoracic surgeons (25.0%) practised in other metropolitan locations; in Victoria two out of the total 34 (5.9%) practised in other metropolitan locations; and in New South Wales four out of the total 32 (12.5%) worked in other metropolitan locations (Table 4).

Table 4: Percentage distribution of cardiothoracic surgeons by geographic location, by State/Territory*, 2001

Location	NSW	Vic	Qld	SA	WA	Tas	ACT	Aust.
Capital city	87.5	94.1	75.0	100.0	100.0	100.0	100.0	89.7
Other metro.	12.5	5.9	25.0	-	-	-	-	10.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

*Northern Territory not reported on as there are no cardiothoracic surgeons located in the Northern Territory.
Source: AMWAC survey of units

Although the Working Party considers the AMWAC 2001 survey of units to be the most accurate representation of the current geographic distribution of cardiothoracic surgeons across Australia, another source of information, the annual AIHW medical labour force survey, is shown in Table 5. The most recent published survey results are from the 1998 AIHW survey. The AIHW data allows comparision with other medical specialities, as the medical labour force survey covers all medical specialists. The AIHW 1998 data indicated that all cardiothoracic surgeons were located in urban areas, with 86.1% located in a capital city and 13.9% in other metropolitan areas. This distribution pattern has remained relatively constant during the last few years, with the 1997 AIHW survey showing 87.4% of cardiothoracic surgeons located in a capital city and the remainder in other metropolitan areas.

Table 5: Distribution of cardiothoracic surgeons as compared to all surgeons and population, by geographic location, 1998

	Capital city %	Other metropolitan %	Large rural centre %	Other rural and remote %	Total %
Cardiothoracic surgeons	86.1	13.9	0.0	0.0	100.0
All surgeons	76.0	8.1	8.5	7.4	100.0
Population	63.8	7.6	6.0	22.7	100.0

Sources: AIHW and ABS

A similar geographic distribution pattern was evident from the AMWAC 2000 survey of the cardiothoracic surgery workforce, in which all responding cardiothoracic surgeons indicated that they were located in a metropolitan region (92.7% in a capital city and 7.3% in other metropolitan areas). Based on the AMWAC workforce survey, six responding cardiothoracic surgeons reported that they provide services in rural areas. Of those who indicated that they spent some of their time providing services in rural areas, the average time spent was 2.5 days per month, and the services provided in rural areas were usually consultations.

To examine the cardiothoracic surgery workforce distribution by State/Territory, as compared with the population share in each State/Territory, Table 6 uses RACS data, AIHW 1998 survey data, the results of the AMWAC 2001 survey of cardiothoracic surgery units, and ABS data. While all three data sources are shown for illustrative purposes, the Working Party considers the results of the 2001 survey of cardiothoracic surgery units to be the most accurate representation of the current workforce distribution.

For most States and Territories the distribution of cardiothoracic surgeons appears to be fairly closely matched to the population distribution, with the exception of Victoria. All three data sources show that Victoria has a larger share of the total number of cardiothoracic surgeons relative to its share of the total population. According to the unit survey results, Victoria had 31.8% of all cardiothoracic surgeons as compared with 24.6% of the Australian population. All three data sources indicate that New South Wale's share of cardiothoracic surgeons is lower than their population share. The Northern Territory, with approximately 1.0% of the population, had no cardiothoracic surgeons.

Table 6 also examines the specialist to population ratio and the number of cardiothoracic surgeons per 100,000 population, by State/Territory.

Data from the RACS indicated that in 2000 there were 0.5 cardiothoracic surgeons per 100,000 population (one specialist per 183,732 persons). The Australian Capital Territory had the highest ratio of cardiothoracic surgeons to population, with one cardiothoracic surgeon for every 105,467 persons. South Australia had the lowest ratio, with one cardiothoracic surgeon for every 299,240 persons.

The AIHW data indicated that in 1998 there were 0.5 cardiothoracic surgeons per 100,000 people in Australia (one specialist per 193,087 persons). Tasmania, the Northern Territory, Western Australia, South Australia, and Queensland showed per 100,000 population ratios below the national average, while the ratio for New South Wales was the same as for Australia as a whole (0.5). The data also showed that the ratios for Victoria (0.7) and the Australian Capital Territory (1.0) were well above the national average.

According to the AMWAC survey of the cardiothoracic surgery units, in 2001 there were 0.6 cardiothoracic surgeons per 100,000 people in Australia (one specialist per 180,347 persons). States/Territories with cardiothoracic surgeons per 100,000 population ratios below that for Australia as a whole were New South Wales, Western Australia, South Australia, and Queensland. The ratios for the other States and Territories (except the Northern Territory) were well above that for the whole of Australia.

Whilst there is some interstate movement of patients generally such movements are probably more significant in considering the workforce situation of New South Wales. The New South Wales and the Australian Capital Territory workforces drain some common population and the combined New South Wales/Australian Capital Territory SPR is 1:194,666. It is also notable that some northern New South Wales population receives its cardiothoracic surgical services in Queensland. These two points mollify the apparently low SPR in New South Wales.

Table 6: Number of cardiothoracic surgeons and cardiothoracic surgeons per 100,000 population, by State/Territory, 1998- 2001

State/ Territory	Number	% of total Cardiothoracic surgeons	% of Australian population	SPR	Cardiothoracic surgeons per 100,000 pop'n
		Survey of Units (2001)			
NSW	32	29.9	33.7	1 : 202,941	0.5
Vic	34	31.8	24.6	1 : 139,665	0.7
Qld	20	18.7	18.9	1 : 182,000	0.5
SA	7	6.5	7.8	1 : 214,529	0.5
WA	8	7.5	9.9	1 : 239,388	0.4
Tas	3	2.8	2.4	1 : 156,833	0.6
NT	0	0.0	1.1	-	-
ACT	3	2.8	1.7	1 : 106,400	0.9
Australia	**107**	**100.0**	**100.0**	**1 : 180,347**	**0.6**
		RACS (2000)			
NSW	34	32.7	33.7	1 : 189,465	0.5
Vic	31	29.8	24.7	1 : 152,177	0.7
Qld	19	18.3	18.7	1 : 188,311	0.5
SA	5	4.8	7.8	1 : 299,240	0.3
WA	9	8.7	9.9	1 : 209,611	0.5
Tas	3	2.9	2.5	1 : 157,000	0.6
NT	0	0.0	1.1	-	-
ACT	3	2.9	1.7	1 : 105,467	0.9
Australia	**104**	**100.0**	**100.0**	**1 : 183,732**	**0.5**
		AIHW (1998)[a]			
NSW	32	33.0	33.8	1 : 197,928	0.5
Vic	34	35.1	24.8	1 : 136,691	0.7
Qld	15	15.5	18.5	1 : 230,560	0.4
SA	6	6.2	7.9	1 : 247,500	0.4
WA	6	6.2	9.8	1 : 304,767	0.3
Tas	1	1.0	2.5	1 : 472,400	0.2
NT	0	0.0	1.0	-	-
ACT	3	3.1	1.7	1 : 103,867	1.0
Australia	**97**	**100.0**	**100.0**	**1 : 193,087**	**0.5**

a - figures based on cardiothoracic surgeons whose main specialty of practice is cardiothoracic surgery

Sources: AMWAC survey of units, RACS, AIHW and ABS.

Age Profile

The AMWAC 2001 survey of units showed that the average age of cardiothoracic surgeons in Australia was 48 years (minimum 33 years, maximum 69 years, mode 46 years). As shown in Table 7, by State/Territory, the average age ranged from a low of 47 years in the Australian Capital Territory to a high of 51 years in South Australia. A large proportion of cardiothoracic surgeons was less than 45 years of age (39.6%), and only 25.4% of the workforce were aged 55 years or greater.

The survey of units showed the average age of cardiothoracic surgeons located in capital cities was 48.1 years, as compared with 46.9 years for those located in other metropolitan areas.

Table 7: Age profile of cardiothoracic surgeons by State/Territory*, 2001

State/ Territory	Under 35 yrs %	35-44 yrs %	45-54 yrs %	55-64 yrs %	65+ yrs %	Total (all ages)	Average age (years)
NSW	-	40.6	37.5	18.8	3.1	100.0	47.8
Vic	6.1	33.3	39.4	18.2	3.0	100.0	47.6
Qld	-	40.0	30.0	25.0	5.0	100.0	48.4
SA	-	28.6	14.3	57.1	-	100.0	51.3
WA	-	37.5	37.5	25.0	-	100.0	47.1
Tas	-	33.3	66.7	-	-	100.0	47.3
ACT	-	66.7	-	33.3	-	100.0	47.0
Australia	**1.9**	**37.7**	**34.9**	**22.6**	**2.8**	**100.0**	**48.0**

* Northern Territory not reported on as there are no cardiothoracic surgeons located there.
Source: AMWAC survey of units

The 1998 AIHW medical labour force results showed a similar age profile as indicated by the 2001 survey of units. Based on the AIHW 1998 data, the average age of cardiothoracic surgeons in Australia was 48.2 years. In total, 26.0% of cardiothoracic surgeons were aged 55 years or greater, as compared with 40.8% of all surgeons and 31.4% of all specialists.

Gender Profile

There were very few female cardiothoracic surgeons in Australia. The AMWAC 2001 survey of units showed that there were three female cardiothoracic surgeons out of the total workforce of 107 (2.8%), with these three females located in Queensland and Victoria. The AIHW 1998 medical labour force survey also indicated that the majority of cardiothoracic surgeons were male (94.8%), showing five female cardiothoracic surgeons at that time, located in Victoria and New South Wales. However, based on the AIHW data, while the cardiothoracic surgery workforce had a very high proportion of males when compared with all other specialties combined (84.4% male in all other specialties combined), the proportion of males in cardiothoracic surgery is similar to that for all surgical specialties (96.4% male in all surgical specialties combined).

Hours Worked

Based on the 1998 AIHW medical labour force survey, cardiothoracic surgeons worked among the highest number of hours per week, on average, of any medical specialist practitioner workforce. The data show that cardiothoracic surgeons worked an average of 64.1 hours per week. In comparison, all surgeons combined averaged 56.7 hours per week and all specialists combined averaged 51.2 hours per week.

In general, the high number of hours worked may be related to the nature of the work involved in the practise of cardiothoracic surgery. Cardiothoracic surgery entails long operations and often the duration of an operation is unpredictable. In addition, operations are increasingly complex and time-intensive due to ongoing changes and advancements in applicable technology. The nature of the work therefore requires that surgeons spend an increasing and often unpredictable length of time in the theatre in order to manage the caseload.

Another factor to be considered when reviewing the overall hours worked, is that the practise of cardiothoracic surgery in Australia has changed significantly in recent years. Cardiothoracic surgery units are no longer just based within the major metropolitan public hospitals. There are now a proliferation of multiple small private units throughout the country, driven partly by invasive cardiology and private hospitals. This has been out of the control of cardiac surgeons, but it means the surgeons are now often forced to practise in multiple institutions. This is in general an unfavourable trend which State health departments have not been able to address. It has had a detrimental affect on the efficiency of private practice and significantly increased working time in terms of travelling requirements.

A total of 42.8% of the cardiothoracic surgery workforce worked more than 65 hours per week and 17.2% of the workforce worked more than 80 hours per week. In comparison, 31.6% of all surgeons worked more than 65 hours per week and 14.9% worked more than 80 hours per week. Among all specialists, 20.4% of the workforce worked more than 65 hours per week, and 8.8% worked more than 80 hours per week.

Table 8: Number of cardiothoracic surgeons, average total hours worked per week as compared with all surgeons and all specialists, 1998

Average hours worked per week	Less than 35 hours	35 to 49 hours	50 to 64 hours	65+ hours	Total
% cardiothoracic surgeons	6.1	16.5	34.7	42.8	100.0
% all surgeons	12.1	19.1	37.2	31.6	100.0
% all specialists	15.6	27.7	36.4	20.4	100.0

Source: AIHW

By State/Territory, the average hours worked by cardiothoracic surgeons ranged from a high of 73.5 hours per week in New South Wales to 50.6 hours per week in Queensland. Overall, cardiothoracic surgeons spent an average of 81.9% of their 64.1 total working hours per week on direct patient care (52.5 hours per week).

It is important to note that while the number of hours worked by cardiothoracic surgeons in New South Wales appears quite high in comparison with other States and Territories, the figure should be interpreted with care. The proportion of total hours worked spent on activities other than direct patient care is quite high in New South Wales relative to some of the other States/Territories. In addition, the New South Wales' total hours worked figure for 1998 may be an aberration related to the medical labour force survey responses for that particular year. The average hours worked by cardiothoracic surgeons in New South Wales in the previous two years was more in line with the national average. Based on the 1997 AIHW medical labour force survey results, cardiothoracic surgeons in New South Wales worked 62.7 hours per week as compared with a national average of 62.3 hours per week. In 1996 the survey results showed cardiothoracic surgeons in New South Wales worked an average of 64.8 hours per week as compared with a national average of 61.7 hours per week.

Table 9: Average hours worked per week by cardiothoracic surgeons, by State/Territory*, 1998

State/Territory	NSW	Vic	Qld	SA	WA	Tas	ACT	Total
Total hours worked	73.5	61.8	50.6	61.3	60.7	a	52.5	64.1
Direct patient care hours worked	56.5	53.8	43.5	46.7	51.0	-	40.0	52.5
Proportion (%) of direct patient care hours to total hours worked	76.9	87.1	86.0	76.2	84.0	-	76.2	81.9

* Northern Territory not reported on as there are no cardiothoracic surgeons located in the Northern Territory.
a – data suppressed to maintain confidentiality.
Source: AIHW

As shown in Table 10, cardiothoracic surgeons in the 35 to 44 year age group worked the most hours per week, on average, while those aged 65 years or greater worked the fewest. Female cardiothoracic surgeons averaged 15.8 fewer hours per week than their male colleagues.

Table 10: Average hours worked by cardiothoracic surgeons, by age group and gender, 1998

Age group	Under 35 yrs	35-44 yrs	45-54 yrs	55-64 yrs	65+ yrs	Total
Male	65.0	67.2	68.5	60.2	45.0	64.8
Female	-	a	a	66.0	-	49.0
Total	**65.0**	**67.2**	**66.5**	**60.6**	**45.0**	**64.1**

a – data suppressed to maintain confidentiality.
Source: AIHW

The AMWAC 2000 survey of cardiothoracic surgeons found that, overall, cardiothoracic surgeons responding to the survey worked a total of 62.0 hours per week on average.

It is interesting to note that, based on the AIHW 1998 data, cardiothoracic surgeons located in capital cities worked, on average, more hours per week (66.9 hours per week, on average), than those located in other metropolitan areas (46.4 hours per week, on average). The AMWAC survey found a similar result, with those located in capital cities stating that they worked an average of 62.7 hours per week while those located in other metropolitan areas averaged 51.3 hours per week.

Services Provided

Surgical services in Australia are provided through Medicare and through other insurance arrangements in fee for service practice, and through the government funded public hospital system. Detailed service specific data on medical services which attract Medicare benefits are available for several years, while hospital casemix activity data are only available for recent years.

The Health Insurance Commission processes all claims relating to private medical services provided out of hospital and medical services for private patients in public and private hospitals. It is from this claims database that Medicare statistics are derived. While Medicare data only cover private practice billing activity, they do enable some broad conclusions to be drawn about the average number of services being provided per provider, and enable the identification of longer term trends. In addition, Medicare can be separated into services provided by specialists and those provided by non-specialists.

For hospital data, the key source is the AIHW National Hospital Morbidity database (ICD-9-CM) for cardiothoracic surgery procedures and diagnosis. The collection is based on admitted patient episodes and includes data for both public and private hospitals.

The Medicare and hospital morbidity databases cannot be aggregated to provide a picture of national activity because both record different sets of data. However, when looked at independently they provide a useful indication of the activity and trends in cardiothoracic surgery service provision over time.

Medicare Services

Between 1995-96 and 1999-00, the number of Medicare services provided by cardiothoracic surgeons increased by 9.0%, which represents a compound annual increase of 2.2%. During the same period, the number of cardiothoracic surgeons providing Medicare services increased at a similar rate, 2.3% per annum (9.6% increase overall). The average number of services per provider has remained almost constant, decreasing only slightly (0.1% per annum or 0.6% decrease overall).

