

VICTORIA

Auditor General
Victoria

Managing medical equipment in public hospitals

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AUDITOR GENERAL
VICTORIA

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Under the provisions of section 16 of the *Audit Act* 1994, I transmit my performance audit report on *Managing medical equipment in public hospitals*.

Yours faithfully

J.W. CAMERON
Auditor-General

27 March 2003

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Foreword

Over recent years, I have monitored the financial position of public hospitals and reported the results to Parliament. This report adds to this work, providing further insight into asset management and replacement practices of hospitals.

In a climate of scarce resources, the challenge facing public hospitals and the Department is how the issue is best addressed, while at the same time meeting the community's right to receive high quality health care.

I have observed in this and other sectors a tendency for managers to resist the development of good asset management planning and practices because of uncertainty in the provision of funds for equipment. These situations are precisely why effective asset management planning is crucial by agencies. Such practices are hardly likely to make central agencies feel comfortable about transferring asset management responsibility to agencies through fully funding for depreciation.

This report provides practical suggestions for addressing this resource management challenge.



J.W. CAMERON
Auditor-General

27 March 2003

Part 1

Executive summary

INTRODUCTION

1.1 Public hospitals hold a vast array of medical equipment ranging from small inexpensive items costing less than \$100 to expensive complex items costing several million dollars. At 30 June 2002, the book value of medical equipment held by Victoria's 91 public hospitals, was approximately \$507 million. This represents 13 per cent of the non-current assets of all public hospitals.

1.2 The primary source of funding for most hospitals to acquire and maintain this equipment is the Department of Human Services. Annual funding is provided through equipment and infrastructure maintenance grants (based largely upon the quantum of patient throughput), the Capital Medical Equipment Program (comprising targeted equipment grants and special equipment acquisitions), and capital developments. Targeted equipment grants are allocated for items costing in excess of \$200 000 (\$50 000 for small rural hospitals) on the basis of business cases submitted by hospitals. Other funding sources for hospitals include internally generated surpluses, business unit revenue and fundraising.

AUDIT OBJECTIVES AND SCOPE

1.3 This audit examines the efficiency and effectiveness of the management, maintenance and replacement of major medical equipment by the public health sector in Victoria. It included an assessment of the current condition and life expectancy of medical equipment and the asset management practices in hospitals.

1.4 Nineteen of the State's 91 public hospitals were covered in the audit and around 4 300 items of medical equipment were examined. The total replacement cost of the equipment items examined at August 2002 was \$252 million (\$144 million for 3 common hospital presentations; \$108 million for major equipment).

1.5 Our examinations of medical equipment focused on 2 groups: 5 of the most costly items of equipment (e.g. magnetic resonance imaging systems and computed tomography scanners) which perform complex diagnostic and treatment functions and are expensive to acquire, and the less costly but essential items used in nearly all hospitals for the treatment of 3 common conditions, heart attack, chest pain and hip replacement (e.g. infusion pumps, physiologic monitoring systems and ventilators). While the majority of items used by the 19 hospitals visited in the treatment of heart attack, chest pain and hip replacement were examined, a small number were not as they were in use at the time of our visit.

AUDIT CONCLUSION

1.6 The medical equipment we examined in our sample of 19 public hospitals was well maintained, although a high proportion was beyond its life expectancy. Only a small proportion (about 3 per cent) of equipment was in poor condition, in that it was unreliable, had excessive downtime and/or had doubtful availability of spare parts. A further proportion of equipment (about 14 per cent) was in fair condition in that it was still reliable but nearing the end of its useful life, downtime was increasing and it had been surpassed by newer technology.

1.7 For the 19 hospitals examined, the equipment in poor condition needs to be replaced immediately at an estimated cost of \$10 million. The equipment in fair condition needs to be replaced by 2005 at an estimated cost of \$32 million. The Department of Human Services initiated reviews in 1995 and 2001, which also highlighted the high and on-going cost of replacing medical equipment. However, to date only limited short-term action has been taken by the Department in response to this issue.

1.8 Effective equipment management and decision-making requires a comprehensive assessment of the relative costs of continued maintenance versus replacement. However, the decisions of hospitals were based on inadequate information and poor analysis of relative costs, the age and condition of equipment, utilisation levels, expected future service provision and benefits from new technologies. None of the 19 hospitals had established proper asset management planning processes to identify their equipment needs, including funding requirements, beyond a 12 month period nor had they developed strategies to address funding gaps. Only one hospital was developing an asset management plan at the time of our audit.

1.9 Hospitals need to adopt a long-term approach (say 5 years) to planning for their medical equipment needs, including regular monitoring of equipment life expectancy and condition and developing strategies to address funding uncertainty and gaps where they exist. The uncertainty surrounding funding makes it all the more important for hospitals to have good asset management information and planning.

1.10 Meeting the challenge ahead will require a concerted, long-term focus. The Department needs to work with hospitals to develop a strategic framework for managing medical equipment that includes linkages to service delivery strategies across the State, agreed asset life expectancies and maintenance principles. The funding models, which form part of the framework, should assess all sources of funds (recurrent funding and donations) and minimise the need for special one-off grants. Otherwise, there is a real risk that hospitals may not have sufficient funds to replace equipment as and when required.

AUDIT FINDINGS

Condition of medical equipment

1.11 Not all of the 19 sample hospitals had assessed the condition or life expectancy of their equipment. Our assessment (at August 2002) of the condition of this equipment was based on a 5 point rating scale developed in the course of the audit. The assessment of life expectancy was based on guidelines developed by the American Society for Healthcare Engineering (ASHE). (*paras 3.4 to 3.9*)

1.12 Where equipment is working well, can be maintained, and has not been superseded by a significantly improved model, there is no need for the item to be replaced. However, ongoing use of equipment that has exceeded its life expectancy without planning for its eventual replacement increases the risk of disruptions to service delivery. (*para. 3.7*)

Equipment associated with heart attack, chest pain and hip replacement

1.13 Two per cent of the medical equipment items examined associated with the 3 common causes of hospital admission was assessed as “poor” requiring immediate replacement, and 14 per cent was in “fair” condition but requiring replacement within the next one to 3 years. Around 90 per cent of the equipment assessed as in “poor” or “fair” condition had exceeded the ASHE life expectancy benchmark (26 items had exceeded the ASHE life expectancy benchmark by 10 years, 8 by 11 years, 6 by 12 years, 5 by 13 years and 4 by 17 years or more). (*paras 3.10 to 3.16*)