Table 11: Cardiothoracic surgery Medicare services and providers, 1995-96, 1997-98 and 1999-00

	1995-96	1997-98	1999-00	% change 1995-99	Annual % change[a]
Number of providers	94	102	103	9.6	2.3
Number of services	66,329	72,863	72,308	9.0	2.2
Average number of services per provider	706	714	702	-0.6	-0.1

[a] compound annual percentage change
Source: DHAC

Table 12 shows the ten most common Medicare services (based on 1999-00 data) provided by cardiothoracic surgeons. Whilst these items represented a large proportion of all Medicare services provided by cardiothoracic surgeons, they are not necessarily representative of total cases, as two of the items (38588 and 38496) are procedures performed during other heart procedures. The top ten Medicare items, combined, showed an overall increase of 3.6% per annum. The consultation items (104 – referred consultation, and 105 – subsequent referred consultation) accounted for the largest proportion of all Medicare services provided by cardiothoracic surgeons and provide an indication of total cases. Combined, these two items represented between 54% and 57% of all services in 1995-96 and 1999-00. The consultation items showed only small increases between 1995-96 and 1999-00 (item 104 increased by 0.2% per annum, and 105 increased by 1.8% per annum).

Table 12: Top 10 Medicare services* provided by cardiothoracic surgeons, 1995-96 and 1999-00

Medicare item		1995-96	1999-00	% change 1995-99	Annual % increase[a]
104	Referred consultation	19,756	19,878	0.6	0.2
105	Subsequent referred consultation	18,047	19,388	7.4	1.8
38588	Cannulation of the coronary sinus for, and supervision of, the retrograde administration of blood or crystalloid for cardioplegia, including pressure monitoring	2,278	4,506	97.8	18.6
38500	Coronary artery bypass using single arterial graft, with or without vein graft or grafts, including harvesting of internal mammary artery or vein graft material where performed	4,457	2,992	-32.9	-9.5
38503	Coronary artery bypass using 2 or more arterial grafts, with or without vein graft or grafts incl harvesting of internal mammary artery or vein graft material where performed	1,888	2,830	49.9	10.6
38496	Artery harvesting (other than internal mammary), for coronary artery bypass	426	2,445	473.9	54.8
11700	Twelve-lead electrocardiography, tracing and report	821	1,840	124.1	22.4
38488	Valve replacement with bioprosthesis or mechanical prosthesis	1,242	1,366	10.0	2.4
11721	Implanted pacemaker testing of atrioventricular sequential, rate responsive, or antitachycardia pacemakers, including reprogramming when required, not being a service associated with a service to which item 11700 or 11718 applies	266	1,338	403.0	49.8
38281	Permanent pacemaker, insertion, removal or replacement of	652	846	29.8	6.7
Total (top 10 Medicare items*)		**49,833**	**57,429**	**15.2**	**3.6**
Grand total (all Medicare items)		**66,329**	**72,308**	**9.0**	**2.2**
Top 10 items* as a % of all Medicare items		**75.1**	**79.4**	**-**	**-**

Note: Shaded items (38588 and 38496) are procedures performed during other heart procedures.
[a] compound annual increase
* includes services for those providers who provided 100 or more Medicare services in that year
Source: DHAC

Coronary artery bypass graft (CABG) operations and valve procedures are representative of cardiothoracic surgery work. Table 13 shows that between 1995-96 and 1999-00 there was a decline (1.6%) in the number of CABG operations and valve procedures combined, based on Medicare data. During this period the number of CABG operations decreased by 3.8% while the number of valve replacement procedures increased by 8.0%.

Table 13: Coronary artery bypass graft operations* and valve procedures*, 1995-96 and 1999-00

	1995-96	1999-00	% change 1995-99[a]
CABG operations	7,556	6,472	-3.8
Valve procedures	1,460	1,985	8.0
Total (CABG + Valve)	9,016	8,457	-1.6

* Coronary artery bypass graft operations include Medicare items: 38497, 38500 and 38503; valve procedures include Medicare items: 38480, 38481, 38488, and 38489.
[a] - compound annual increase
Source: DHAC

Hospital Casemix Data

For hospital casemix data, the key source of information is the AIHW National Hospital Morbidity database (ICD-9-CM) for cardiothoracic surgery procedures. The collection is based on admitted patient episodes and includes data for both public and private hospitals. To examine hospital service trends using this data source, the Working Party selected a range of AN-DRG codes related to cardiothoracic surgery. DRGs related to pacemaker implantation and replacement procedures were excluded from the hospital separations trend information because it is not possible to determine from the data which specialist is providing these services (i.e., a cardiologist or a cardiothoracic surgeon). The Working Party considered that it was likely that the majority of the services related to pacemaker implantation and replacement were performed by a cardiologist and therefore including this data would be misleading to the overall trend in cardiothoracic surgery services. Table 14 shows hospital separations for the selected codes, and indicates that the average increase for all selected procedures in total was 5.5% (1.8% per annum).

Table 14: Hospital separations for cardiothoracic surgery procedures, 1995-96 to 1998-99

AN-DRG code and description		1995-96	1996-97	1997-98	1998-99	% change 1995-98	Annual % change*
160	major chest procedures with major cc	648	715	772	838	29.3	8.9
161	major chest procedures with non-major cc	1,170	1,228	1,505	1,754	49.9	14.4
162	major chest procedures without cc	1,922	2,048	2,208	2,295	19.4	6.1
178	major chest trauma age > 69 with cc	556	612	613	676	21.6	6.7
179	major chest trauma (age > 69 without cc) or (age < 70 with cc)	1,161	1,097	1,137	1,227	5.7	1.9
180	major chest trauma age <70 without cc	1,267	1,187	1,210	1,237	-2.4	- 0.8
221	cardiac valve proc with pump with invasive cardiac inves proc with cc	465	546	599	687	47.7	13.9
222	cardiac valve proc with pump with invasive cardiac inves proc without cc	63	63	78	69	9.5	3.1
223	cardiac valve proc with pump without invasive card inves proc with maj cc	543	630	749	800	47.3	13.8
224	cardiac valve proc with pump without invasive card inves proc without maj cc	2,475	2,525	2,913	2,806	13.4	4.3
226	other cardiothoracic procedures without pump, congenital	183	208	202	273	49.2	14.3
227	other cardiothoracic procedures without pump, acquired	740	637	725	844	14.1	4.5
287	coronary bypass with invasive card inves proc with major cc	827	873	843	992	20.0	6.3
288	coronary bypass with invasive card inves proc age > 64 or with non-maj cc	2,427	2,430	2,476	2,457	1.2	0.4
289	coronary bypass with invasive card inves proc age < 65 without cc	849	746	692	700	- 17.6	- 6.2
290	coronary bypass without invasive cardiac inves proc with major cc	1,558	1,807	1,788	1,947	25.0	7.7
291	coronary bypass without invasive cardiac inves proc without major cc	10,021	9,330	9,613	8,745	- 12.7	- 4.4
292	other cardiothoracic/vascular procedures with pump, congenital	404	616	608	551	36.4	10.9
293	other cardiothoracic/vascular procedures with pump, acquired	229	221	221	344	50.2	14.5
704	cardiothoracic/vascular procedures for neonates	287	271	296	86	- 70.0	- 33.1
	Total	**27,795**	**27,790**	**29,248**	**29,328**	**5.5**	**1.8**

*compound annual increase
Source: AIHW

Table 15 shows hospital separations for procedures indicating cardiothoracic surgery (see Table 13 for a description of the procedures included), by State/Territory. The data show that between 1995-96 and 1998-99, the largest increase occurred in Queensland, with a 5.3% annual compound increase in hospital separations, while in South Australia, Western Australia, and the Northern Territory there were decreases.

Table 15: Hospital separations for cardiothoracic surgery procedures, by State/Territory, 1995-96 to 1998-99

Year	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Aust
1995-96	10,659	7,538	5,023	2,115	2,418	n.a.	n.a.	42	27,795
1996-97	10,691	7,743	5,426	1,555	2,340	n.a.	n.a.	35	27,790
1997-98	10,615	8,025	5,515	1,971	2,259	606	227	30	29,248
1998-99	10,807	7,910	5,862	2,027	2,129	558	n.a.	35	29,328
% change 1995-98	1.4	4.9	16.7	-4.2	-12.0	-	-	-16.7	5.5
Annual % increase*	0.5	1.6	5.3	-1.4	-4.2	-	-	-5.9	1.8

n.a. - data not available
* compound annual increase
Source: AIHW

Table 16 provides information on cardiothoracic surgery separations by the geographic location of the patient. These data indicate that, overall, the proportion of patients from rural and remote areas receiving cardiothoracic services in 1998-99 was in line with population share, except in New South Wales and the Northern Territory. In the Northern Territory, New South Wales, and Tasmania there were proportionately more hospital separations of metropolitan patients, as compared with the share of population in metropolitan areas.

Table 16: Hospital separations relating to cardiothoracic surgery, by geographic location of patient and State/Territory*, 1998-99

Geographic location	NSW	Vic	Qld	WA	SA	Tas	NT	Aust
				Number of cardiothoracic separations				
Capital city and other metro.	8,470	5,701	3,341	1,460	1,568	251	22	20,813
Rural/remote	2,253	2,139	2,489	556	544	307	11	8,299
Unstated	84	70	32	11	17	0	2	216
Total	**10,807**	**7,910**	**5,862**	**2,027**	**2,129**	**558**	**35**	**29,328**
				% cardiothoracic separations				
Capital city and other metro.	78.4	72.1	57.0	72.0	73.6	45.0	62.9	71.0
Rural/remote	20.8	27.0	42.5	27.4	25.6	55.0	31.4	28.3
Unstated	0.8	0.9	0.5	0.5	0.8	0.0	5.7	0.7
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
				% population				
Capital city and other metro.	71.4	75.6	58.9	73.2	73.3	41.3	45.6	71.3
Rural/remote	28.7	24.4	41.1	26.8	26.7	58.7	54.4	28.7
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

na - data not available for the Australian Capital Territory
Sources: AIHW and ABS

Table 17 shows hospital separations following cardiothoracic surgery procedures, by private and public sector. The proportion of hospital separations for the private sector has been steady between 1995-96 and 1998-99, remaining at approximately two-thirds of total separations.

Table 17: Hospital separations for procedures relating to cardiothoracic surgery, by private and pubic sector, 1995-96 to 1998-99

Sector	1995-96	1996-97	1997-98	1998-99
Private	18,921	18,416	19,910	19372
Public	8,874	9,374	9,338	9956
Total	**27,795**	**27,790**	**29,248**	**29,328**
% private	68.1	66.3	68.1	66.1

Source: AIHW

Coronary Artery Bypass Graft (CABG) Operations

The most common heart operation in Australia is coronary artery bypass grafting (AIHW 2000). As shown in Table 18, the largest proportion of CABG procedures are for patients aged 65 years or greater, and this proportion has been steadily increasing. In 1995, 54.3% of CABG operations were for patients aged 65 years or greater, and this proportion increased to 55.1% in 1996, 57.4% in 1997 and 58.1% in 1998.

The total number of CABGs has remained relatively constant between 1995 and 1998, although there has been an increase in the number of CABGs for those in the over 65 year age group. For all age groups combined, the overall increase in CABG procedures between 1995 and 1998 was 0.6% per annum. For most age groups (between 20 and 64 years of age) the number of CABG procedures decreased, by approximately 2% to 3%. For those in the over 65 year age group the number of CABGs increased by 2.8% per annum, and for the 0 to 19 year age group there was an increase, from three CABG procedures in 1995 to ten CABG procedures in 1998.

Table 18: Number of coronary artery bypass graft operations by age and gender, 1995 to 1998

Gender	0–19 years	20-34 years	35-54 years	55-64 years	65+ years	Total (all ages)
			1995			
Male	-	42	2,604	3,895	6,592	13,133
Female	3	5	331	951	2,727	4,017
Total	**3**	**47**	**2,935**	**4,846**	**9,319**	**17,150**
			1996			
Male	-	32	2,588	4,064	6,863	13,547
Female	1	13	388	893	2,917	4,212
Total	**1**	**45**	**2,976**	**4,957**	**9,780**	**17,759**
			1997			
Male	2	27	2,403	3,724	7,118	13,274
Female	-	8	378	867	2,849	4,102
Total	**2**	**35**	**2,781**	**4,591**	**9,968**	**17,377**[a]
			1998			
Male	5	26	2,324	3,692	7,138	13,185
Female	5	17	402	849	2,995	4,268
Total	**10**	**43**	**2,726**	**4,541**	**10,133**	**17,453**
			Annual % increase 1995 to 1998*			
Male	-	-14.8	-3.7	-1.8	2.7	0.1
Female	18.6	50.4	6.7	-3.7	3.2	2.0
Total	**49.4**	**-2.9**	**-2.4**	**-2.1**	**2.8**	**0.6**

a – 1997 total includes one patient where gender was unspecified.
* Compound annual increase.
Source: AIHW.

Coronary Angioplasty Operations

The increasing trend in the number of coronary angioplasties in recent years (Table 19) may have an impact on the number of CABG procedures being performed. Coronary angioplasties are not performed by cardiothoracic surgeons (they are performed by cardiologists), the increasing use of this procedure is likely to decrease the requirement for CABG procedures, thereby potentially decreasing cardiothoracic surgeons' workload.

As shown in Table 19, the number of angioplasties has increased significantly between 1995 and 1998, with a compound increase of 14.8% per annum. The annual rate of increase has been slightly higher for female patients (15.1%) than for male patients (14.6%). By age group, the greatest increase has been for those aged 65 years or greater (20.6% per annum increase).

Table 19: Number of angioplasties by age and gender, 1995 to 1998

Gender	0–19 years	20-34 years	35-54 years	55-64 years	65+ years	Total (all ages)
			1995			
Male	0	72	2,994	2,756	3,085	8,907
Female	0	10	491	891	1,671	3,063
Total	**0**	**82**	**3,485**	**3,647**	**4,756**	**11,970**
			1996			
Male	0	62	3,303	3,202	3,775	10,342
Female	0	21	579	916	1,995	3,511
Total	**0**	**83**	**3,882**	**4,118**	**5,770**	**13,853**
			1997			
Male	0	65	3,488	3,530	4,709	11,792
Female	0	15	619	1,024	2,468	4,126
Total	**0**	**80**	**4,107**	**4,554**	**7,177**	**15,918**
			1998			
Male	0	79	3,884	4,072	5,388	13,423
Female	0	24	596	1,099	2,952	4,671
Total	**0**	**103**	**4,480**	**5,171**	**8,340**	**18,094**
			Annual % increase 1995 to 1998*			
Male	-	3.1	9.1	13.9	20.4	14.6
Female	-	33.9	6.7	7.2	20.9	15.1
Total	**-**	**7.9**	**8.7**	**12.3**	**20.6**	**14.8**

* compound annual increase.
Source: AIHW.

Training Arrangements

Before undertaking the RACS advanced training program in cardiothoracic surgery, all candidates must complete an intern year, at least two years of basic surgical training, and have completed and passed the FRACS Part I examination.

The advanced training program in cardiothoracic surgery comprises a minimum of six years, with some variation as to how the six years are spent. The most common path is two years of advanced general surgery training followed by four years of cardiothoracic surgery training. Alternatively, candidates may complete the full general surgery training (four years) followed by at least three years of cardiothoracic surgery training. This choice is rare and will be outmoded with the College's new plan to have a common two year general surgery component, as noted above. There are other variations possible which include a year for research, which is recognised, or hybrid programs, where the middle year (fourth year) may qualify for both general surgery and cardiothoracic surgery training.

The FRACS Part II examination is completed in the sixth and final year of advanced training. It is usual for most candidates to spend an additional one to two years in

overseas posts before returning to a consultant post in Australia.

Table 20 shows the number of training positions and the number of trainees by hospital and by State/Territory. The information shows that 7 out of the available 26 training posts in 2001 are vacant.

Table 20: Cardiothoracic surgery training placements, by hospital and State/Territory, 2001

State/Territory	Hospital	Training Positions	Trainees
New South Wales		**10**	**7**
	John Hunter	1	1
	New Children's, Westmead	1	0.5*
	Prince of Wales	1	1
	Royal North Shore	1	0
	Royal Prince Alfred	2	1.5*
	St George	1	1
	St Vincent's	2	1
	Westmead	1	1
Victoria		**8**	**6**
	Alfred	2	1
	Austin/Repatriation Medical	2	1.5*
	Monash Medical Centre	1	1
	Royal Children's	1	0.5*
	Royal Melbourne	1	1
	St Vincent's	1	1
Queensland		**3**	**3**
	The Prince Charles	3	3
Western Australia		**2**	**2**
	Royal Perth	1	1
	Sir Charles Gardiner	1	1
South Australia		**2**	**2**
	Flinders Medical Centre	1	1
	Royal Adelaide	1	1
Tasmania		**1**	**0**
	Royal Hobart	1	0
Australia		**26**	**20**

* 0.5 trainee represents one trainee for a six month period.
Source: RACS Board of Cardiothoracic Surgery

Table 21 shows the distribution of cardiothoracic surgery trainees by State/Territory. As of March 2001 there were 20 trainees throughout Australia. New South Wales and Victoria had the highest proportion of trainees (35.0% and 30.0% of trainees each, respectively) and the Australian Capital Territory, the Northern Territory, and Tasmania had no trainees. Tasmania has one training position, but it is currently not filled.

Table 21: Cardiothoracic surgery trainees, by State/Territory, 2001

State/Territory	Total number of trainees	% of trainees	% of population
NSW	7	35.0	33.7
Victoria	6	30.0	24.6
Queensland	3	15.0	18.9
South Australia	2	10.0	7.8
Western Australia	2	10.0	9.9
Tasmania	-	-	2.4
ACT	-	-	1.7
Northern Territory	-	-	1.1
Total	20	100.0	100.0

Source: RACS Board of Cardiothoracic Surgery

As shown in Table 22, the majority of cardiothoracic surgery trainees were between 31 and 34 years old (42.9%). The average age of trainees was 33 years.

Table 22: Cardiothoracic surgery advanced trainees, percentage by age group, 2001

Age group	Up to 30 yrs	31 – 34 yrs	35+ yrs	Unknown	Total
% of trainees	19.0	42.9	14.3	23.8	100.0

Source: RACS

Table 23 shows that between 1995 and 2000, the RACS has admitted an average of five new cardiothoracic surgery Fellows per year.

Table 23: New cardiothoracic surgery Fellows admitted to the RACS, 1995 to 2000

	1995	1996	1997	1998	1999	2000
Number of new Fellows	3	9	7	3	2	6

Source: RACS

The Main Characteristics of the Cardiothoracic Surgery Workforce

The Working Party estimates that there are currently 107 practising cardiothoracic surgeons across Australia, which represents one cardiothoracic surgeon per 180,347 persons, or 0.6 surgeons per 100,000 population.

The workforce is predominantly male (2.8% or three females in total) and is urban based (89.7% of the workforce is located in capital cities and 10.3% in other metropolitan areas). Cardiothoracic surgery services are generally not sustainable in rural areas due to the infrastructure required to support cardiothoracic surgery and the population base required to maintain a viable cardiothoracic surgery practice.

These requirements place a constraint on both the location and the size of the cardiothoracic surgery workforce, and, generally limit cardiothoracic surgeons to practising in metropolitan locations.

Each State/Territory's share of the total number of cardiothoracic surgeons is fairly consistent with its share of population, with a couple of notable exceptions. Victoria has a proportionately greater share of cardiothoracic surgeons, with 31.8% of the total workforce located in Victoria as compared with 24.6% of total population. There are no cardiothoracic surgeons located in the Northern Territory, due to a lack of infrastructure and other requirements to sustain a viable cardiothoracic surgery practise.

The cardiothoracic surgery workforce is relatively young, with an average age of 48 years. By State/Territory, the average age ranges from a low of 47 years in the Australian Capital Territory to a high of 51 years in South Australia. A large proportion of cardiothoracic surgeons are less than 45 years of age (39.6%), and only 25.4% of the workforce is aged 55 years or greater.

Based on the 1998 AIHW medical labour force survey, cardiothoracic surgeons worked among the highest number of hours per week, on average, of any medical specialist practitioner workforce. The data show that cardiothoracic surgeons worked an average of 64.1 hours per week. In comparison, all surgeons combined averaged 56.7 hours per week and all specialists combined averaged 51.5 hours per week.

ADEQUACY OF THE CURRENT CARDIOTHORACIC SURGERY WORKFORCE

There are a number of indicators of the adequacy of a medical workforce and no single measure can provide a definitive assessment. However, by examining each of the following it is possible to gain an indication of whether the workforce is adequately meeting current demand or if there is a significant shortfall or oversupply. The indicators chosen by the Working Party were:

- cardiothoracic surgeon : population ratio;
- sustainable cardiothoracic surgery practice;
- public hospital vacancies;
- hours worked and workload;
- surgery waiting times; and
- consultation waiting times.

Cardiothoracic Surgeon : Population Ratio

Specialist to population ratios are useful for comparing States/Territories and changes over time.

While the Working Party considers the results of the AMWAC 2001 survey of units to be the most accurate snapshot of the size of the current cardiothoracic surgery workforce, it does not provide any information about trends in SPRs. The AIHW annual medical labour force survey provides a consistent data source to examine the growth trend during the last few years and is considered here for that purpose. Table 24 shows that from 1993 to 1998 the SPR increased. In 1997 and 1998 the ratio has remained steady, averaging about one cardiothoracic surgeon per 194,000. During the same period, 1993 to 1998, the population increased by 6.0% (1.2% per annum) while the total number of cardiothoracic surgeons increased by 16.9% (3.2% per annum).

Table 24: Cardiothoracic surgeon to population ratio, selected years 1993 to 1998

Year	Number of cardiothoracic surgeons	Population ('000)	SPR	Cardiothoracic surgeons per 100,000 pop'n
1993	83	17,662.0	1 : 212,789	0.5
1996	97	18,208.2	1 : 187,713	0.5
1998	97	18,729.4	1 : 193,087	0.5

Sources: AIHW and ABS.

As shown in Table 25, based on the AIHW annual medical labour force surveys, the national cardiothoracic surgeon to population ratio increased from 1:212,789 in 1993 to 1:193,087 in 1998. Table 26, which shows the SPR based on the 2001 survey of cardiothoracic surgery units, indicates that the national SPR increased even further, to 1:180,347 in 2001.

Table 25 shows the wide variation in the SPRs among the individual States and Territories in 1993 and 1998. As shown in Table 26, based on the cardiothoracic surgery unit survey, there was much less variation in the SPR among the States/Territories in 2001.

Within each State/Territory Queensland showed the most significant change between 1993 and 1998, from one cardiothoracic surgeon per 518,767 persons in 1993 to one per 230,560 persons in 1998. The SPR for Queensland increased further to 1:182,000 in 2001. The SPR for Tasmania showed the greatest increase between 1998 and 2001, from 1:472,400 in 1998 to 1:156,833 in 2001. While the SPR in Western Australia appeared to decrease between 1993 and 1998, it returned to the 1993 level in 2001. The Northern Territory no longer has a cardiothoracic surgeon, having been recorded as having one in 1993 (Tables 25 and 26).

Table 25: Cardiothoracic surgeon to population ratio, by State/Territory, 1995 and 1998

State/ Terr	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Total
				1993 (AIHW)					
No. Cardio. Surgeo	29	32	6	5	7	1	1	2	83
Pop'n ('000)	6,009	4,462	3,113	1,462	1,678	472	168	299	17,662
SPR 1:	207,193	139,441	518,767	292,340	239,657	471,700	168,300	149,450	212,789
Cardio. Surg. per 100,000 popn	0.5	0.7	0.2	0.3	0.4	0.2	0.6	0.7	0.5
				1998 (AIHW)					
No. Cardio. Surgeo	32	34	15	6	6	1	0	3	97
Pop'n ('000)	6,334	4,648	3,458	1,485	1,829	472	192	312	18,729
SPR 1:	197,928	136,691	230,560	247,500	304,767	472,400	-	103,867	193,087
Cardio. Surg. per 100,000 pop'n	0.5	0.7	0.4	0.4	0.3	0.2	-	1	0.5

Sources: AIHW and ABS.

Table 26: Cardiothoracic surgeon to population ratio, by State/Territory, 2001

State/ Terr.	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Total
No. Cardio. surg.	32	34	20	7	8	3	0	3	107
Pop'n ('000)	6,494	4,749	3,640	1,502	1,915	471	205	319	19,297
SPR 1:	202,941	139,665	182,000	214,529	239,388	156,833	-	106,400	180,347
Cardio. surg. Per 100,000 pop'n	0.5	0.7	0.5	0.5	0.4	0.6	-	0.9	0.6

Sources: AMWAC survey of units and ABS.

Requirements for a Sustainable Cardiothoracic Surgical Practice

The Australasian Society of Cardiac and Thoracic Surgeons (ASCTS) developed a document which details recommendations for minimum cardiac surgery caseloads; estimated population catchment for a viable cardiothoracic surgery practice; and minimum requirements for staffing, hospital infrastructure and equipment. This section contains a summary of the document (a copy of the full document may be found at Appendix D).

The ASCTS has defined the minimum cardiac surgery caseload for a hospital and for an individual cardiothoracic surgeon. The ASCTS recommends that a hospital reach a caseload of 400 cases per year within two years of commencing cardiac surgery, although this may vary depending on a number of factors such as whether or not the hospital is co-located with another major hospital performing cardiac surgery. For an individual cardiothoracic surgeon, the ASCTS recommends a minimum caseload of 200 cardiac surgery cases per surgeon per year. This minimum caseload is required to allow each surgeon to maintain his/her expertise, including exposure to more unusual and difficult cases, and some of this caseload may be performed at another hospital. It has been shown in many studies that the risk of adjusted mortality following cardiac surgery decreases with increasing surgeon caseload, and the ASCTS recommends that, optimally, the caseload for a surgeon performing cardiac surgery should be in excess of 250 cases per year.

In terms of population catchment, extrapolating the data on minimum caseloads from the ASCTS recommendations means a hospital (a unit with two cardiothoracic surgeons) caseload of 400 cases per year would rely on a population base of approximately 300,000 to 400,000 (150,000 to 200,000 population per surgeon). Comparing this suggested range for the specialist to population ratio (SPR) with the actual SPR based on the AMWAC survey of cardiothoracic surgery units (Table 6) shows that the actual 2001 national SPR (1:180,347) is within the suggested range.

The ASCTS recommends that cardiothoracic surgery units have a minimum of two fully trained cardiothoracic surgeons, and one of these surgeons must be available at all times. The cardiothoracic surgeons must be FRACS or have equivalent training and be accredited by the RACS. Units are required to practise regular audit and quality management activities. In addition, various supporting staff and other specialists are required, including:

- cardiac anaesthetists and perfusionists;
- intensive care specialists and an intensive care fellow or registrar;
- appropriately trained nursing staff;
- physiotherapists and other allied health workers;
- actively practising medical specialists in general surgery, urology, cardiology, respiratory medicine, neurology, neurosurgery and renal medicine;
- a data collector to supervise a cardiac database;
- an echocardiographer; and
- if a public hospital, junior medical staff support and a cardiac secretary.

In addition to specialised supporting staff, appropriate hospital infrastructure is required to support a cardiothoracic surgery unit. The required infrastructure, which should be available at all times, includes the following services and departments:

- intensive care unit with full monitoring facilities;
- cardiac catheterization laboratory;
- radiology including CT scanning;
- blood bank, haematology, and biochemistry;
- echocardiography department;
- operating theatre of adequate size and adequately equipped;
- post-cardiac surgery ward;
- office space of sufficient size for administrative support and management of an operational database;
- nuclear medicine department;
- physiotherapy department; and
- pastoral care, pharmacy, and rehabilitation services.

The ASCTS document also identifies the equipment which must be available in the operating theatre, intensive care unit and the step down cardiac ward (see Appendix D for details).

It is important to note that a cardiothoracic surgery practice may not be sustainable in a rural area, due to the required minimum caseloads and resulting estimated population catchments as well as the specialised infrastructure required to support the practice, as outlined above. These requirements place a constraint on both the location and the size of the cardiothoracic surgery workforce.

Public Hospital Vacancies

The AMWAC definition of a vacancy is an approved position for which funding is available and for which active recruitment action has been undertaken, but has been unsuccessful.

The 1997 AMWAC survey of all public hospital specialist vacancies, across all specialties and sub-specialties, found that there was one cardiothoracic surgery vacancy, located in New South Wales, and that a further three cardiothoracic surgery vacancies were being filled by temporary resident doctors.

To obtain more current information, in AMWAC surveyed the State/Territory Health Departments in mid 2000 to gain a snapshot of current vacancy rates in public hospitals. The results showed that there were no vacancies.

Hours Worked and Workload

Hours Worked

Based on the 1998 AIHW labour force survey results, cardiothoracic surgeons worked among the highest average hours per week of any medical specialist workforce, including other surgeons. While all surgeons combined reported working an average of 56.7 hours per week, cardiothoracic surgeons averaged 64.1 hours per week. The only medical specialty workforce which reported working longer hours was vascular surgery, with an average of 65.2 hours per week.

The AIHW survey also provides information on the proportion of the workforce working excessive hours, or more than 65 hours per week. For the cardiothoracic surgery workforce, 42.8% worked more than 65 hours per week. In comparison, 31.6% of all surgeons combined worked more than 65 hours per week and 20.4% of all specialists worked more than 65 hours per week (Table 27). Based on previous AIHW annual medical labour force surveys, the proportion of cardiothoracic surgeons working more than 65 hours per week has been consistently high. In 1996 a total of 44.8% of the workforce worked more than 65 hours per week and in 1997 a total of 36.1% worked more than 65 hours per week. The proportion for all surgeons combined was approximately 28.0% in both 1996 and 1997 and for all specialists it was 17.0% in both 1996 and 1997.

Table 27: Proportion of the cardiothoracic surgery workforce working excessive hours, as compared with all surgeons and all specialists, 1998

	Between 65 and 79 hours per week	More than 80 hours per week	More than 65 hours per week
% cardiothoracic surgeons	25.6	17.2	42.8
% all surgeons	16.7	14.9	31.6
% all specialists	11.6	8.8	20.4

Source: AIHW

The 2000 AMWAC survey of the cardiothoracic surgery workforce showed similar results, with 41.0% of respondents indicating that they worked more than 65 hours per week.

Cardiothoracic Surgeons' Workload

Overall, 65.5% of cardiothoracic surgeons who responded to the AMWAC 2000 survey of the cardiothoracic surgery workforce indicated that their workload was about right, 23.6% felt that their workload was too much and 10.9% felt that it was too little. A total of 8 respondents (15.4% of respondents to this question) felt that more cardiothoracic surgeons were required in their geographic area. Three respondents (6.5% of respondents to this question) indicated that they felt more cardiothoracic surgeons were required in Australia as a whole.

In response to the question on capacity to increase their workload, 51.8% indicated they felt they had time available to increase their surgery time, 51.8% felt they had time available to increase their consultative work and 28.0% felt they had time available to increase their hospital work.

Impact of Hours Worked and Workload

The Working Party concluded that while the number of hours worked by cardiothoracic surgeons is high, it is not likely to be indicative of an overall shortage in the total number of cardiothoracic surgeons. The high number of hours is influenced by the nature of the work and may be considered to contribute to a quality outcome for patients.

Based on a number of studies a high caseload per surgeon improves efficiency and quality of outcome. Most operations in cardiac surgery are relatively long and therefore the match of time commitment with maintenance of caseload is difficult to balance. Surgeons tend to regard case numbers as a higher priority than modest working hours. Additionally, changing technologies in cardiac management demand big time commitment to ensure appropriate mastery of the full therapeutic range.

Further, the practise of cardiothoracic surgery has changed from units based within the major metropolitan public hospitals catering for both public and private patients, to a proliferation of multiple small private units throughout the country, driven partly by invasive cardiology and private hospitals. This tends to force surgeons to practise in multiple institutions and has had a detrimental effect on the efficiency of practise and significantly increased working hours added to by travelling requirements.