1.14 At January 2003, equipment assessed as beyond its life expectancy benchmark was valued at \$46 million. Over the next 15 years to 2017, an additional \$98 million will also be required to replace equipment items that will exceed their life expectancy benchmark over that period. (*paras 3.17 to 3.19*)

Major equipment items

1.15 Three per cent of the 62 major equipment items examined were assessed as “poor” requiring immediate replacement and 13 per cent were assessed to be in “fair” condition requiring replacement within the next one to 3 years. Around 80 per cent of these equipment items had exceeded the ASHE life expectancy benchmark. (*paras 3.20 to 3.24*)

1.16 At January 2003, 18 items of equipment assessed as beyond their life expectancy were valued at \$38 million. Over the next 8 years to 2010, an additional \$70 million will be required to replace major equipment items that will also exceed their life expectancy over that period. (*paras 3.25 to 3.27*)

Adequacy of medical equipment management practices

Development of asset management plans

1.17 The Asset Management Series (guidelines) developed by the Department of Treasury and Finance requires entities to establish systems and processes to support the preparation of 5 year forward asset strategies covering acquisition, maintenance, refurbishment, redeployment and disposal, together with the attendant capital and operating costs. (*paras 4.5 to 4.6*)

1.18 Our audit found that the asset management policies and practices of hospitals were not consistent, in all respects, with either the Asset Management Series referred to above, or industry best practice. Of the 19 hospitals visited:

- none had established comprehensive asset management plans that showed the current condition and utilisation of medical equipment, expected future demand for medical services and the cost of sustaining that level of service in the longer-term;
- only one (Barwon) was in the process of developing an asset management plan;
- 2 (Colac and Austin) had determined their future equipment needs for new buildings under construction; and
- in all cases, complete and accurate information was not available to enable preparation of an asset management plan. (*para. 4.7*)

1.19 Hospital planning processes tended to focus on current or short-term needs with little or no consideration of the future replacement of equipment. This contrasts with best practice, which would involve a 5 to 10 year forward estimate of funding requirements. According to hospitals, a major factor influencing their current practices was that the level of funding likely to be provided by the Department of Human Services beyond a 12 month period was not known. (*paras 4.8 to 4.10*)

Medical equipment asset registers

1.20 Reviews initiated by the Department of Human Services in 1995, 1998 and 2001 consistently identified deficiencies in asset registers held by public hospitals. Our examination of 19 sample hospital asset registers highlighted that:

- there was insufficient information to efficiently and effectively manage assets (e.g. information on the condition and utilisation of equipment was not maintained);
- most hospitals did not provide regular asset management reports to their executive management;
- those hospitals that maintained multiple registers did not periodically ensure each was complete and accurate;
- asset descriptions were not standardised; and
- the conduct of physical inspections was infrequent. (*paras 4.11 to 4.19*)

Determining equipment priorities

1.21 Most hospitals had established arrangements for determining their medical equipment priorities. All hospitals had either a senior executive or an equipment committee, comprising both finance and medical staff, who collated equipment requests from each department annually and developed a prioritised equipment list. (*paras 4.21 to 4.23*)

1.22 We found that replacement considerations were reactive in that they were overwhelmingly linked to the Department of Human Service's annual funding process and to the internal annual allocation of any surpluses generated by particular hospital departments or faculties. As a result, the hospitals' medical equipment acquisition and replacement programs were short-term, typically 12 months and, therefore, generally less than the life of the relevant assets. (*paras 4.24 to 4.26*)

1.23 Unfunded equipment requests at the 19 sample hospitals totalled an estimated \$23.3 million at August 2002 (i.e. equipment requested but not funded by the Department of Human Services). (*paras 4.27 to 4.30*)

Procurement of medical equipment

1.24 A review conducted for the Department of Human Services in 2001 by the Monash University Centre for Biomedical Engineering recommended that, as hospitals are required to purchase a wide range of medical equipment, a combination of procurement options would provide the best outcome for hospitals and the Department of Human Services (e.g. ad hoc purchasing groups, centrally negotiated contracts, preferred suppliers). However, hospitals have continued to purchase equipment independently of each other and it was rare for hospitals to consolidate their combined purchasing powers and expertise. (*paras 4.32 to 4.33 and para. 4.40*)

1.25 Following a Ministerial Review, in July 2001 Health Purchasing Victoria was established to facilitate centralised procurement arrangements for Victorian public hospitals. To date, most of Health Purchasing Victoria's activity has been related to medical consumables but it is envisaged that this activity will expand to encompass medical equipment. (*paras 4.34 to 4.37*)

Maintenance of medical equipment

1.26 Based on our examination of policies, practices and assessment of the condition of medical equipment, overall, we found that the equipment had been well maintained by the 19 sample hospitals. All hospitals had maintained equipment in accordance with the Australian standard, maintenance was scheduled to minimise disruption to service delivery, about half of the hospitals used quality accredited maintenance providers (internal departments or external providers) and expenditure on maintenance was in line with the medical benchmark. Some hospitals could potentially reduce their maintenance costs if greater consideration was given to adopting risk-based principles when determining the nature and frequency of preventative maintenance. (*paras 4.42 to 4.67*)

Utilisation of medical equipment

1.27 Except for 4 metropolitan hospitals (The Alfred, Austin, Monash and Royal Melbourne), the utilisation of major equipment items was not monitored on a regular basis. In general, information on equipment utilisation was only communicated to hospital management annually when considering equipment replacements and then only those items that were deemed to need replacement. *(paras 4.69 to 4.70)*

1.28 Utilisation levels of major equipment items varied significantly depending upon their location, size and complexity. Several equipment items appeared to have less than optimal utilisation which, according to the hospitals, may be due to a reduced level of demand from patients, medical personnel or both. The newer and more advanced units were more heavily utilised due to their capacity for both better imaging (effectiveness) and processing patients in a shorter time span (efficiency). *(paras 4.71 to 4.75)*

Role of the Department of Human Services

1.29 Over the 4 year period 1998 to 2002, funding for medical equipment and maintenance provided by the Department to hospitals was \$50 million, \$50 million, 53 million and \$75 million, respectively - a significant increase over prior years. In 2000-01, the Department approved 14 per cent of major medical equipment funding requests by hospitals and 9 per cent in 2001-02. *(paras 5.2 to 5.4 and paras 5.17 to 5.18)*

1.30 As indicated in my *Report on Public Sector Agencies* presented to Parliament in February 2003, the capacity for hospitals to meet equipment funding gaps is declining. That report stated that current Parliamentary Appropriation arrangements are based on the full cost of service delivery, including non-cash amounts such as depreciation. However, grants provided to hospitals by the Department do not cover depreciation. This shortfall is partially met through capital grants allocated in part on the basis of hospital submissions. *(para. 5.21)*

1.31 The Department allocates equipment and infrastructure maintenance grants based on the number of hospital services provided (i.e. patient throughput). However, this may not reflect the relative needs of individual hospitals, particularly when their existing equipment stock and condition, their capacity to raise funds and the nature of the patient services offered is taken into account. *(paras 5.5 to 5.7)*

1.32 Although the use of standard business case forms has ensured consistency and improved the quality of applications for funding submitted by hospitals, some useful information is not requested by the Department. Information not requested included full cost or life cycle costing, current and/or expected utilisation of the equipment item, the current operating condition and frequency of breakdown of the equipment to be replaced, the number of patients awaiting treatment and the waiting time for treatment. *(paras 5.8 to 5.10)*

1.33 Processes for assessing funding submissions in the Department's 5 regional (rural) offices could be improved. Only one regional office (Grampians) had developed formal criteria for assessing the priority of applications. These criteria were generally adequate but were not weighted and had only been recently developed. The remaining 4 regional offices used informal criteria to assess applications and these varied across offices. *(para. 5.12)*

1.34 Other concerns with the Department's regional (rural) offices raised by our 19 sample hospitals, and with which we concur, included:

- staff need to be adequately experienced, trained, and have sufficient expertise in relation to assessing medical equipment requests;
- feedback was not provided to hospitals on unsuccessful funding submissions; and
- a longer and more certain time frame is required by hospitals to prepare submissions. *(para. 5.14)*

1.35 Eighteen of the 19 sample hospitals examined had pursued other sources of medical equipment funding to supplement allocations received from the Department (e.g. corporate sponsorship, bequests, community fundraising). On average, 24 per cent in 2000-01 and 33 per cent in 2001-02 of the total amount expended by hospitals on procuring medical equipment was derived from such sources. The percentages ranged from 5 per cent (Echuca, Wangaratta) to 50 per cent (Barwon, The Alfred). *(paras 5.22 to 5.23)*

1.36 Hospitals have been pro-active in developing strategies to contain medical equipment costs. Five of the 19 hospitals examined in detail had entered into one or more equipment leasing arrangements in the last 2-3 years due, primarily, to the lack of capital funding available. However, leasing may increase annual operating costs and may be unsustainable for some hospitals. *(paras 5.24 to 5.28)*

1.37 The funding conditions of targeted equipment grants precludes the use of these funds for leasing equipment. However, in some instances it may be a more cost-effective option to purchasing equipment. *(para. 5.29)*

1.38 The Department of Human Services has not developed an overarching strategic framework for medical equipment management over the long-term (say 5 years) or provided guidance to hospitals on the sound management of medical equipment through the use of asset management plans. *(paras 5.31 to 5.36)*

RECOMMENDATIONS

<i>Paragraph number</i>	<i>Recommendations</i>
Adequacy of medical equipment management practices	
4.20	<p>We recommend that hospitals, in consultation with the Department:</p> <ol style="list-style-type: none"> (1) prepare asset management plans for their medical equipment which incorporate, as a minimum, 5 year forecasts of funding requirements; (2) develop a single asset register, using standard classifications to describe the medical equipment and specified details of the equipment, which is linked to the key user groups within the hospital; (3) develop and use guidelines which reflect industry best practice to periodically assess the life expectancy of their equipment; and (4) regularly determine the condition of their medical equipment using a standardised assessment system. <p>We recommend that the Department:</p> <ol style="list-style-type: none"> (5) consider options to support the introduction of better information technology systems for the management of medical equipment; and (6) assess the merits of linking a proportion of funding allocations to the quality of the asset management practices adopted by individual hospitals.
4.41	We recommend that the Department of Human Services and hospitals pursue opportunities for improved value-for-money in the procurement of medical equipment.
4.68	<p>We recommend that hospitals:</p> <ol style="list-style-type: none"> (1) adopt risk-based principles when determining the nature and frequency of preventative maintenance; and (2) evaluate the costs and benefits of their in-house maintenance department obtaining external quality accreditation.
4.82	We recommend that hospitals regularly monitor the utilisation levels of major equipment items. Where utilisation is less than optimal, options such as sharing within and between hospitals should be explored.
Role of the Department of Human Services	
5.30	<p>We recommend that the Department:</p> <ol style="list-style-type: none"> (1) obtain additional information from hospitals to facilitate a more stringent assessment of their major equipment needs (e.g. life cycle costs, utilisation levels, equipment condition and backlog of patients to be treated); (2) enhance the transparency and rigor of its selection and prioritisation process by developing standard criteria for its regional offices to assess applications, and ranking the relative importance of each criterion; (3) provide hospitals with a formal response for funding submissions not supported; and (4) review the level of equipment funding currently provided to hospitals in the context of their future equipment replacement and maintenance needs, including the funding of depreciation costs.
5.37	<p>We recommend that the Department:</p> <ol style="list-style-type: none"> (1) develop a strategic framework for managing medical equipment; and (2) adopt a more pro-active role in guiding hospitals in the development of medical equipment asset management plans.

RESPONSE provided by Secretary, Department of Human Services**Overall comment**

The Department welcomes the suggested improvements to the management, maintenance and replacement of major medical equipment by the public health sector in Victoria, in particular the move to a more planned approach. Future hospital and departmental planning on equipment replacement will not only be based on the age of equipment but will also take into account other relevant factors concerned with the importance of the equipment to patient care such as utilisation.

General comments

The Department also makes a significant contribution towards the funding of medical equipment via capital developments, and programs other than the Targeted Equipment Program.

The Government is not the only source of funding for medical equipment in public hospitals, with significant funding provided by hospitals through other sources of revenue including internally generated surpluses and revenue from business units as well as fund raising. Over recent years alternative funding generated by hospitals has been around 30 to 50 per cent of annual expenditure on equipment.

The allocation of funding by the Government towards replacement medical equipment is made on the basis of annual bids by the Department and in the context of competing government priorities for funding.

The Department has, to date, not supported funding of non-MBS licensed Positron Emission Tomography (PET) scanners and Magnetic Resonance Imaging (MRI) systems (included in the report as costed replacement items).