However, on balance, the Working Party felt that working hours to the stated levels are not necessarily required to ensure a high quality outcome for patients. The results of the AMWAC 2000 workforce survey further support this view as the survey showed that nearly one quarter of respondents (23.6%) felt their workload was too high, indicating that, in some cases, the hours being worked may be excessive. Overall, 65.5% of cardiothoracic surgeons who responded to the AMWAC 2000

survey indicated that their workload was about right.

Cardiothoracic Surgery Waiting Times

As shown in Table 28, AIHW data show that in 1995-96, for cardiothoracic surgery, the median waiting time for urgent patients (category 1) was 7 days and for non-urgent patients (category 2 and 3) the median waiting time was 27 days. In comparison, the median waiting time for all surgery was 8 days for urgent (category 1) patients and 36 days for non-urgent (category 2 and 3) patients.

Table 28: Median waiting time (days) prior to admission, by urgency category and specialty of surgeon, 1995-96

Specialty of surgeon	Category 1 [a]	Category 2 [b]	Category 3 [b]	Categories 2 and 3 [a]	All patients [a]
Cardiothoracic	**7**	**40**	**19**	**27**	**13**
Ear, nose and throat	8	44	70	57	36
General	8	34	46	29	17
Gynaecology	8	33	36	31	19
Neurosurgery	6	34	21	18	11
Ophthalmology	10	47	58	60	46
Orthopaedic	7	63	75	55	34
Plastic	9	46	57	37	24
Urology	12	32	41	32	22
Vascular	6	23	14	25	11
Other	1	19	40	8	3
All patients	**8**	**39**	**50**	**36**	**21**

a - for patients admitted in New South Wales, South Australia, and the Northern Territory;
b - for patients admitted in South Australia and the Northern Territory
Source: AIHW

Table 29 shows the clearance times for cardiothoracic surgery patients in all categories were comparatively low, at approximately half a month for urgent (category 1) patients and about one and a half months for non-urgent (category 2 and 3) patients. Clearance time is the theoretical time it would take to clear all patients from the waiting list at a point in time, ie., the time it would take to clear a list if no new patients were added to the list.

Table 29: Clearance time (months) by specialty of surgeon and urgency category, 1995 and 1995-96

	1995 [a]			1995-96		
Specialty of surgeon	**Category 1**	**Categories 2 and 3**	**All patients**	**Category 1 [b]**	**Categories 2 and 3 [b]**	**All patients [b]**
Cardiothoracic	**0.5**	**1.5**	**1.1**	**0.4**	**1.7**	**1.1**
Ear, nose and throat	0.7	4.7	4.0	0.9	5.0	4.1
General	0.5	30.	2.2	0.6	2.7	1.9
Gynaecology	0.6	2.2	1.8	0.5	2.1	1.6
Neurosurgery	0.4	1.9	1.3	0.5	1.4	1.0
Ophthalmology	0.5	4.2	3.6	0.5	3.6	3.1
Orthopaedic	0.8	5.2	4.2	0.8	5.6	4.4
Plastic	0.8	5.0	3.8	0.9	4.3	3.0
Urology	0.8	3.7	2.9	0.8	3.1	2.4
Vascular	0.5	3.9	2.5	0.5	2.9	1.7
Other	0.2	1.4	1.0	0.2	1.7	1.0
All patients	**0.6**	**3.5**	**2.7**	**0.6**	**3.4**	**2.5**

a - January to June 1995. All States and Territories except Queensland; b - all States and Territories except Victoria and Queensland.
Source: AIHW

The 1995-96 data summarised above are the most recent nationally published information on surgery waiting times by specialty. To obtain more current data, the AMWAC 2000 survey of the cardiothoracic surgery workforce collected information on average waiting time prior to operation, and the Working Party also contacted State/Territory health departments directly to obtain any readily available information on cardiothoracic surgery waiting times.

The AMWAC 2000 survey of cardiothoracic surgeons requested respondents to estimate the average waiting time prior to operation for patients referred for an operation, for a clinically urgent condition and for a non-urgent condition. The average waiting time prior to operation for patients with a clinically urgent condition was 10.5 days for a public sector service and 4.4 days for a private sector service. The average waiting time prior to operation for patients with a non-urgent condition was 48.1 days for a public sector service and 13.9 days for a private sector service (Table B14).

Table 30 provides a summary of waiting time information, where available, provided by State/Territory health departments. The waiting time data may not be directly comparable across States/Territories due to differences in the type of statistic reported, time period of the data, and level of detail.

Table 30: Waiting times for cardiothoracic surgery, by State/Territory, 2000

State/Terr.	Waiting Time Information
NSW	The average waiting time for cardiothoracic booked surgery was 24 days (0.8 months) in May 2000. On a monthly basis, between July 1997 and May 2000, the average waiting times ranged from 0.7 months (March 2000) to 1.2 months (July 1997).
SA	The median waiting time for cardiothoracic surgery was 11 days in 1998, 12 days in 1999 and 10 days in 2000. Specifically for coronary artery bypass graft procedures the median waiting times were 13 days in 1998, 21 days in 1999 and 13 days in 2000.
WA[a]	By category, in May 2000 the average waiting times were: category 1 - 15 days; category 2 - 50 days; and category 3 – 109 days.
ACT[a]	The average waiting time for cardiothoracic elective surgery for patients admitted from the waiting list in 1999-2000 was 20.8 days for category 1 patients, 36.5 days for category 2 patients, and 23 days for category 3 patients.

[a] Category 1 – urgent, admission desirable within 30 days; category 2 – semi-urgent, admission desirable within 90 days; and category 3 – non-urgent, admission desirable within 91 days or over.
Source: AIHW

Consultation Waiting Times

The AMWAC 2000 survey of cardiothoracic surgeons collected information on cardiothoracic surgery consultation waiting times. In considering these waiting times, one needs to be aware that patients who ultimately become cardiothoracic patients have a spectrum of urgency and a variety of intermediate steps including investigations and consultations with other specialists. The various steps each apply judgement about urgency and each have their own waiting times, which may affect the overall waiting time for a patient to eventually see a cardiothoracic surgeon.

The data (Table 31) reveal that for a clinically urgent condition (eg., severe left main lesion), the average waiting time to see a cardiothoracic surgeon in his/her private rooms was 2.3 days while for a patient presenting to a public sector service the average waiting time was 3.5 days. For a consultation for a non-urgent condition (eg., stable angina pectoris) with a cardiothoracic surgeon in his/her private rooms the average waiting time was 9.4 days while for a patient presenting to a public sector service the average waiting time was 16.6 days.

Table 31: Average consultation waiting time (days) for cardiothoracic surgery services for a clinically urgent condition and a non-urgent condition, by type of service and State/Territory, 2000

State/Territory	Public Outpatient	Private Room
	Clinically urgent condition	
NSW/ACT	2.9	2.8
Victoria/Tasmania	5.4	2.4
Queensland	3.0	2.6
South Australia	3.6	1.0
Western Australia	2.0	1.5
Total	**3.5**	**2.3**
	Non-urgent condition	
NSW/ACT	19.2	12.0
Victoria/Tasmania	14.0	8.8
Queensland	26.7	10.4
South Australia	11.8	6.4
Western Australia	11.8	5.3
Total	**16.6**	**9.4**

Source: AMWAC survey of cardiothoracic surgeons.

Conclusions on Adequacy of the Current Cardiothoracic Surgery Workforce

Overall, the Working Party concluded that the cardiothoracic surgery workforce is adequately meeting current requirements. None of the selected indicators pointed to any significant workforce shortage. Nationally the SPR has been reasonably constant during the last several years and it is in line with the estimated SPR range provided by the ASCTS. There were no public hospital vacancies and the waiting time indicators were not excessively high. Despite the fact that cardiothoracic surgeons work, on average, a much higher number of hours than other specialists and surgeons, the Working Party felt that this was not necessarily indicative of an overall workforce shortage.

PROJECTIONS OF REQUIREMENTS

Population

Australia has a growing and ageing population. The 2000 population was estimated at 19.1 million, and the population is projected to increase to 20.0 million by 2005 and to 21.0 million by 2011. Between 2000 and 2011, the overall increase is estimated to be 9.9%, a compound annual increase of 0.9%. The ageing of the population expected to add a further 0.4% to the demand for medical services, for a combined growth rate of 1.3%.

The expected population growth rate varies by age group. The older age groups, particularly those aged 45 years and over, are projected to grow at a faster rate than the younger age groups. Between 1997 and 2011, the population aged under 45 years is expected to grow at a rate of 0.1% per annum, while the 45 years and greater population is expected to grow at a rate of 2.3% per annum. The 45 to 64 year age group is anticipated to increase at a rate of 2.4% per annum and the 65 years and greater age group is expected to increase at a slightly lower rate, 2.0% per annum.

ABS estimates that the median age of the total population will rise from 34.3 years in 1997 to between 40.1 and 41.1 years in 2021. As a proportion of the total population, those aged 65 years and over represented 12.1% (2.2 million) in 1997 and this proportion is projected to increase to 14.0% (3.0 million) in 2011. Those aged 45 years and over represented 33.5% of the population in 1997 (6.2 million) and this proportion is expected to increase to 40.4% of the population in 2011 (8.5 million).

Coronary Heart Disease

Trends in coronary heart disease (CHD) may provide an indication of possible trends in requirements for cardiothoracic surgery, as the majority of work for cardiothoracic surgeons is provided as a result of CHD in the population.

Coronary heart disease is a major cause of death and morbidity in Australia, although deaths from CHD have been decreasing. Between 1986 and 1998, the age standardised death rates from CHD have decreased by 4.3% per annum for males (2,895 per million population in 1986 to 1,712 per million population in 1998); for females the decrease was 4.1% per annum (1,535 per million population in 1986 to 932 per million population in 1998). The decrease is due to a combination of a reduction in risk factors such as tobacco smoking and hypertension, and better treatment of hypocholesterolaemia and myocardial infarction. Between 1989 and 1995, smoking rates for males decreased from 32.1% in 1989 to 27.3% in 1995; for females the rate decreased from 24.7% in 1989 to 20.3% in 1995. Similarly, hypertension rates have also decreased, with age standardised rates for adult males decreasing from 24.1% in 1980 to 19.1% in 1995; for adult females the age

standardised rates were 14.2% in 1980 and 10.3% in 1995.

Increasing age is the key factor correlating with the incidence of CHD. This is evidence based on the age standardised death rates from CHD, which were much lower for the younger age groups. For example, in 1998 the age standardised death rate from CHD for males was 41 per million for those aged 25 to 34 years, while the rate was 17,498 per million for those aged 75 to 84 years. Similarly, for females in 1998 the age standardised death rate from CHD was 10 per million for those aged 25 to 34 years and 19,381 per million for those aged 75 to 84 years. A greater incidence of CHD heart disease in the older age groups may also be indicated by the larger number of hospital separations following cardiothoracic surgery procedures per person in the higher age groups as compared with the lower age groups. Using 1998-99 data (Table 32), the number of separations per person, following cardiothoracic surgery procedures, was 6.6 per 1,000 population for those aged 65 years or greater; 4.0 per 1,000 population for those aged 55 to 64 years; 1.0 per 10,000 population for those aged 35 to 54 years; and 0.3 for those under 35 years of age.

Trends in Services

The Medicare and the National Hospital Morbidity databases provide information regarding trends in cardiothoracic surgery service provision over recent years and are useful indicators of likely future demand.

Services Attracting Medicare Benefits

The Working Party analysed the available data on the growth rate in the number of Medicare cardiothoracic surgery services and providers. Between 1995-96 and 1999-00, total Medicare services performed by cardiothoracic surgeons increased an average of 2.2% per annum, an increase of 9.0% in total. During the same period the number of cardiothoracic surgeons increased by 2.3% per annum (9.6% increase in total).

The combined total number of CABG operations and valve procedures, which are representative of the work of cardiothoracic surgeons, showed a decrease of 1.6% per annum between 1995-96 and 1999-00, based on Medicare data. During this period the number of coronary artery bypass graft operations decreased by 3.8% while the number of valve replacement procedures increased by 8.0%.

National Hospital Morbidity Database

The Working Party analysed hospital separations following cardiothoracic surgery procedures of public and private patients. Between 1995-96 and 1998-99 the average increase for all selected procedures in total was 5.5% (1.8% per annum). The Working Party considered that the increasing trend in the number of coronary angioplasties in recent years (Table 19) has contributed to a decreased requirement for CABG procedures, thereby potentially decreasing cardiothoracic surgeons

workload.

Forecasts of future trends in total cardiothoracic surgery procedures have been calculated by applying population projections for 2008 and 2018 to hospital separation data for 1998-99, by age group and gender. These projections, which are based on the 1998-99 patterns of demand and practise, suggest that in total (across all age groups and gender) the demand for cardiothoracic surgery procedures over the next 20 years will continue to increase. These projections assume that the rate of hospital separations for 1998-99 will remain constant, and will only increase by the projected growth in population for each age/gender group. Forecasts of cardiothoracic surgery procedures for the period 1998-99 to 2008 indicate an overall growth rate of 2.1% per annum, across all age groups. For the period 1998-99 to 2008, the forecasts indicate a per annum growth rate of 2.1% for all age groups, and for the period 1998-99 to 2018 the projected per annum growth rate is 2.2%. Cardiothoracic surgery procedures for females are expected to increase at a slightly lower rate than for males (Table 33).

Table 32: Actual and projected population and hospital separations for cardiothoracic surgery related procedures, by age group and gender, 1998-99 to 2018

Age group	Population			Separations		
	Male	Female	Total	Male	Female	Total
			1998-99 (actual)			
0 – 19 yrs	2,683,882	2,549,482	5,233,364	741	593	1,334
20 – 34 yrs	2,131,892	2,105,761	4,237,653	707	404	1,111
35 – 54 yrs	2,689,891	2,671,368	5,361,259	3,864	1,393	5,257
55 – 64 yrs	815,029	801,306	1,616,335	4,905	1,633	6,538
65+ yrs	999,203	1,282,545	2,281,748	9,927	5,161	15,088
Total (all ages)	**9,319,897**	**9,410,462**	**18,730,359**	**20,144**	**9,184**	**29,328**
			2008 (projected)			
0 – 19 yrs	2,659,651	2,523,936	5,183,587	734	587	1,321
20 – 34 yrs	2,192,325	2,135,206	4,327,531	727	410	1,137
35 – 54 yrs	2,956,625	2,992,328	5,948,953	4,247	1,560	5,808
55 – 64 yrs	1,207,197	1,203,323	2,410,520	7,265	2,452	9,717
65+ yrs	1,230,363	1,502,349	2,732,712	12,224	6,045	18,269
Total (all ages)	**10,246,161**	**10,357,142**	**20,603,303**	**25,197**	**11,055**	**36,252**
			2018 (projected)			
0 – 19 yrs	2,555,144	2,422,938	4,978,082	705	564	1,269
20 – 34 yrs	2,304,921	2,237,201	4,542,122	764	429	1,194
35 – 54 yrs	3,034,599	3,051,296	6,085,895	4,359	1,591	5,950
55 – 64 yrs	1,419,474	1,452,358	2,871,832	8,543	2,960	11,502
65+ yrs	1,713,747	2,008,121	3,721,868	17,026	8,081	25,107
Total (all ages)	**11,027,885**	**11,171,914**	**22,199,799**	**31,398**	**13,624**	**45,022**

Note: It is assumed that the rate of hospital separations for each age group for 1998-99 will remain constant to 2008 and 2018, and, using this assumption, 1998-99 hospital separations have been projected using the ABS population projections.
Sources: AIHW hospital morbidity database, ABS Catalogue 3222.0 and AMWAC.