The report makes considerable reference to the review undertaken by the Monash University Centre for Biomedical Engineering (MUCBE) for the Department of Human Services in 2001. The MUCBE report has not been released for general circulation as it is an Internal Working Document, consistent with the provisions of section 30(1)(a) and (b) of the Freedom of Information Act 1982, and is continuing to be used as a key document in the State Budget process. There are a number of limitations in the MUCBE analysis, including:

- *it is based on a limited survey of 29 hospitals, with over-representation of large and specialist hospitals; and*
- *the extrapolation of the sample findings to the whole of the State requirements is overstated because of the bias from inclusion of a disproportionate number of hospitals with greater requirements due to their role as major or specialist hospitals.*

Specific comments

The replacement of much of the medical equipment identified as in poor condition, such as anaesthesia units, defibrillators/monitors, electrocardiographs, infusion pumps, orthopaedic surgery kits, ventilators, sterilising units and physiologic monitor systems, fall under the \$200 000 threshold (as single items) and would usually be managed by the hospital/health service with funding from the Equipment and Infrastructure Maintenance Grant and other sources. However, the Department has also recognised the need for urgent replacement of such items and the inability of some health services to fund such and has funded some of these requests through the Targeted Equipment Program. (para. 1.6)

The Government, through the Department, has provided additional funds to help specifically address urgent backlogs and continues to consider specific equipment program bids through the asset investment process, in the light of competing priorities. (para. 1.7)

The level of recurrent funds via the Equipment and Infrastructure Maintenance Grant has remained at relatively consistent levels for the last 5 years, which would enable the health services to plan. (para. 1.9)

RESPONSE provided by Secretary, Department of Human Services – continued

Specific comments - continued

Infusion pumps are usually \$3 000-\$4 000 each and, as such, are managed by the hospitals/health services from recurrent funds such as the Equipment and Infrastructure Maintenance Grant. However, some health services/hospitals have identified immediate urgent need for a large volume of these “low-cost” items and this has been taken into consideration under the Targeted Equipment Program. (para. 1.12)

The Acute Health Capital Equipment Program as part of the Medical Equipment Program is bid-based and, as such, is dependant on its success in the annual asset investment process. However, the nature of this program does not preclude hospitals/health services from developing forward estimates of requirements. Any information received from this process would only add to the fullness of information provided to the asset investment program.

Hospitals should not rely on the Acute Health Capital Equipment Program as the only source of funding for equipment replacement.

Hospitals should plan on the basis of a 5 to 10 year forward estimate of expenditure. These plans should be regularly updated to reflect the availability of internal and external funding. (para. 1.20)

The formula to distribute these funds has in recent years been moderated to account for the accumulated depreciation on hospital equipment and for hospitals’ capacity to self-finance through special purpose and trust funds. (para. 1.32)

The extent of analysis and the associated cost thereof should be contingent with the value of the equipment being replaced. It will not always be appropriate nor cost effective to evaluate the number of patients treated and the waiting time for treatment, particularly for small items of generic equipment. (para. 1.33)

Since the conduct of the audit, a Service Development Group has been established within the Rural and Regional Health Services Branch (RRHSB). The establishment of the service development team gives the Rural and Regional Health and Aged Care Services Division similar planning capacity and expertise to that within the Programs Branch of the Metropolitan Health and Aged Care Services Division. In future, this group will have overarching responsibility for the assessment of equipment submissions for rural health services.

The establishment of the RRHSB Service Development Group will provide the opportunity to standardise the evaluation process and to provide expert support to Rural Regional Offices in their evaluation of submissions and provide an informed overview of regional priorities in the context of departmental and Statewide priorities.

In future, it is intended that feedback will be provided to rural regional offices and rural agencies regarding unsuccessful submissions and the reasons for the rejection of submissions. (paras 1.34 and 1.35)

The Targeted Equipment Program as part of the Capital Medical Equipment Program is funded solely from the Asset Investment Program bid for New Works through the Economic Review Committee. These funds are not guaranteed from one year to the next as they are dependent upon the outcome of the annual internal Department of Human Services bidding process and Economic Review Committee Asset Investment Program approval process.

Where a hospital enters into an operating lease, the costs are disbursed over a number of years, and are incorporated into the case weights for casemix funding. It is inappropriate to commit the annual equipment allocations to fund such recurrent lease obligations. (paras 1.37 and 1.38)

Acknowledged. The Department will develop a strategy to address this. (para. 1.39)

RESPONSE provided by Secretary, Department of Human Services - continued

RECOMMENDATIONS

Adequacy of medical equipment management practices

- 4.20 (1) *Accept. Hospitals should plan on the basis of a 5 year forward estimate of expenditure. The plans should be regularly updated to reflect the availability of internal and external funding and reviewed at least annually.*
- (2) *Accept.*
- (3) *Accept. The Department accepts the recommendation to develop and use guidelines for hospitals to periodically assess the life expectancy of their equipment. These guidelines alone are insufficient to determine decisions on replacement of equipment. Decisions on replacement of equipment need to take into account all relevant factors, including the impact of the availability of equipment on patient care, the utilisation of the equipment, patient safety, staff safety and affordability. Analysis of all relevant factors should be incorporated in asset management plans.*
- (4) *Accept.*
- (5) *Accept. Preliminary work has already commenced as part of the Department's Whole-of-Health Information and Communication Technology Strategy.*
- (6) *Accept. The Department will work with the hospitals and health services to improve their asset management practices.*

4.41 *Accept. The Department has been and will continue to liaise with Health Purchasing Victoria (HPV) to explore possible options.*

4.68 (1) *Accept.*

(2) *Accept.*

4.82 *Accept. It is noted that in some circumstances low utilisation may be acceptable (e.g. in rural areas where the option of sharing equipment between agencies is not readily available due to distances between rural health services or where the maintenance and/or staffing costs are sufficiently low). The level of utilisation should be taken into account in determining a hospital's equipment replacement program.*

Role of the Department of Human Services

- 5.30 (1) *Accept. This will be required as part of asset management plans.*
- (2) *Accept.*
- (3) *Accept.*
- (4) *Noted. The level of equipment funding provided through the Department will continue to be a matter for government decision taking account of competing policy requirements and financial capacity. The formula to distribute the Equipment and Infrastructure Maintenance Grant funds has in recent years been moderated to account for the accumulated depreciation on hospital equipment and for the capacity of hospitals to self-finance through special purpose and trust funds.*
- 5.37 (1) *Accept.*
- (2) *Accept.*

RESPONSE provided by Chief Executive Officer, The Alfred

The Auditor-General should be congratulated for a well-researched report on the areas that it covered, i.e. the 5 high cost diagnostic equipment items and for equipment used in the 3 common hospital presentations – heart attack, chest pain and hip replacements.

However, the limiting factor with respect to the report is that the conclusions reached, although valid in the context of the audit scope, are not extrapolated to provide an overall financial shortfall for the backlog and ongoing replacement value of medical equipment in Victorian public hospitals.

Hopefully, the Auditor-General's report on medical equipment, together with previous reports by the Australian National University and Monash University, will lead to improvement in the funding and management of medical equipment in public hospitals.

RESPONSE provided by Chief Executive Officer, Goulburn Valley Health

The report in general acknowledges the lack of long-term planning for equipment replacement that occurs in public hospitals and outlines the major issue being the process adopted by the Department of Human Services for funding equipment replacement.

RESPONSE provided by Chief Executive Officer, Portland and District Hospital

The audit has concluded in many instances our dilemma in attempting to manage, replace and maintain expensive medical equipment within a hospital, which has an operating budget of less than \$18 million.

We agree that the maintenance of equipment has been difficult and has now required in most instances the services of bio-medical engineers to do this task. (Extra expense). These services have value added to our asset management strategies and we believe that we are getting a return on this investment.

The Department of Human Services allows through successful submissions only, targeted medical equipment grants for items in excess of \$100 000 for our size hospital. Without this grant, we would not be in a position to purchase or replace any medical equipment. We have been looking at other financing options and have recently leased (Finance Lease) theatre equipment. The return analysis is crucial to this strategy.

We are also looking at other options such as privatisation of business units to walk away from the risk of equipment replacement. This has worked successfully in radiology.

Asset management to the extent that has been concluded in your report would require extra resources to ensure the information is always reliable. Extra staff and specialised staff would need to be employed or sourced externally to ensure that full value would be gained through a process of this nature. This is not a possibility at this stage due to our financial position, however, it has been included on a strategic plan under asset management. The next step is reliant on resources.

We have also had the experience of technology improvements pushing the "bar up" for earlier equipment replacement. These pressures make it all the more difficult to plan as you have suggested over a 5 year period. Not impossible, but at times difficult to keep on track.

RESPONSE provided by Chief Executive Officer, Wangaratta District Base Hospital

The report accurately identifies the resource and management issues surrounding the implementation and maintenance of comprehensive asset management systems. Although the health service has established some components of an asset management system, a broadly applied co-ordinated definitive system remains unattended for many of the reasons identified in the report. Wangaratta seeks the opportunity to actively participate in any working party review that is established to address asset management systems.

RESPONSE provided by Chief Executive Officer, West Gippsland Hospital

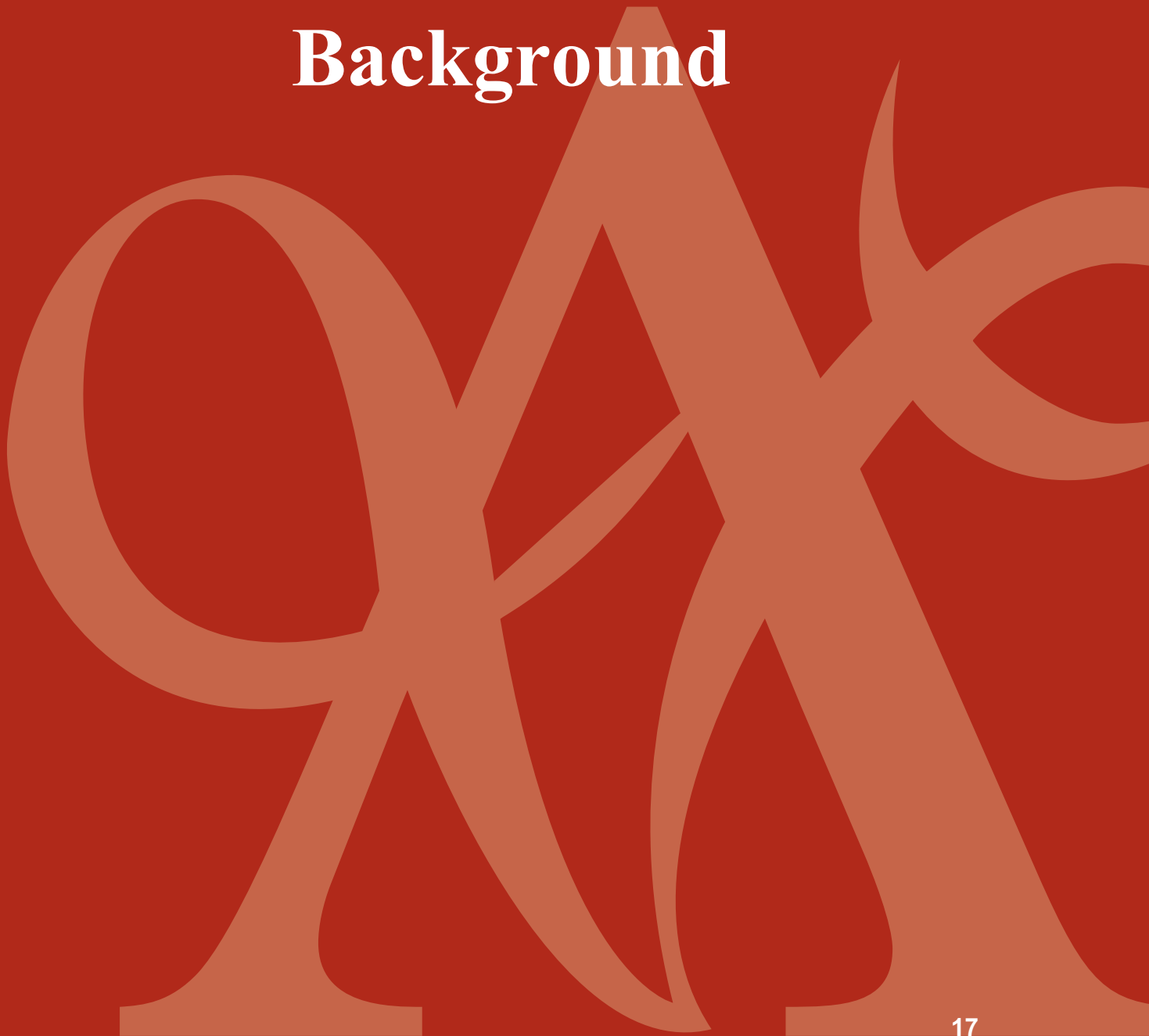
West Gippsland Hospital agrees with the major findings of the audit of Managing medical equipment in public hospitals.