Table 33: Annual percentage increase* in projected population and hospital separations for cardiothoracic surgery related procedures, by age group and gender, 1998-99 to 2018

Age group	Population			Separations		
	Male	Female	Total	Male	Female	Total
			1998-99 to 2008			
0 – 19 yrs	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
20 – 34 yrs	0.3	0.1	0.2	0.3	0.1	0.2
35 – 54 yrs	0.9	1.0	1.0	0.9	1.1	1.0
55 – 64 yrs	3.6	3.8	3.7	4.0	4.1	4.0
65+ yrs	1.9	1.4	1.7	2.1	1.6	1.9
Total (all ages)	**0.9**	**0.9**	**0.9**	**2.3**	**1.9**	**2.1**
			1998-99 to 2018			
0 – 19 yrs	-0.2	-0.2	-0.2	-0.2	-0.3	-0.2
20 – 34 yrs	0.4	0.3	0.3	0.4	0.3	0.4
35 – 54 yrs	0.6	0.6	0.6	0.6	0.7	0.6
55 – 64 yrs	2.7	2.9	2.8	2.8	3.0	2.9
65+ yrs	2.6	2.2	2.4	2.7	2.3	2.6
Total (all ages)	**0.8**	**0.8**	**0.8**	**2.2**	**2.0**	**2.2**

Note: Percentage changes are calculated based on data from Table 32.
* compound annual increase
Sources: AIHW hospital morbidity database, ABS Catalogue 3222.0 and AMWAC.

Projections of Coronary Artery Bypass Graft (CABG) Operations

As with total cardiothoracic surgery procedures, forecasts of future trends in CABG operations have also been calculated by applying population projections for 2008 and 2018 to CABG data for 1998-99, by age group and gender. These projections, which are based on the 1998-99 patterns of demand and practise, suggest that in total (across all age groups and gender) the demand for CABG operations over the next 20 years will continue to increase. Forecasts of CABG operations for the period 1998-99 to 2008 indicate an overall growth rate of 2.4% per annum, across all age groups. For the period 1998-99 to 2008, the forecasts indicate a per annum growth rate of 2.4% for all age groups, and for the period 1998-99 to 2018 the projected per annum growth rate is 2.2%. Cardiothoracic surgery procedures for females are expected to increase at a slightly lower rate than for males (Table 35).

Table 34: Actual and projected population and coronary artery bypass graft operations, by age group and gender, 1998-99 to 2018

Age group	Population			CABG operations		
	Male	Female	Total	Male	Female	Total
			1998-99 (actual)			
0 – 19 yrs	2,683,882	2,549,482	5,233,364	5	5	10
20 – 34 yrs	2,131,892	2,105,761	4,237,653	26	17	43
35 – 54 yrs	2,689,891	2,671,368	5,361,259	2,324	402	2,726
55 – 64 yrs	815,029	801,306	1,616,335	3,692	849	4,541
65+ yrs	999,203	1,282,545	2,281,748	7,138	2,995	10,133
Total (all ages)	**9,319,897**	**9,410,462**	**18,730,359**	**13,185**	**4,268**	**17,453**
			2008 (projected)			
0 – 19 yrs	2,659,651	2,523,936	5,183,587	5	5	10
20 – 34 yrs	2,192,325	2,135,206	4,327,531	27	17	44
35 – 54 yrs	2,956,625	2,992,328	5,948,953	2,554	450	3,005
55 – 64 yrs	1,207,197	1,203,323	2,410,520	5,468	1,275	6,743
65+ yrs	1,230,363	1,502,349	2,732,712	8,789	3,508	12,298
Total (all ages)	**10,246,161**	**10,357,142**	**20,603,303**	**16,844**	**5,256**	**22,100**
			2018 (projected)			
0 – 19 yrs	2,555,144	2,422,938	4,978,082	5	5	10
20 – 34 yrs	2,304,921	2,237,201	4,542,122	28	18	46
35 – 54 yrs	3,034,599	3,051,296	6,085,895	2,622	459	3,081
55 – 64 yrs	1,419,474	1,452,358	2,871,832	6,430	1,539	7,969
65+ yrs	1,713,747	2,008,121	3,721,868	12,242	4,689	16,932
Total (all ages)	**11,027,885**	**11,171,914**	**22,199,799**	**21,327**	**6,710**	**28,037**

Note: It is assumed that the rate of CABG operations for each age group for 1998-99 will remain constant to 2008 and 2018, and, using this assumption, 1998-99 CBG operations have been projected using the ABS population projections.

Sources: AIHW hospital morbidity database and ABS Catalogue 3222.0.

Table 35: Annual percentage increase* in projected population and coronary artery bypass operations, by age group and gender, 1998-99 to 2018

Age group	Population			CABG operations		
	Male	Female	Total	Male	Female	Total
			1998-99 to 2008			
0 – 19 yrs	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
20 – 34 yrs	0.3	0.1	0.2	0.3	0.1	0.2
35 – 54 yrs	0.9	1.0	1.0	0.9	1.1	1.0
55 – 64 yrs	3.6	3.8	3.7	4.0	4.1	4.0
65+ yrs	1.9	1.4	1.7	2.1	1.6	2.0
Total (all ages)	**0.9**	**0.9**	**0.9**	**2.5**	**2.1**	**2.4**
			1998-99 to 2018			
0 – 19 yrs	-0.2	-0.2	-0.2	-0.2	-0.3	-0.2
20 – 34 yrs	0.4	0.3	0.3	0.4	0.3	0.4
35 – 54 yrs	0.6	0.6	0.6	0.6	0.7	0.6
55 – 64 yrs	2.7	2.9	2.8	2.8	3.0	2.9
65+ yrs	2.6	2.2	2.4	2.7	2.3	2.6
Total (all ages)	**0.8**	**0.8**	**0.8**	**2.4**	**2.3**	**2.4**

Note: Percentage changes are calculated based on data from Table 34.
* compound annual increase
Sources: AIHW hospital morbidity database and ABS Catalogue 3222.0.

Cardiothoracic Surgeons' Perceptions of Factors Affecting Workforce Requirements

Respondents to the AMWAC survey of cardiothoracic surgeons were asked to indicate whether they believed particular factors would increase workforce requirements, decrease workforce requirements or whether requirements would stay the same. The survey did not ask respondents to quantify the likely impact of the factors on service utilisation, but rather to indicate, in their opinion, the direction of the impact of the factor on the cardiothoracic surgery workforce.

Among the issues that the largest proportion of respondents thought would increase workforce requirements were 'patient expectations/knowledge', 'geographic distribution of the population', and 'technology', while no respondents thought that 'ageing of the population' would increase workforce requirements. Factors perceived as most likely to decrease workforce requirements were 'disease patterns', 'lifestyle changes that improve population health' and 'public health resource allocation'. (Table B18)

Summary of Cardiothoracic Surgery Requirement Indicators

Table 36 provides a summary of each of the main requirement indicators considered by the Working Party.

Table 36: Summary of cardiothoracic surgery requirement indicators

Requirement indicator	Compound annual increase %
Population growth 2000-2011	0.9
Population growth and ageing impact 2000-2011	1.3
Medicare cardiothoracic surgery services 1995-96 to 1999-2000	2.2
Medicare CABG operations and valve procedures 1995-96 to 1999-2000	- 1.6
National hospital morbidity database cardiothoracic surgery procedures 1995-96 to 1998-99	1.8
National hospital morbidity database CABG operations 1995-96 to 1998-99	0.6
Forecast national hospital morbidity database cardiothoracic surgery procedures 1998-99 to 2008*	2.1
Forecast national hospital morbidity database cardiothoracic surgery procedures 1998-99 to 2018*	2.2
CABG operation forecast 1998-99 to 2008*	2.4
CABG operation forecast 1998-99 to 2018*	2.4

Note: * - the forecast assumes that the rate of hospital separations for 1998-99 will remain constant and will only increase by projected growth in population
Sources: AMWAC, ABS, DHAC, AIHW

PROJECTIONS OF SUPPLY

Additions and Losses to the Cardiothoracic Surgery Workforce

Additions to the Cardiothoracic Surgery Workforce

During the last five years the RACS has admitted an average of five cardiothoracic surgery Fellows per year. Based on the number of trainees currently in the cardiothoracic surgery advanced training program, it is anticipated that this trend will continue, resulting in an average of approximately five new Fellows per year until 2006.

Retirements

The AMWAC survey of cardiothoracic surgeons asked respondents to provide details of their retirement intentions. The expected age of retirement ranged from 55 years to 75 years, with an average expected retirement age of 62.6 years (mode 65 years; median 65 years; standard deviation 3.9 years). The results of the AMWAC 2000 workforce survey indicate that 22 cardiothoracic surgeons (42.3% of respondents) intend to retire by 2010, with 10 planning to retire by 2005 and the remaining 12 planning to retire between 2005 and 2010 (Table B17).

If the planned average retirement age of respondents to the AMWAC 2000 survey of the cardiothoracic surgery workforce (62.6 years) is indicative of the intentions of the workforce in general, approximately one quarter of the cardiothoracic surgery workforce can be expected to leave the workforce over the next ten years. Overall, based on the AMWAC 2001 survey of cardiothoracic surgery units, 25.4% of the cardiothoracic surgery workforce (27 cardiothoracic surgeons) are aged 55 years or greater (Table 7). If all of these cardiothoracic surgeons retire over the next ten years, this would result in an average loss of approximately two to three (average 2.7) cardiothoracic surgeons per year.

Female Participation in the Workforce

There are relatively few women in the cardiothoracic surgery workforce in Australia, with the AMWAC 2001 survey of units indicating that there are three female cardiothoracic surgeons (2.8% of the workforce). The number of female trainees can be expected to increase somewhat over the next decade given the general growth in the number of females entering medical schools. However, despite the fact that the current proportion of female trainees (9.5%) is somewhat higher than that represented in the cardiothoracic surgery workforce, the impact of a slight increase in the number of women graduating from the cardiothoracic surgery training program on the workforce is expected to be minimal because currently there are so few female cardiothoracic surgeons.

Expected Changes in Work Hours

In total, 70.9% of respondents to the AMWAC 2000 survey of the cardiothoracic surgery workforce indicated that they anticipated a change in the hours that they work over the next ten years, with 61.8% anticipating a reduction in their hours and 9.1% planning to increase their hours worked (Table B15). Of the responding cardiothoracic surgeons who expected their work hours to decrease over the next ten years, 37.5% were over 55 years of age. Of the responding cardiothoracic surgeons who expected their work hours to increase, 80.0% were under the age of 45 years (Table B16).

Provision of Services in Rural and Remote Areas

Based on the results of the AMWAC 2001 survey of units, the AMWAC 2000 survey of the cardiothoracic surgery workforce, and the AIHW 1998 data, all cardiothoracic surgeons are located in a metropolitan area. Only one respondent to the AMWAC 2000 workforce survey indicated that they had a secondary practice located in a rural area. A total of six respondents (13.0%) indicated that they provide outreach services to rural areas.

Although the distribution of cardiothoracic surgeons is not consistent with the population distribution (Table 5), it must be noted that cardiothoracic surgery services are generally not sustainable in rural areas. This is due to the infrastructure required to support cardiothoracic surgery (in terms of clinical and other support services, equipment and staff – see Appendix D) and the population base required to maintain a viable cardiothoracic surgery practice. These requirements place a constraint on both the location and the size of the cardiothoracic surgery workforce, and, generally limit cardiothoracic surgeons to practising in metropolitan locations.

Nevertheless, as shown in table 16 residents of rural and remote areas receive cardiothoracic surgery services at the same rate as metropolitan residents.

BALANCING SUPPLY AGAINST REQUIREMENTS

The standard AMWAC specialist medical workforce projection model has been used to project a cardiothoracic surgery supply and requirements scenario to 2011. On the supply side, the model takes into account expected entrants to the workforce and those leaving, converts the number of specialists to a full time equivalent (FTE) figure using the average hours worked per week by age and gender, and factors in the expected lower average lifetime workforce contribution of female specialists. On the requirements side, the likely trend in demand for cardiothoracic surgery services is included, based on the Working Party's assessment of the expected trend in requirements (AMWAC 2000; Theile et al, 1998).

Both supply and requirements have been projected over a ten year period to 2011. It is recognised that a ten year projection period is a long time frame for assumptions to remain valid. However, this time frame was chosen because five years was considered to be too short for any impact on training numbers to move through, particularly given the length of the cardiothoracic surgery training program.

Requirement Trends

The Working Party assessed various indicators as the basis for estimating future requirements for cardiothoracic surgeons. These indicators included population growth, actual and projected growth in hospital separations following cardiothoracic surgery procedures, and Medicare service provision trends.

Each of the selected requirement indicators has been projected over the period 2000 to 2011 and the results are outlined in Table 37. The projections have been converted to FTE hours per week using the estimated average hours worked by cardiothoracic surgeons of 64.1 hours per week. For the projection modelling, the Working Party assumed no vacancies, as identified by the most recent information collected on public hospital vacancies. Conversion of the data to hours worked allows comparisons to be made with projected supply data, which has been similarly converted.

The Working Party concluded that the best indicators of likely future cardiothoracic surgery service requirements include the actual (1995 to 1998) and projected (1998 to 2008) growth trends in the number of hospital separations relating to cardiothoracic surgery. These indicators show a growth rate in the range of 1.8% per annum to 2.1% per annum, which is above the projected growth in population combined with the effects of ageing (1.3% per annum) for the ten year period.

Table 37: Projected requirements for cardiothoracic surgery services (in FTE hours per week) for selected indicators, 2001 to 2011*

Projected requirements for cardiothoracic surgery services in FTE hours per week	% growth per annum	2001	2003	2005	2007	2009	2011
Population growth (2000-2011)	0.9	6,946	7,072	7,199	7,330	7,462	7,597
Population growth and ageing (2000-2011)	1.3	6,973	7,156	7,343	7,535	7,733	7,935
Medicare service provision (1995-96 to 1999-00)	2.2	7,035	7,348	7,675	8,017	8,373	8,746
Hospital separations ICD-9-CM (projected 1998 to 2008)	2.1	7,029	7,327	7,638	7,962	8,300	8,652
Hospital separations ICD-9-CM (1995-96 to 1998-99)	1.8	7,008	7,262	7,526	7,800	8,083	8,377

*assumes an average of 64.1 hours worked per week
Source: AMWAC

Supply Trends

The supply of cardiothoracic surgeons was projected by ageing the estimated number of cardiothoracic surgeons through each year, subtracting expected retirements (estimated to average approximately 2.7 per year) and adding anticipated new graduates (estimated to be approximately five per year). The Working Party estimated that, based on the current number of trainees and trends in recent years, approximately five cardiothoracic surgeons will enter the workforce per year.

The number of cardiothoracic surgeons was converted to hours per week by applying the average number of hours worked to head counts in each major age cohort. In doing so the Working Party assumed that the pattern of workforce participation of the current workforce provides a suitable basis on which to project future workforce requirements. These supply projections show that, based on the current estimated intake of trainees of about five per year, supply is projected to increase from the estimated 2000 level of approximately 6,884 FTE hours per week to an estimated 8,418 FTE hours per week in 2011 (Table 38).

Table 38: Projected supply of cardiothoracic surgery services (in FTE hours per week), 2000 to 2011

Year	Expected graduates	Estimated FTE hours
2000	5	6,884
2001	5	6,974
2002	5	7,177
2003	5	7,358
2004	5	7,528
2005	5	7,685
2006	5	7,831
2007	5	7,965
2008	5	8,090
2009	5	8,206
2010	5	8,315
2011	5	8,418

Source AMWAC

Projected Balance

Using the projected supply and requirements scenarios summarised in Tables 37 and 38, an indication of the expected shortage or oversupply within the workforce can be calculated. This is outlined in Table 39 and shows that the projected workforce supply will continue to be in balance with the estimated cardiothoracic surgery service requirements level, assuming growth in requirements of 1.8% per annum. With a growth rate of 1.8% per annum, maintaining approximately five graduates per year results in a slight notional oversupply, peaking at 2.2% in 2006 and then steadily decreasing thereafter to 0.5% in 2011. Assuming a growth rate of 1.3% per annum results in a notional oversupply starting at 1.6% in 2002 and then steadily increasing to peak at 5.8% in 2009 and 2010.