The report documents the difficulties for hospitals of developing rational equipment acquisition and replacement programs against a background of annual funding rounds.

We note also the suggestion that hospitals develop systems for monitoring utilisation levels for major equipment items. To do so will require resources which we simply do not have at present. We would welcome any assistance from the Department of Human Services in developing an effective asset management plan.

Part 2

Background



FOCUS OF THE AUDIT

2.1 For public hospitals, effectively maintained medical equipment is an important asset central to patient care. Hospitals hold a vast array of medical equipment ranging from small inexpensive items, such as infusion pumps each costing less than \$5 000, to complex items, such as linear accelerators which typically cost over \$4 million and involve substantial ongoing costs.

2.2 At 30 June 2002, the total value of medical equipment held by Victoria's 91 public hospitals was approximately \$507 million. This represents 13 per cent of the non-current assets of all public hospitals.

2.3 Hospitals' primary source of funding for medical equipment acquisitions and maintenance is from the Victorian Government through the Department of Human Services. Other sources of funding include bequests, donations, fundraising and research grants.

2.4 The audit focused on the performance of public hospitals in efficiently and effectively managing certain types of medical equipment. An assessment of the current condition of equipment and the adequacy of short-term and long-term asset plans established for managing these assets was also undertaken. A complete description of the audit's objectives, scope and methodology is detailed in Appendix A of this report.

IMPORTANCE OF ASSET MANAGEMENT

2.5 The Victorian Government requires public sector agencies to manage their assets efficiently. In December 2000, it released a policy document *Sustaining Our Assets* which provides a high level framework for managing public sector assets and is supported by detailed guidelines (known as the Asset Management Series) developed by the Department of Treasury and Finance. The asset management framework is aimed at addressing a number of risks associated with infrastructure investment and assisting in a co-ordinated approach to asset replacement and related management decisions by public sector agencies.

2.6 The main principles of the framework include:

- *Service delivery needs form the basis of all asset management practices and decisions* - asset management activities should aim to improve service delivery throughout the State;
- *An integrated approach to planning* - asset planning and management are to be integrated into corporate and business plans, and budgetary and evaluation processes;
- *Informed decision-making* - asset management decisions are to be based on evaluation of all alternatives and take into account all costs incurred throughout the life cycle of the asset;
- *Asset management within a whole-of-government policy framework* - asset management activities are to be undertaken as part of the Government's overall resource allocation and management framework for the whole of the State;

- *Accountability and responsibility* - ownership, control, accountability and reporting requirements for assets are to be established, clearly communicated and implemented. Evaluation of the contribution of asset management to meeting departmental objectives is to form a key part of performance management; and
- *Sustainability* - planning is to include evaluation of all methods to meet the demands for service delivery, including non-asset solutions and demand management strategies.

ASSET MANAGEMENT REVIEWS IN HOSPITALS

2.7 In 1995, the Department of Human Services commissioned the Australian National University to undertake a comprehensive survey and analysis in Victoria's public hospitals (metropolitan, provincial and rural) of the existing distribution of, and future capital funding needs for, buildings and plant and equipment stock. The report, *Capital Investment in Victorian Public Hospitals*, estimated that capital consumption (i.e. the reduction in asset lives through use and obsolescence) of buildings, plant, furniture and equipment was in the order of \$160 million per annum (buildings and plant \$102.4 million, equipment \$50 million and furniture and furnishings \$7.6 million).

2.8 Subsequently, the Department adopted an annual equipment funding strategy to assist hospitals meet their equipment needs and requiring hospitals to adopt appropriate asset management and planning practices.

2.9 In November 2001, the Department engaged the Monash University Centre for Biomedical Engineering (MUCBE) to undertake the first stage of a review of its annual capital equipment funding strategy. The review aimed to identify the present and future equipment funding levels necessary to meet the replacement and growth needs of hospitals, and the costs associated with upgrading equipment.

2.10 The MUCBE review, which analysed items of equipment with a value of greater than \$50 000 at 29 hospitals, representing just over 70 per cent of the State's patient throughput, identified that hospitals were facing significant funding issues in that:

- The replacement value (estimated) of capital equipment in Victorian public hospitals at March 2001 was \$1.085 billion (determined using an extrapolation model based on gross operating cost). Sixty-eight per cent of this amount (\$738 million) represents medical equipment;
- The cost (estimated) of major equipment items requested from the Department, but not purchased for all Victorian public hospitals, totalled \$123.2 million at March 2001; and
- The estimated total future investment requirements (routine replacement, backlog catch-up and growth) for major equipment extrapolated for the State averages \$158 million per annum over the 5 financial years to June 2006 (including \$103 million for equipment items that cost \$50 000 and above).

2.11 The Department advised that the MUCBE Report has not been released for general circulation as it is an *Internal Working Document*, consistent with the provisions of section 30(1)(a) and (b) of the *Freedom of Information Act* 1982, and is continuing to be used as a key document in the State Budget process.

EQUIPMENT USED IN THE DELIVERY OF MEDICAL CARE

2.12 For the purposes of the audit, our analysis of medical equipment was confined to that used specifically for the treatment of 3 common hospital presentations (heart attack, chest pain and hip replacement) and 5 of the most costly items of equipment.

2.13 An overview of the type of equipment used in the 3 presentations is described in Chart 2A.

CHART 2A EQUIPMENT USED FOR 3 COMMON HOSPITAL PRESENTATIONS

HEART ATTACK

An acute myocardial infarction (AMI), commonly known as a heart attack, is caused by a sudden blockage to one of the branches of the coronary arteries that supply blood to the heart. Lack of blood flow (and, therefore, oxygen) to the heart muscle (myocardium) is a source of irreparable damage to the heart.

To determine whether or not a patient has experienced a heart attack, the electrical activity of the person's heart is assessed using an **electrocardiogram (ECG)**. A damaged heart may create certain discernable patterns on the electrocardiograph. A blood sample is also taken to see if certain enzymes, often released after injury to the myocardium, are present. Further diagnostic procedures, such as a chest X-ray or echocardiograph, may also be undertaken. If a heart attack is confirmed, the patient will usually be administered with a thrombolytic agent to try and improve the flow of blood to the heart.

Once a heart attack is confirmed, the patient will be closely monitored, often in a coronary care unit. Patients are connected to **cardiac monitors**, and **visual display units**, located at the patients' bedside and/or nurses' station, that show the electrical activity of the heart. An alarm is emitted should the monitoring system detect unusual patterns. People who have experienced a heart attack are often treated with glyceryl trinitrate (GTN), which dilates the coronary arteries to improve blood flow to the heart. Because doses of GTN have to be very exact, an **infusion pump** is used. Regular monitoring of blood pressure and oxygen saturation is also important, and this is usually performed using **electronic physiological monitoring equipment**. If damage to the patient's heart interferes with its rhythm, the patient may be fitted with an external pacing device.

In the event of a patient's heart stopping or going into ventricular fibrillation, medical staff will try and restore heart rhythm by using a **cardiac defibrillator**. This, and other emergency equipment, is always found in coronary care units.

The severity of the heart attack, and individual patient factors, will determine the type of treatment a patient receives following a heart attack as well as the length of their hospital stay. Patients may be managed medically with cardiac drugs; they may undergo angiography and have either a stent or balloon device inserted in their coronary arteries to improve blood flow to the heart; or, they may have to have a coronary artery bypass graft.

CHART 2A
EQUIPMENT USED FOR 3 COMMON HOSPITAL PRESENTATIONS - *continued*

CHEST PAIN
(coronary angiogram with insertion of stent)

Coronary angiogram is an imaging procedure where a dye is inserted into the patient's coronary arteries. A catheter or needle is inserted under fluoroscopic guidance into a major artery (usually the femoral artery), followed by injection of contrast material and then imaging of the artery with the use of serial film. While imaging the areas, a cardiologist can insert a stent into the artery using a catheter. The stent opens up the coronary artery to improve blood flow to the heart. The procedure is usually performed following a heart attack, or, if the patient has other signs of coronary artery occlusion (i.e. angina).

Coronary angiogram and insertion of a stent is performed by a cardiologist in an **angiography suite/cardiac catheterisation laboratory**. A number of expensive equipment items compose these laboratories/suites, including contrast injectors, radiographic equipment and **physiological monitoring equipment**. A **defibrillator** is also available should an emergency occur. During the procedure the patient may be administered light sedation and local anaesthetic. The patient's vital signs are observed closely throughout the procedure with electronic **physiological monitoring equipment**. Provided the procedure goes smoothly, the patient will return to the ward where they will usually remain overnight and be regularly monitored to ensure that there are no post-operative complications. The patient may be connected to a cardiac monitor so that the rhythm and rate of their heart can be closely observed. Other vital signs, such as blood pressure and oxygen saturation, are also closely monitored.

HIP REPLACEMENT

A fracture of the hip is one of the most common types of major fractures in older people as persons over 70 often have fragile (osteoporotic) bones. The hip is a ball and socket joint with the upper end of the hip bone (femur) formed as a 3/4 ball fitting into a socket cup on the hipbone. If the neck between the ball and the shaft of the femur is fractured, a pin is inserted into the ball to stabilize the neck. Further stabilizing is achieved by screwing a plate onto the shaft of the femur. If the ball itself is damaged, a metal ball is required and a new metal neck is inserted into the shaft of the femur. A corresponding artificial (metal) socket must also be glued into the hipbone.

Hip revision describes the repair of the prosthetic hip or fixation device to make it articulate better or make it more secure following wear and tear, loosening or displacement.

Before a patient undergoes hip surgery they must be assessed. As patients are usually in an older age group, an electrocardiogram is almost always performed to determine if there are any cardiac problems that need to be taken into account during and after the procedure. Similarly, a patient's chest may be X-rayed to ascertain if they have any respiratory conditions. The patient's hip will also be X-rayed to determine the location and extent of the damage.

Hip replacement procedures are performed under either a general or a regional (either spinal or epidural) anaesthetic. With a regional anaesthetic, the patient is conscious or lightly sedated and the lower part of the body being operated upon is numbed. If the procedure is performed under a general anaesthetic, the patient is unconscious. Usually the anaesthesia is maintained through the metered administration of gases through an **anaesthesia unit**.

The patient is placed on a special **operating table** so that the femur and hip are easily accessed. The incision goes through the skin and side muscles down to the femur bone. Burning the ends of the blood vessels using an **electrosurgical unit** stops bleeding in the surrounding tissue.

If the femoral neck is fractured, under **X-ray** control, a wire is aligned through the centre of the neck into the femoral head and then a strengthening pin is hammered into the head along this path. The lower end of the pin is attached to a flat plate screwed to the femoral shaft. With a hip replacement, the surgeon cuts the end of the femur closest to the pelvis with an **oscillating saw** powered by compressed air.

CHART 2A
EQUIPMENT USED FOR 3 COMMON HOSPITAL PRESENTATIONS - *continued*

HIP REPLACEMENT - *continued*

Throughout surgery, the patient's vital signs are monitored (blood pressure, haemoglobin saturation, heart rhythm, inspired oxygen and expired carbon dioxide). The **physiological monitor** with the **anaesthetic unit** also measures the level of anaesthetic vapour and may measure the nitrous oxide level and the patient's body temperature.

After surgery, the patient will be monitored in the recovery section adjacent to the operating theatre. Once the patient's vital signs are stable, they will return to the ward. If the patient has had epidural anaesthesia, this treatment will often be continued for the first few days of the patient's recovery. This is delivered via an **infusion pump**. Patients that do not have an epidural may be given a button-controlled syringe for administering pain relief medication, such as morphine. Each of these pain relief techniques will usually be used for the first few days after which oral analgesics are usually sufficient.

Throughout the patient's stay their vital signs are regularly monitored so that any complications can be promptly detected. Automated monitoring devices may be used to measure blood pressure and respiration, or this may be done manually. The amount of oxygen in the blood is measured by a **pulse oximeter** via a small peg that is usually applied to a person's finger.

Provided there are no complications, the patient will remain in hospital for about 3 days and then be moved to a rehabilitation unit or other sub-acute environment for a further one to 2 weeks.

2.14 Further descriptions of the various items of equipment used in the 3 presentations outlined above are contained in Appendix B.