Table 39: Projected cardiothoracic surgery requirements (in FTE hours per week) and estimated over/under supply, 2000 to 2011[a]

Year	Projected Requirements	Estimated over/under supply (-) %
Assuming a projected growth rate of 1.8%		
2000	6,884	0.0
2001	7,008	- 0.5
2002	7,134	0.6
2003	7,262	1.3
2004	7,393	1.8
2005	7,526	2.1
2006	7,662	2.2
2007	7,800	2.1
2008	7,940	1.8
2009	8,083	1.5
2010	8,228	1.0
2011	8,377	0.5
Assuming a projected growth rate of 1.3%		
2000	6,884	0.0
2001	6,973	0.0
2002	7,064	1.6
2003	7,156	2.7
2004	7,249	3.7
2005	7,343	4.5
2006	7,439	5.0
2007	7,535	5.4
2008	7,633	5.6
2009	7,733	5.8
2010	7,833	5.8
2011	7,935	5.7

a – based on growth rates of 1.8% and 1.3%, respectively, average retirement rates (average 2.7 per year), average graduating cardiothoracic surgeons (five per year), and a working week of 64.1 hours.
Source: AMWAC

The Working Party considered an alternative scenario where the number of graduates was decreased from the current level of five to four per year and assuming a growth in requirements of 1.3% per annum, which is equivalent to projected population and ageing combined. 2007 is the first year in which the number of graduates can be changed, as the cardiothoracic surgery training program is six years and those trainees who are expected to graduate up to the year 2006 would have already entered the training program. Table 40 shows that decreasing the number of graduates per year from five to four results in a notional oversupply peaking at 5.4% in 2007, and steadily decreasing to 2.8% by 2011.

Table 40: Projected cardiothoracic surgery supply and requirements (in FTE hours per week), 2000 to 2011[a]

Year	Projected Supply	Projected Requirements	Estimated over/under supply (-) (%)
2000	6,884	6,884	0.0
2001	6,974	6,973	0.0
2002	7,177	7,064	1.6
2003	7,358	7,156	2.7
2004	7,528	7,249	3.7
2005	7,685	7,343	4.5
2006	7,831	7,439	5.0
2007	7,965	7,535	5.4
2008	8,026	7,633	4.9
2009	8,078	7,733	4.3
2010	8,123	7,833	3.6
2011	8,161	7,935	2.8

a – based on a growth rate of 1.3%, average retirement rates (average 2.7 per year), a decrease in the average number of graduating cardiothoracic surgeons (from five to four per year starting in 2007), and a working week of 64.1 hours.
Source: AMWAC

Based on the results of the projection modelling, the Working Party recommends that the number of graduates be maintained at approximately five per year. A total of five graduates per year is unchanged from the average number of trainees who have graduated from the cardiothoracic surgery training program in recent years, and the average number per year who are expected to graduate during the next several years (based on those already in the program). The Working Party recommends that an update of this workforce review be undertaken in 2005-2006, to ensure the workforce size continues to adequately meet requirements.

It should be noted that the projection model is sensitive to the chosen requirement growth indicator, number of retirements per year, average hours worked and the age and gender profile of the workforce. If the expected requirement growth for cardiothoracic surgery varies from the projected trend of 1.8% per annum, or if any of the other factors mentioned changes significantly, then the model will need to be updated with these scenarios. The cardiothoracic surgery workforce is particularly sensitive to changes in these factors due to its relatively small total size.

RECOMMENDATIONS

The Working Party recommends:

1. To achieve an appropriate supply of cardiothoracic surgeons the annual intake to the cardiothoracic surgery training program should be maintained at approximately five per year. (Currently an average of five trainees graduate from the training program each year.).

   The aim of maintaining first year advanced trainee numbers within this range is to match workforce supply with an expected future growth in cardiothoracic surgery requirements of 1.8% per annum.

2. That the coordination of the cardiothoracic surgery trainee placements continue to be overseen by the Royal Australasian College of Surgeons (RACS) Board of Cardiothoracic Surgery, in consultation with State/Territory health departments.

3. That cardiothoracic surgery requirements and supply projections continue to be monitored regularly so that they can be amended if new trends in any of the workforce characteristics emerge or projection assumptions change. That this monitoring be coordinated by the RACS and AMWAC and the results incorporated into the AMWAC annual report to AHMAC. AMWAC will provide necessary support.

4. That an update of this review of the cardiothoracic surgery workforce be undertaken in 2005-2006.

APPENDIX A: RURAL, REMOTE AND METROPOLITAN AREAS CLASSIFICATION

The Commonwealth Departments of Health and Aged Care and Primary Industries and Energy, Rural, Remote and Metropolitan Areas classification, has been used to classify the geographic location of the job of responding medical practitioners in the following seven categories.

Metropolitan areas:

1. *Capital cities* consist of the State and Territory capital cities of Sydney, Melbourne, Brisbane, Perth, Adelaide, Hobart, Darwin and Canberra.

2. *Other metropolitan centres* consist of one or more statistical subdivisions which have an urban centre of population of 100,000 or more in size. These centres are: Newcastle, Wollongong, Queanbeyan (part of Canberra-Queanbeyan), Geelong, Gold Coast-Tweed Heads, Townsville-Thuringowa.

Rural zones:

3. *Large rural centres* are statistical local areas where most of the population reside in urban centres of population of 25,000 to 99,999. These centres are: Albury-Wodonga, Dubbo, Lismore, Orange, Port Macquarie, Tamworth, Wagga Wagga (NSW); Ballarat, Bendigo, Shepparton-Mooroopna (Vic); Bundaberg, Cairns, Mackay, Maroochydore-Mooloolaba, Rockhampton, Toowoomba (Qld), Whyalla (SA); and Launceston (Tas).

4. *Small rural centres* are statistical local areas in rural zones containing urban centres of population between 10,000 and 24,999. These centres are: Armidale, Ballina, Bathurst, Broken Hill, Casino, Coffs Harbour, Forster-Tuncurry, Goulburn, Grafton, Griffith, Lithgow, Moree Plains, Muswellbrook, Nowra-Bombaderry, Singleton, Taree (NSW); Bairnsdale, Colac, Echuca-Moama, Horsham, Mildura, Moe-Yallourn, Morwell, Ocean Grove-Barwon Heads, Portland, Sale, Traralgon, Wangaratta, Warrnambool (Vic); Caloundra, Gladstone, Gympie, Hervey Bay, Maryborough, Tewantin-Noosa, Warwick (Qld); Mount Gambier, Murray Bridge, Port Augusta, Port Lincoln, Port Pirie (SA); Albany, Bunbury, Geraldton, Mandurah (WA); Burnie-Somerset, Devonport (Tas).

5. *Other rural areas* are the remaining statistical areas within the rural zone. Examples are Cowra Shire, Temora Shire, Guyra Shire (NSW); Ararat Shire, Cobram Shire (Vic); Cardwell Shire, Whitsunday Shire (Qld); Barossa, Pinnaroo (SA); Moora Shire, York Shire (WA); George Town, Ross (Tas); Coomalie, Litchfield (NT).

Remote zones:
These are generally less densely populated than rural statistical local areas and hundreds of kilometres from a major urban centre.

6. *Remote centres* are statistical local areas in the remote zone containing urban centres of population of 5,000 or more. These centres are: Blackwater, Bowen, Emerald, Mareeba, Moranbah, Mount Isa, Roma (Qld); Broome, Carnarvon, East Pilbara, Esperance, Kalgoorlie/Boulder, Port Hedland, Karratha (WA); Alice Springs, Katherine (NT).

7. *Other remote areas* are the remaining areas within the remote zone. Examples are: Balranald, Bourke, Cobar, Lord Howe Island (NSW); French Island, Orbost, Walpeup (Vic); Aurukun, Longreach, Quilpie (Qld); Coober Pedy, Murat Bay, Roxby Downs (SA); Coolgardie, Exmouth, Laverton, Shark Bay (WA); King Island, Strahan (Tas); Daly, Jabiru, Nhulunbuy (NT).

APPENDIX B: AMWAC SURVEY OF THE CARDIOTHORACIC SURGERY WORKFORCE, 2000

METHODOLOGY

To assist with the establishment of a profile of the cardiothoracic surgery workforce in Australia, a confidential mailed survey of all cardiothoracic surgeons who were Fellows of the RACS was conducted in July/August 2000. The survey was administered by AMWAC in consultation with the RACS. In total, 130 questionnaires were distributed and 74 Fellows responded, which is a response rate of 56.9%.

RESULTS

The results of this survey are presented in the following sequence:

- an analysis of the survey response rate, which includes a description of the profile of respondents;
- a description of the work profile of responding cardiothoracic surgeons including type of practice, work setting, hours worked, practice activities, waiting times, provision of services to rural areas, and professional satisfaction; and
- an examination of factors influencing future workforce participation and requirements, including plans to change hours worked, retirement expectations, and respondents' perceptions of factors affecting workforce requirements.

Response rate analysis

Distribution

Table B1 shows that the State/Territory distribution of survey respondents (for those respondents who indicated their State/Territory) was similar to the distribution of cardiothoracic surgeons who are Fellows of the RACS. New South Wales/Australian Capital Territory and Queensland were slightly under represented in the survey responses, while South Australia and Western Australia were slightly over represented.

Table B1: Distribution of survey respondents (2000) compared with the distribution of all cardiothoracic surgeons who are Fellows of the RACS (2000), by State/Territory

	NSW / ACT	Vic/ Tas	Qld	SA	WA	NT	Aust
AMWAC survey respondents							
% respondents	32.2	33.9	14.3	8.9	10.7	-	100.0
Cardiothoracic surgeons who are Fellows of the RACS							
% of members	35.6	32.7	18.3	4.8	8.7	-	100.0

Sources: RACS and AMWAC survey of cardiothoracic surgeons.

All survey respondents who indicated the location of their primary practice were located in a metropolitan area, with 92.7% located in a capital city and 7.3% in other metropolitan areas. The AIHW 1998 survey data showed a similar distribution with

all cardiothoracic surgeons located in a metropolitan area (86.1% in a capital city and 13.9% located in other metropolitan areas).

Table B2: Geographic distribution of cardiothoracic surgeons, AMWAC 2000 survey and AIHW 1998 survey

	Capital city	Other metropolitan	Rural	Australia
AMWAC survey respondents				
% respondents	92.7	7.3	0.0	100.0
AIHW medical labour force data				
% of cardiothoracic surgery workforce	86.1	13.9	0.0	100.0

Source: AIHW and AMWAC survey of cardiothoracic surgeons

Age Profile

The age range of survey respondents was from 35 years to 87 years with an average age of 55.6 years, while the AIHW 1998 survey data showed the average age of cardiothoracic surgeons was somewhat younger, 48.2 years. Table B3 shows the distribution of respondents by age group varied from the age profile of the workforce, as indicated by the 1998 AIHW medical labour force survey, particularly for the 65 year and over age group. However, of the 17 AMWAC survey respondents who were 65 years of age or greater, all but one indicated they were either retired or employed in another field and did not answer the body of the questionnaire. Due to the fact that they are not currently practising in cardiothoracic surgery, these 16 respondents would not be likely to be included in the AIHW count and age profile (as shown in Table B3) of specialists whose main specialty of practise is cardiothoracic surgery.

Table B3: Age profile of cardiothoracic surgeons, AMWAC 2000 survey and AIHW 1998 medical labour force survey

	<35 yrs	35-44 yrs	45-54 yrs	55-64 yrs	65+ yrs
AMWAC survey respondents					
% respondents	0.0	23.9	28.2	23.9	23.9
AIHW medical labour force data					
% cardiothoracic surgery workforce	2.1	36.5	35.4	22.9	3.1

Source: AIHW and AMWAC survey of cardiothoracic surgeons.

The average age of the 56 respondents who were currently active in the cardiothoracic surgery workforce and responded to the body of the questionnaire, was 50.3 years, which is much closer to the average age indicated by the AIHW 1998 survey (48.2 years).

Gender Profile
In total, of the respondents who indicated their gender on the questionnaire, 95.7% were male and 4.3% were female. This gender profile is almost identical to the profile indicated by the AIHW 1998 labour force data, which showed 94.8% of cardiothoracic surgeons were male and 5.2% were female.

Workforce Status
In total, 79.7% (55) of survey respondents indicated they were currently working in the field of cardiothoracic surgery, of whom 98.2% (54) indicated they were working full-time and 1.8% (1) indicated they were working part-time. One of these 55 respondents did not complete the body of the questionnaire, although they did indicate that they were working full time in the cardiothoracic surgery workforce. Of the other 19 respondents, 17 did not complete the body of the questionnaire (14 were retired and 3 indicated that they were employed in another field). The remaining two respondents, although they did not specify their current employment status (full time versus part time), did complete the body of the questionnaire and therefore it was assumed they are active in the workforce.

The remainder of this report focuses on the information provided by the 56 respondents who were currently active in the cardiothoracic surgery workforce and responded to the body of the questionnaire.

Response Rate Conclusions
The Working Party concluded that a response rate of 56.9% was acceptable. Furthermore, it was concluded that the profile of respondents was sufficiently consistent with the RACS and AIHW profiles of the cardiothoracic surgery workforce to provide data representative of the cardiothoracic surgery workforce.

Qualifications
All respondents indicated that they hold a Fellowship of the RACS.

Type of Cardiothoracic Surgery Practice
Proportion of Time Spent by Practice Area
Respondents were asked to indicate the proportion of their professional effort spent in various cardiothoracic surgery practice areas. On average, for Australia as a whole, respondents spent the largest proportion of their time on adult cardiac surgery (74.8%), followed by thoracic surgery (20.2%) and paediatric cardiac surgery (5.0%). In every State/Territory, the majority of respondents' time was spent on adult cardiac surgery, with the least amount of time spent on paediatric cardiac surgery. Queensland had a slightly different profile as compared with the other States/Territories, with only a very small proportion of time spent on thoracic surgery (4.3%) (Table B4).

Table B4: Average percentage of professional time spent in cardiothoracic surgery practice areas, by State/Territory, 2000

Area of cardiothoracic surgery practice	NSW / ACT	Vic /Tas	Qld	SA	WA	Aust.
Adult cardiac surgery	75.9	69.5	86.0	69.8	77.5	74.8
Thoracic surgery	20.6	25.5	4.3	28.0	17.5	20.2
Paediatric cardiac surgery	3.5	5.0	9.8	2.2	5.0	5.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: AMWAC survey of cardiothoracic surgeons.

Number of Cardiothoracic Surgery Procedures Performed

Respondents were asked to indicate how many of certain types of procedures they performed each year, on average, based on their last three years' experience. Across Australia, the number of coronary artery bypass procedures performed each year per respondent ranged from 0 to 450, with an average of 211 procedures, and the most frequent response was 200 procedures per year. The number of other open heart procedures performed each year ranged from 0 to 200 per respondent, with an overall average of 73 procedures and the most frequent response was 50 procedures per year. For major thoracic procedures (excluding bronchoscopy and oesophagoscopy), the range was from 0 to 400 procedures per year, with an average of 82 procedures per year and the most frequent response was 30 procedures per year (Table B5).

By State/Territory, the average number of coronary artery bypass procedures performed per year per respondent ranged from 171 in Victoria/Tasmania to 254 in New South Wales/Australian Capital Territory. For other open heart procedures the average number per year per respondent ranged from 56 in Victoria/Tasmania to 85 in Western Australia. Respondents from South Australia reported the highest average number of major thoracic procedures per year (123) and respondents from Queensland reported the lowest (29) (Table B5).

Table B5: Average number of cardiothoracic surgery procedures per surgeon per year, by State/Territory, 2000

Type of procedure	NSW / ACT	Vic /Tas	Qld	SA	WA	Aust.
Coronary artery bypass procedures	254	171	184	250	207	211
Other open heart procedures	78	56	83	82	85	73
Major thoracic procedures	75	100	29	123	75	82

Source: AMWAC survey of cardiothoracic surgeons.

Work Setting

Respondents to the survey were asked to indicate where they practised cardiothoracic surgery. On average, respondents indicated that 48.6% of their time was spent in the public sector in a salaried position and 51.4% of their time was spent in private practice. A total of 23.2% of respondents indicated that all of their time was spent in private practice, 8.9% indicated that all of their time was spent in a salaried position, and the remaining 67.9% indicated that they worked in both a salaried position and in private practice (Table B6).

Table B6: Average percentage of cardiothoracic surgery workforce by work setting, 2000

Work setting	Average % of cardiothoracic surgeons by work setting
Salaried position only	8.9
Private practice only	23.2
Salaried position and private practice	67.9
Total	**100.0**

Source: AMWAC survey of cardiothoracic surgeons.

As shown in Table B7, of the respondents who indicated they worked some or all of their time in a salaried position and reported their source of salary, the main source of salary indicated was a public hospital (90.2%). The remainder of respondents were divided among the following salary sources: university; public hospital and university; and public and private. No respondents indicated research/institute as a source of salary.

Table B7: Source of salary of cardiothoracic surgeons employed in the public sector in cardiothoracic surgery, 2000

Source of Salary	Percent
Public Hospital	90.2
University	2.4
Public Hospital and University	4.9
Public and Private	2.4
Total	**100.0**

Source: AMWAC survey of cardiothoracic surgeons.

As shown in Table B8, of the respondents who indicated they worked some or all of their time in a private practice, and reported their source of salary, the majority had public and private hospital appointments (80.4%). A further 13.7% indicated they had a public hospital appointment only and 5.9% indicated a private hospital appointment only.

Table B8: Appointment in private practice in cardiothoracic surgery, 2000

Appointment in Private Practice	Percent
Public hospital and private hospital appointments	80.4
Public hospital appointment only	13.7
Private hospital appointment only	5.9
Total	**100.0**

Source: AMWAC survey of cardiothoracic surgeons.

Hours Worked

On average, respondents worked a total of 62.0 hours per week (minimum 36 hours; maximum 80 hours; mode 60 hours; median 60 hours). In addition, respondents reported being on call, but not working, for an average of 57.6 hours per week. In the survey total hours worked were defined as total hours spent in patient care, including hours on call that were worked (but excluding hours on call not worked), plus time spent on non-patient care activities such as administration, continuing medical education, teaching and research.

Table B9 shows that the average hours worked per week ranged from a low of 56.0 hours in South Australia to a high of 65.0 hours in Western Australia.

Table B9: Average hours worked per week by cardiothoracic surgeons, by State/Territory, 2000

	NSW / ACT	Vic/ Tas	Qld	SA	WA	Aust.
Average hours worked	61.3	63.3	61.8	56.0	65.0	62.0

Source: AMWAC survey of cardiothoracic surgeons.

As shown in Table B10, none of the survey respondents indicated that they worked less than 35 hours per week, while most respondents (50.0%) worked between 50 and 64 hours per week. Overall, 91.1% of the workforce worked more than 50 hours per week, and 8.9% worked more than 80 hours per week. The hours worked profile varied quite significantly by State/Territory. For example, all respondents from South Australia reported working between 50 and 64 hours per week, and the majority of respondents from Western Australia (66.7%) reported working between 65 and 79 hours per week. No respondents from Queensland, South Australia or Western Australia reported working more than 80 hours per week.

Table B10: Percentage of cardiothoracic surgeons, average total hours worked per week, by State/Territory, 2000

Hours worked	NSW / ACT	Vic/ Tas	Qld	SA	WA	Aust.
Less than 35 hours	-	-	-	-	-	-
35 to 49 hours	11.1	10.5	12.5	-	-	8.9
50 to 64 hours	55.6	42.1	37.5	100.0	33.3	50.0
65 to 79 hours	16.7	36.8	50.0		66.7	32.1
80 hours or more	16.7	10.5	-	-	-	8.9
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: AMWAC survey of cardiothoracic surgeons.

Table B11 shows a variation in the profile of hours worked by age group. In total, 52.8% of respondents under the age of 55 years indicated that they worked more than 65 hours per week on average, with 11.1% indicating that they worked more than 80 hours per week. In comparison, 22.3% of respondents aged 55 years or more indicated that they worked 65 hours per week or more, with 5.6% indicating that they worked more than 80 hours per week.

Table B11: Percentage of cardiothoracic surgeons, average total hours worked per week, by age group, 2000

Age group	Less than 35 hours	35 to 49 hours	50 to 64 hours	65 to 79 hours	80 hours or more	Total
Under 55 years	-	11.1	36.1	41.7	11.1	100.0
55 years and over	-	5.6	72.2	16.7	5.6	100.0

Source: AMWAC survey of cardiothoracic surgeons.

Practice Activities

Respondents were asked to indicate the percentage of their time spent in various activities over a typical week. The responses showed that the majority of their time was spent on clinical activities (75.4%), with responses ranging from 3% to 95% of time spent on clinical activities. Respondents indicated that their remaining time was fairly evenly divided among the other specified activities (administration, research, teaching, and continuing medical education (CME)) listed on the survey questionnaire. Six respondents indicated that they spent some of their working hours on 'other' activities, with the percentage of time spent on these activities ranging from 2% to 7%. The 'other' activities specified included 'community education', 'business', 'travel', 'RACS activities', and 'audit/review'.

Table B12: Percentage of hours worked by cardiothoracic surgeons, by type of activity, 2000

Type of activity	Percentage of total hours worked in a typical week %
Clinical	75.4
Administration	7.5
Research	6.1
Teaching	5.8
CME	4.8
Other	0.4
Total	100.0

Source: AMWAC survey of cardiothoracic surgeons.

Waiting Times

Survey respondents were asked to indicate what a patient's waiting time would be if they were referred for a consultation or for an operation, by type of condition (urgent and non-urgent).

Consultation Waiting Times

Table B13 shows that patients with a clinically urgent condition (eg., severe left main lesion) wait slightly less time, on average (2.3 days), to see a cardiothoracic surgeon in his/her private rooms than do patients in public outpatient departments (3.5 days). The data also show that there is some variation in average waiting times among the States/Territories. Waiting time for a patient with a clinically urgent condition presenting to a public sector service ranged from 2.0 days in Western Australia to 5.4 days in Victoria/Tasmania. For patients with a clinically urgent condition presenting to a private sector service waiting times showed a narrower range, from 1.0 day in South Australia to 2.8 days in New South Wales/Australian Capital Territory. Victoria/Tasmania showed the most variation in average waiting time, from 2.4 days for patients presenting to a private sector service to 5.4 days for patients presenting to a public sector service.

The survey results show the disparity between the private and public systems with respect to waiting time for a consultation with a cardiothoracic surgeon for a non-urgent condition (eg., stable angina pectoris) is much greater than for a clinically urgent condition. The average waiting time for a patient to see a cardiothoracic surgeon in his/her private rooms for a standard first consultation was 9.4 days, while for a patient presenting to a public sector service the average waiting time was 16.6 days. Among the States/Territories, patients in Queensland had the longest average waiting time for a consultation for a non-urgent condition when presenting to a public sector service (26.7 days), while those in South Australia and Western Australia had the shortest (11.8 days). For patients presenting to a private sector service, the waiting time ranged from 5.3 days in Western Australia to 12.0 days in New South Wales/Australian Capital Territory.

Table B13: Average consultation waiting time (days) for cardiothoracic surgery services for a clinically urgent condition and a non-urgent condition, by type of service and State/Territory, 2000

State/Territory	Public Outpatient	Private Room
Clinically urgent condition		
NSW/ACT	2.9	2.8
Victoria/Tasmania	5.4	2.4
Queensland	3.0	2.6
South Australia	3.6	1.0
Western Australia	2.0	1.5
Total	**3.5**	**2.3**
Non-urgent condition		
NSW/ACT	19.2	12.0
Victoria/Tasmania	14.0	8.8
Queensland	26.7	10.4
South Australia	11.8	6.4
Western Australia	11.8	5.3
Total	**16.6**	**9.4**

Source: AMWAC survey of cardiothoracic surgeons.

Operation Waiting Times

Based on the survey results, if a patient with a clinically urgent condition is referred for an operation with a cardiothoracic surgeon, the patient's waiting time until the operation would average 10.5 days if presenting to a surgeon in her/her private rooms, as compared with 4.4 days for patients in public outpatient departments. For patients presenting with a non-urgent condition, the average waiting time to operation was 13.9 days for a private sector service and 48.1 days for a public sector service (Table B14).

Among the States/Territories, Queensland showed the longest average waiting times for patients presenting to a public sector service; 27.7 days for patients with a clinically urgent condition and 80.0 days for patients with a non-urgent condition. For patients presenting to a private sector service, the average waiting times for a clinically urgent condition were highest in Queensland (6.0 days) and for a non-urgent condition waiting times were highest in New South Wales/Australian Capital Territory.

Within State/Territory, Queensland showed the greatest variation in waiting times to operation, for both clinically urgent and non-urgent conditions. For patients presenting with a clinically urgent condition the average waiting time ranged from 27.7 days for a public sector service and 6.0 days for a private sector service. For a non-urgent condition, the average waiting time ranged from 80.0 days for a public sector service to 11.8 days for a private sector service.

Table B14: Average operation waiting time (days) for cardiothoracic surgery services for a clinically urgent condition and a non-urgent condition, by type of service and State/Territory, 2000

State/Territory	Public Outpatient	Private Room
Clinically urgent condition		
NSW/ACT	8.9	5.2
Victoria/Tasmania	6.1	3.5
Queensland	27.7	6.0
South Australia	7.8	3.2
Western Australia	6.7	3.8
Total	**10.5**	**4.4**
Non-urgent condition		
NSW/ACT	42.0	19.6
Victoria/Tasmania	41.8	12.1
Queensland	80.0	11.8
South Australia	74.2	9.0
Western Australia	19.8	7.7
Total	**48.1**	**13.9**

Source: AMWAC survey of cardiothoracic surgeons.

Provision of Services to Rural Areas

All of the survey respondents indicated that their primary practice was located in a metropolitan area. Only one respondent, from Queensland, indicated that they had a secondary practice located in a rural area.

Respondents were also asked to indicate if they work in the city but provide services in the country. A total of six respondents (13.0%) to this question reported that they provide services in the country. Of these, three were located in New South Wales/Australian Capital Territory, two in Queensland, and one in South Australia.

Of the respondents who indicated that they spend some of their time providing services in country areas, the average time spent working in the country was 2.5 days per month. Three of the six respondents indicated that their time spent providing services in country areas was on consultations only (no operative work), while two respondents indicated that they spent between 40% and 60% of time on consultations and between 40% and 60% on operative work. The remaining respondent did not indicate what type of services they provided in the country.

Professional Satisfaction of Cardiothoracic Surgeons

Workload Level

Overall, 65.5% of respondents indicated that they felt their current workload was about right, 23.6% felt that their workload was too much and 10.9% felt that their workload was too little. Reasons given for having a workload that was too heavy

included: ‘referral patterns’, ‘a heavy clinical load in addition to administrative and research commitments’, ‘too much time on call’, and ‘lack of support’. Reasons given for having a workload that was too little included: ‘decreasing surgical/patient workload’, ‘too many surgeons and units’, and ‘lack of or a decrease in public hospital resources’. A total of 8 respondents (15.4% of respondents to this question) felt that more cardiothoracic surgeons were required in their geographic area. Three respondents (6.5% of respondents to this question) indicated that they felt more cardiothoracic surgeons were required in Australia as a whole.

Capacity to Increase Practice Activity

In response to a question on capacity to increase workload, 29 (51.8%) respondents indicated they felt they had time available to increase their surgery time, 29 (51.8%) felt they had time available to increase their consultative work and 14 (28.0% of respondents to this question) felt they had time available to increase their hospital work. A total of 18 responding cardiothoracic surgeons provided details of the conditions under which they could increase their practice activity. Some of the conditions specified included: ‘better structuring/patient flow’, ‘better remuneration’, and ‘improved public hospital conditions/resources’.

Number of Procedures Required to Attain and Maintain Competence

Respondents were asked, in their opinion, how many open heart operations (including off pump) a cardiothoracic surgeon should perform each year to attain and maintain competence. On average, the respondents specified that cardiothoracic surgeons should perform a minimum of 160 operations per year (responses ranged from 50 to 350 per year) and, ideally, should perform 272 operations per year (responses ranged from 150 to 400 per year). In terms of number of procedures actually performed (Table B5), respondents indicated that, on average, they performed 284 open heart operations per year (211 coronary artery bypass procedures and 73 other open heart procedures).

Plans to Change Hours Worked

In total, 70.9% of responding cardiothoracic surgeons indicated that they anticipated a change in the hours that they work over the next ten years, with 61.8% anticipating a reduction in their hours and 9.1% planning to increase their hours worked (Table B15). Those who expected to increase their hours worked planned to increase their hours from between 10.0% and 50.0%, with an average increase of 21.0%. Those who expected to decrease their hours worked planned to decrease their hours from between 10.0% and 100.0%, with an average decrease of 24.8%.

Among the States/Territories, the majority of respondents in New South Wales/Australian Capital Territory, Queensland, and Victoria/Tasmania planned to decrease their hours worked, while no respondents from Queensland or Western Australia planned to increase their hours worked.

Table B15: Cardiothoracic surgeons' plans to change hours worked, by State/Territory, 2000

State/Territory	Increase hours %	Reduce hours %	Remain the same %	Total %
NSW/ACT	5.6	77.8	16.7	100.0
Vic./Tas.	15.8	57.9	26.3	100.0
Queensland	-	71.4	28.6	100.0
South Aust.	20.0	20.0	60.0	100.0
West. Aust.	-	50.0	50.0	100.0
Australia	**9.1**	**61.8**	**29.1**	**100.0**

Source: AMWAC survey of cardiothoracic surgeons.

Of the responding cardiothoracic surgeons who expected their work hours to increase, 80.0% were aged 35 to 44 years and the remaining 20.0% were aged 45 to 55 years. Of those who planned to decrease their hours worked, 37.5% were 55 years of age or greater and 62.5% were under age 55 years. As shown in Table B16, the majority of respondents aged 45 years or greater planned to decrease their hours worked, with all respondents aged 65 years or greater planning to decrease their hours worked.

Table B16: Cardiothoracic surgeons' plans to change hours worked by age group, 2000

Age group	Increase hours %	Reduce hours %	Remain the same %	Total %
35 to 44 years	26.7	46.7	26.7	100.0
45 to 54 years	5.0	65.0	30.0	100.0
55 to 64 years	-	64.7	35.3	100.0
65+ years	-	100.0	-	100.0
Total	**9.4**	**60.4**	**30.2**	**100.0**

Source: AMWAC survey of cardiothoracic surgeons.

Reasons given by respondents who planned to decrease their work hours over the next ten years, in order of frequency, were:

- lifestyle preference;
- family considerations;
- changed patient numbers;
- retirement; and
- workplace change.

Reasons given by respondents who planned to increase their work hours over the next ten years, in order of frequency, were:

- changed patient numbers;
- to build practice/income;
- work place change; and
- family considerations.

Retirement

Respondents were asked at what age they intend to retire from the cardiothoracic surgery workforce. The expected age of retirement ranged from 55 years to 75 years, with an average expected retirement age of 62.6 years (mode 65 years; median 65 years; standard deviation 3.9 years). Among the States/Territories, the average planned retirement age did not vary much, ranging from 60.5 years in Western Australia to 63.6 years in Queensland.

Table B17 shows that 19.2% (10) of responding cardiothoracic surgeons intend to retire in the next five years and a further 23.1% (12) plan to retire in the next ten years, for a total of 42.3% (22) cardiothoracic surgeons indicating that they plan to retire by 2010. Practitioners aged 55 years and over plan to retire, on average, within the next six years, with 43.8% (7) planning to retire in the next five years and the remaining 56.2% (9) planning to retire within the next ten years.

Table B17: Number of cardiothoracic surgeons who intend to retire in selected years, 2000

to 2005	2006-10	2011-15	2016-2020	2021-2025	2026-2030
10	12	12	8	7	3

Source: AMWAC survey of cardiothoracic surgeons.

Cardiothoracic Surgeons' Perceptions of Factors Affecting Workforce Requirements

Respondents were asked to indicate whether they believe particular factors will increase workforce requirements, decrease workforce requirements or whether requirements would stay the same.

As shown in Table B18, among the issues that the largest proportion of respondents thought would increase workforce requirements were 'patient expectations/knowledge', 'geographic distribution of the population', and 'technology', while no respondents thought that 'ageing of the population' would increase workforce requirements. Factors perceived as most likely to decrease workforce requirements were 'disease patterns', 'lifestyle changes that improve population health' and 'public health resource allocation'.

Table B18: Cardiothoracic surgeons' perceptions of factors that could influence requirements for cardiothoracic surgeons over the next ten years, 2000

Factors likely to influence requirements for cardiothoracic surgeons over the next ten years	Decrease %	Stay the same %	Increase %
Disease patterns	48.1	36.5	15.4
Ageing of the population	22.2	77.8	-
Lifestyle changes that improve population health	46.3	51.9	1.9
Patient expectations/knowledge	5.6	51.9	42.6
Access to beds, nurses, theatres, etc	28.3	60.4	11.3
More defensive medicine	22.4	73.5	4.1
Increasing level of specialisation	15.1	62.3	22.6
Safer procedural practice	11.5	69.2	19.2
Increased productivity in hospitals	10.0	78.0	12.0
Technology	38.5	32.7	28.8
Expectations of other health professionals	18.9	56.6	24.5
Multi-disciplinary team provision	12.2	67.3	20.4
Geographic distribution of population	11.3	58.5	30.2
Health outcomes/quality assurance	3.8	75.5	20.8
Public health resource allocation	43.4	43.4	13.2
Increasing emphasis on hospital efficiency	21.2	63.5	15.4
The introduction of managed care	37.3	49.0	13.7

Source: AMWAC survey of cardiothoracic surgeons.

Additional Comments

Respondents were given the opportunity to provide any additional comments which they felt may assist in planning cardiothoracic surgery workforce requirements. A total of 21 (37.5%) respondents provided comments. Several respondents focussed on the increasing role of cardiologists in the management of coronary artery disease, and the resulting impact on cardiothoracic surgery workforce requirements. Other comments indicated that there should be more of a focus on thoracic surgery, both in terms of training and dedicated thoracic surgery units. Some respondents noted that they foresee potential difficulty in attracting suitable applicants to cardiothoracic surgery, unless cardiothoracic surgeons are adequately valued, given the demands of the career path and the high intensity of the work. The impact of technology, including the increasing applicability of stenting and alternative technology such as direct trans-vascular coronary intervention, was also noted.

APPENDIX C: AMWAC SURVEY OF CARDIOTHORACIC SURGERY UNITS, 2001

METHODOLOGY

To obtain an accurate count of the exact number of cardiothoracic surgeons currently practising in Australia, as well as some basic information about these surgeons, the Working Party undertook a survey of all of the cardiothoracic surgery units across Australia. During February 2001 every unit in Australia was mailed a confidential questionnaire and asked to provide information about the individual cardiothoracic surgeons practising in the unit, including their names. This information was used to obtain a precise count of the total number of surgeons, as duplicates (those surgeons who showed up more than once because they practise in more than one hospital) were identified based on individuals' names. The survey was administered by AMWAC and the Working Party. Information about the cardiothoracic surgeons in 100% of the units surveyed was obtained.

RESULTS

Distribution of Cardiothoracic Surgeons

Table C1 shows the distribution of cardiothoracic surgeons by State/Territory. The majority of surgeons are located in Victoria, followed by New South Wales and Queensland. The distribution of cardiothoracic surgeons by State/Territory is fairly consistent with the population, although Victoria has a significantly higher proportion of cardiothoracic surgeons as compared with its share of total population, and New South Wales has a low share as compared with its share of population.

Table C1: Distribution of cardiothoracic surgeons by State/Territory, 2001

	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Aust.
Number of cardiothoracic surgeons	32	34	20	7	8	3	0	3	107
% distribution of cardiothoracic surgeons	29.9	31.8	18.7	6.5	7.5	2.8	-	2.8	100.0
% population	33.7	24.6	18.9	7.8	9.9	2.4	1.1	1.7	100.0

Source: AMWAC survey of cardiothoracic surgery units

The survey results showed that all of the cardiothoracic surgeons practise in metropolitan locations. Out of the total 107 cardiothoracic surgeons, 96 (89.7%) practise in hospitals located in capital cities, and the remaining 11 (10.3%) practise in other metropolitan locations. By State/Territory, 100% of cardiothoracic surgeons in South Australia, Western Australia, Tasmania and the Australian Capital Territory practise in hospitals located in capital cities. In the remaining States, the majority of cardiothoracic surgeons also practise in capital city locations, with only a small proportion in each State practising in other metropolitan locations. In Queensland, five out of the total 20 cardiothoracic surgeons (25.0%) practise in other metropolitan locations; in Victoria two out of the total 34 (5.9%) practise in other metropolitan

locations; and in New South Wales four out of the total 32 (12.5%) work in other metropolitan locations. (Table C2)

Table C2: Percentage distribution of cardiothoracic surgeons by geographic location, by State/Territory*, 2001

Location	NSW	Vic	Qld	SA	WA	Tas	ACT	Aust.
Capital city	87.5	94.1	75.0	100.0	100.0	100.0	100.0	89.7
Other metro.	12.5	5.9	25.0	-	-	-	-	10.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

* - there are no cardiothoracic surgeons located in the Northern Territory.
Source: AMWAC survey of cardiothoracic surgery units.

Gender Profile

There are only three female cardiothoracic surgeons out of the total 107 (2.8%). The three females were located in Queensland and Victoria.

Age Profile

The survey results showed that the average age of cardiothoracic surgeons in Australia was 48 years (minimum 33 years, maximum 69 years, mode 46 years). By State/Territory, the average age ranged from a low of 47 years in the Australian Capital Territory to a high of 51 years in South Australia. The average age of cardiothoracic surgeons located in capital cities was 48.1 years, as compared with 46.9 years for those located in other metropolitan areas.

Table C3 shows that the distribution of cardiothoracic surgeons by age group, based on the survey of units, is very similar to the distribution as shown by the 1998 AIHW medical labour force survey. A large proportion of cardiothoracic surgeons were less than 45 years of age (39.6%), and only 25.4% of the workforce were aged 55 years or greater.

Table C3: Age profile of cardiothoracic surgeons, AMWAC 2001 survey of units and AIHW 1998 medical labour force survey

	<35 yrs	35-44 yrs	45-54 yrs	55-64 yrs	65+ yrs	Total
AMWAC survey of cardiothoracic surgery units (n=107)						
% cardiothoracic surgeons	1.9	37.7	34.9	22.6	2.8	100.0
AIHW medical labour force data (n=97)						
% cardiothoracic surgery workforce	2.1	36.5	35.4	22.9	3.1	100.0

Source: AIHW and AMWAC survey of cardiothoracic surgery units.

Working Hours

Units were asked to specify whether the cardiothoracic surgeons practising in the unit worked full time or part time. Overall, the results showed that only one cardiothoracic surgeon worked part time. If the surgeon was listed as practising in more than one

unit (as many were) and identified as working part time in one and full time in another, it was assumed that the individual was working full time.

Location of Training

Units were asked to identify where the cardiothoracic surgeons practising in the unit were trained (in Australia; overseas; or, both in Australia and overseas). Overall, the majority were trained in Australia (72.9%), 21.5% received training in Australia and overseas, and 5.6% were trained overseas. Queensland was the State/Territory with the highest number of cardiothoracic surgeons who were trained overseas (15.0%, or 3 out of the 20 cardiothoracic surgeons located in Queensland). Victoria, New South Wales, and the Australian Capital Territory each had one cardiothoracic surgeon who was trained overseas, while none of the cardiothoracic surgeons located in South Australia, Western Australia, or Tasmania were trained entirely overseas (Table C4).

Table C4: Location of training of cardiothoracic surgeons, by State/Territory, 2001

	NSW	Vic	Qld	SA	WA	Tas	ACT	Aust
% trained in Australia	53.1	73.5	85.0	100.0	87.5	100.0	66.7	72.9
% trained in Australia & overseas	43.8	23.5	-	-	12.5	-	-	21.5
% trained overseas	3.1	2.9	15.0	-	-	-	33.3	5.6

Source: AMWAC survey of cardiothoracic surgery units.

Type of Practise

The questionnaire asked for units to indicate what type of surgery each cardiothoracic surgeon in the unit practised: cardiac surgery; cardiac surgery with some thoracic surgery; or, predominantly thoracic surgery. Table C5 shows that overall the largest proportion of cardiothoracic surgeons practised cardiac surgery with some thoracic surgery (in total, 61.7% or 66 out of 107 cardiothoracic surgeons).

Table C5: Type of practise of cardiothoracic surgeons, by State/Territory, 2001

	NSW	Vic	Qld	SA	WA	Tas	ACT	Aust
% cardiac surgery	9.4	23.5	55.0	28.6	-	-	33.3	23.4
% cardiac surgery & some thoracic surgery	81.3	55.9	35.0	42.9	100.0	66.7	33.3	61.7
% mainly thoracic surgery	9.4	20.6	10.0	28.6	-	33.3	33.3	15.0

Source: AMWAC survey of cardiothoracic surgery units.

The units were also asked to indicate whether the surgeons in the unit practised paediatric cardiac surgery. In total, the results showed that there were 11 cardiothoracic surgeons (10.3%) who practised paediatric cardiac surgery, and the largest proportion of these were located in New South Wales (five), followed by Victoria and Queensland (two in each), and South Australia and Western Australia (one in each).

APPENDIX D: REQUIREMENTS FOR A SUSTAINABLE CARDIOTHORACIC SURGICAL UNIT

(Source: Australasian Society of Cardiac and Thoracic Surgeons)

Cardiothoracic surgery consists of three major components:

- adult cardiac surgery (by far the largest);
- thoracic surgery (pulmonary chest wall, mediastinal plus or minus upper gastro-intestinal tract); and
- paediatric cardiac surgery.

Cardiothoracic surgeons tend to sub-specialise predominantly in one of these areas although many surgeons practise both adult cardiac and thoracic surgery.

Paediatric surgery is performed in major specialist units either separate from or as part of a general cardiothoracic unit but is practised essentially by specialist paediatric cardiac surgeons. There are currently four major paediatric units in Australia – Melbourne, Sydney, Brisbane and more recently Perth. Less complex congenital heart procedures may be done outside these units, with usually one predominating in each State. Paediatric surgery has not be included in this summary and probably warrants a separate consideration.

Population

Adult Cardiac Surgery (acquired heart disease)

The performance of cardiac surgery requires a relatively complex and expensive infrastructure with special requirements related to cardiopulmonary bypass, post operative intensive care management, trained specialised cardiac nursing, and availability of a range of diagnostic and specialist services. Therefore it is appropriate that cardiac surgery be developed on the unit structure, and to ensure both cost efficiency and adequate quality assurance, a certain case throughput is necessary.

The Australasian Society of Cardiac and Thoracic Surgeons (ASCTS) has developed a document which details recommendations and requirements for infrastructure, staffing and equipment and also includes guidelines for minimum case loads for both the surgeon and the Unit (see below).

For these requirements to be met a certain population base is required to support the Unit. This population base also needs to take into consideration whether the Unit is only private or public or both.

National Heart Foundation figures in 1994 revealed surgery for acquired heart disease rates to be just over 1,000 per million of population. There had been a slow increase in years previous to 1994 and one would expect that rates have continued to rise in the intervening six years to approximately 1,200 to 1,300 operations per

million population. This would equate to approximately 1,000 coronary artery bypass graft operations per million and 200 to 300 valve and other procedures.

Extrapolating the data from the ASCTS' recommendations a unit caseload of 400 per year (two cardiac surgeons) would therefore rely on a population base of approximately 300,000 to 400,000. The concentration or dispersion of this population would be influential in the rate of referral.

Approximately 30% of patients who undergo diagnostic angiography in the catheter laboratory by cardiologists are referred on for cardiac surgery. This number has probably declined in recent years with the increasing use of percutaneous approaches for treating coronary disease. Therefore, on these grounds, the cardiac surgical unit would need to be supported by a catheter laboratory performing 1,200 diagnostic catheters per year.

Thoracic Surgery

Compared to acquired heart surgery the volume of thoracic surgery is relatively small. Thoracic surgery tends to be practised by surgeons also performing adult cardiac surgery but to a greater extent now by trained cardiothoracic surgeons who specialise in thoracic surgery alone. Currently in Queensland there are two full-time trained cardiothoracic surgeons practising full-time thoracic surgery with four other cardiac surgeons (located in Brisbane, the Gold Coast and Townsville) performing associated thoracic procedures as well. Queensland has a very diverse population but would suggest that there should probably be a thoracic surgeon available per 500,000 population, which would have implications for the surgical staffing of a cardiothoracic unit.

Hospital Infrastructure

Departments

The following active departments should be available seven days per week, 24 hours per day:

1. intensive care unit with full monitoring facilities for post-cardiac surgery (four channel monitoring minimum) [see other equipment in Equipment section below]
2. Cardiac catheterization laboratory
3. Radioloy including computed tomography scanning
4. Blood bank, haematology, biochemistry
5. Echocardiography department
6. Operating theatre of adequate size and adequately equipped to perform cardiac surgery – including anaesthetics set up area and perfusion set up area [see Equipment section below]
7. Post-cardiac surgery ward
8. Office space of sufficient size for secretary, computer, database manager, etc.
9. Nuclear medicine department

10. Physiotherapy department
11. Pastoral care, pharmacy, rehabilitation services

Staffing

1. At least two fully trained cardiac surgeons and one of these surgeons must be available 24 hours a day, seven days per week. The cardiothoracic surgeons must be FRACS or have equivalent training and be accredited by the RACS.
2. Cardiac anaesthetists
3. Cardiac perfusionists – medical and/or clinical
4. Intensive care specialists available 24 hours, on immediate call
5. Intensive care Fellow or Registrar on site 24 hours a day with appropriate rosters
6. Cardiologists of sufficient experience to participate in pre-operative and post-operative care and investigation – including 24 hours a day, seven days per week availability of trans-oesophageal echocardiography
7. Sufficiently trained nursing staff in cardiac operating theatre, intensive care and cardiac ward
8. Physiotherapists and other allied health professionals
9. Actively practising medical specialists in the following specialties available for urgent consultation:
    a. general surgery;
    b. urology;
    c. respiratory physician, lung function testing;
    d. neurology, neurosurgery; and
    e. renal physician, including availability of dialysis
10. Nominated data collector to supervise cardiac database and relaying data to ASCTS National Database, with three monthly auditing – including minutes
11. If public hospital, require junior medical staff support, cardiac secretary
12. Echocardiographer with on call roster – 24 hours a day, seven days per week

Equipment

Operating Theatre

The following equipment should be available:

1. Full cardiac surgery operating theatre instrumentation
2. At least two cardiopulmonary bypass pumps
3. Intra-aortic balloon pump
4. Left ventricular and biventricular assist devices for support of failing heart
5. Facility for extra corporeal membrane oxygenation
6. Echocardiography machine in operating theatre, trans oesophageal echo probe
7. Internal and external defibrillations
8. Pacemakers, cell saver, diathermy machine, surgeon headlights, infusion pumps
9. Adequate storage space for theatre supplies, perfusion set up

Intensive Care Unit

1. Adequate spacing of beds to allow 360 degree access, access for echo machine, intra aortic balloon pump, ventricular assist
2. Adequate storage space for drugs, equipment, etc.
3. Cardiac monitors for each bed for electrocardiogram, central venus pressure, Swan-Ganz, blood pressure and cardiac output
4. Core temperature monitoring
5. Oxygen saturation monitor
6. Blood gas analysis, and basic electrolyte measurement device
7. Ventilators capable of positive end expiration pressure, weaning cycles
8. IV infusion pumps and syringe pump
9. Intra-aortic balloon pump
10. Warming blankets to re-warm patient to body temperature
11. Defibrillation including internal paddles
12. Sternotomy tray
13. Emergency pacing

Step Down Cardiac Ward

1. Telemetry and central monitors
2. Sternotomy tray
3. Emergency pacing facilities

Minimum Caseload

Total hospital caseload

A cardiac surgery caseload of 400 per year is the target to be reached within two years of commencing cardiac surgery. The minimum number depends on whether or not the hospital is co-located with another major hospital performing cardiac surgery, or is a stand alone unit; whether or not there is sharing of staff between the proposed unit and another close by cardiac surgery unit, and depends on the experience of the staff (including surgical, other medical, and nursing).

Individual surgeon caseload

The minimum estimated number of cardiac surgery cases per surgeon per year is 200. This is to allow each surgeon to maintain their expertise, including exposure to more unusual and difficult cases which can present without warning. Some of this caseload may be performed at another hospital. It has been shown in many studies that the risk of adjusted mortality following cardiac surgery decreases with increasing surgeon caseload. Optimally, the caseload for a surgeon performing cardiac surgery would appear to be in excess of 250 cases per year.

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