2.15 The audit also examined 5 of the most costly items of equipment which are described in Chart 2B.

**CHART 2B
FIVE OF THE MOST COSTLY ITEMS OF MEDICAL EQUIPMENT SELECTED
FOR AUDIT EXAMINATION**

COMPUTED TOMOGRAPHY SCANNER



A computed tomography scanner, commonly known as a CAT scan or CT scan, produces cross-sectional images (slices) of anatomy to generate a multidimensional view of the body's interior. A CT scan can clearly show very small bones as well as surrounding tissues (e.g. muscle and blood vessels).

A CT is used for diagnosing many different cancers, to plan and properly administer radiation treatments for tumours, and guide biopsies and other minimally invasive procedures. In cases of trauma, a CT can quickly identify injuries to the liver, spleen, kidneys or other internal organs. A CT can also play a significant role in the detection, diagnosis and treatment of vascular diseases.

POSITRON EMISSION TOMOGRAPHY



A positron emission tomography (PET) is an imaging procedure that uses short-lived radioisotopes to allow non-invasive examination of the heart, brain and other organs. As the radioisotopes are distributed through the body and processed by the organ being imaged, the PET scanner detects the radioactivity released and uses it to create images. While an X-ray, a CT and a magnetic resonance imaging system (MRI) only show body structure, PET images show the chemical or physiological functioning of an organ or tissue.

A PET is particularly useful for detecting cancer, coronary artery disease and brain disease before any anatomical abnormalities become physically evident.

MAGNETIC RESONANCE IMAGING SYSTEMS



Magnetic resonance imaging (MRI) combines the functions of a large magnet and radio waves. The magnet creates a strong magnetic field and radio waves are sent into the body. The response signals emitted by the atoms in the body are picked up by a very sensitive antenna and forwarded to a computer for processing. The computer analyses the response signals and makes 2-dimensional, cross-sectional pictures from inside the body.

MRI is an important diagnostic technique for the early detection of abnormal changes in tissues and organs, and is particularly effective for imaging soft tissue such as the brain, muscles and nerves.

CHART 2B
FIVE OF THE MOST COSTLY ITEMS OF MEDICAL EQUIPMENT SELECTED
FOR AUDIT EXAMINATION - *continued*

LINEAR ACCELERATORS



A linear accelerator is a radiotherapy machine for curing or reducing the size of a cancer, or for controlling its spread when incurable. The linear accelerator delivers high-energy beams of ionising radiation to that part of the body affected by the cancer, destroying the cancer cells, but minimising damage to superficial and surrounding tissues. As different parts of the body are more sensitive to the effect of ionising radiation than others, some cancers are more responsive to this treatment (e.g. cancers of the skin, oral cavity, larynx, cervix and prostate).

DIGITAL SUBTRACTION ANGIOGRAPHY SYSTEMS



Digital subtraction angiography (DSA) is an imaging technique to evaluate vascular disease. A DSA computer system stores images of veins and arteries electronically and then subtracts and manipulates images.

A DSA is performed by inserting a catheter (needle) into an artery or vein under fluoroscopic guidance. A contrast agent is administered through the catheter into an artery close to the diseased area. The vascular distribution in the part of the body being examined is digitally imaged, and interfering structures (e.g. bones) are subtracted from the projected 2-dimensional image. This provides a clear image of veins or arteries (much more so than those produced by non-digital angiography systems), which can be viewed from many perspectives.

Part 3

Condition of medical equipment

INTRODUCTION

3.1 As medical equipment assets have to be replaced or upgraded at some point in time, it is important to identify the life expectancy of each item and monitor its physical condition. However, factors other than age can influence the life expectancy of medical equipment (or extent of use beyond its projected life expectancy) including:

- *utilisation levels* - is the equipment used at full capacity?
- *maintenance practices* - has the equipment been maintained in accordance with generally accepted standards?
- *technological change* - has the equipment become obsolete due to technological advances?
- *availability of replacement parts* - are parts available as and when required? and
- *changes in clinical practices* - are clinicians required to use the equipment in the normal course of treatment?

3.2 This Part of the report details the results of our assessment of the life expectancy and condition of the 2 groups of equipment at the 19 sample hospitals. This equipment comprised: 4 248 items used in the treatment of heart attack, chest pain and hip replacement; and 62 major items (made up of the following numbers in each of 5 categories of high cost items - 7 magnetic resonance imaging systems, 20 computed tomography scanners, 25 digital subtraction angiography systems, 3 positron emission tomography scanners and 7 linear accelerators). While the majority of items used by the 19 hospitals visited in the treatment of heart attack, chest pain and hip replacement were examined, a small number were not as they were in use at the time of our visit.

3.3 The data provides evidence of the performance of the 19 sample hospitals in applying the medical equipment management practices that are detailed in Part 4 of this report and, in particular, whether equipment is replaced as and when required to ensure the quantum and quality of patient care is not unduly compromised.

ASSESSMENT OF EQUIPMENT LIFE EXPECTANCY AND CONDITION

Life expectancy

3.4 As only 2 (Monash and Latrobe) of the 19 sample hospitals had assessed the life expectancy of their equipment, we used guidelines developed in the United States of America to determine the life expectancy of equipment. These guidelines, known as the Life Expectancy Projection Guidelines, were developed in 1995 by the American Society for Healthcare Engineering (ASHE), with input from medical device manufactures. As the equipment used and procedures undertaken in Australian hospitals are similar to those in America, the ASHE Guidelines were suitable for determining the life expectancy of equipment items, and in turn, the level of funding required to replace them. All 19 hospitals agreed with the application of the Guidelines for the purpose of the audit given the absence of other industry guidelines. The ASHE Guidelines were also used by Professor John Deeble in his examination of *Capital investment in public hospitals, 2002*, published in the *Australian Health Review, Volume 25 No 5, in 2002*.

3.5 The ASHE Guidelines, which focus on life expectancy of medical equipment from a maintenance and technology perspective, outline 6 factors which affect medical equipment life expectancy, and are shown in Table 3A.

**TABLE 3A
FACTORS AFFECTING MEDICAL EQUIPMENT LIFE EXPECTANCY**

<p>Availability of new technology As medical technology is constantly advancing, the capacity for equipment to be upgraded must be considered.</p> <p>Equipment no longer meets government or manufacturer safety standards If an item of equipment no longer meets the manufacturer's safety standards, it must immediately be removed from service. This is especially relevant to medical devices that are used for direct patient care.</p> <p>Maximum maintenance expenditure limits Maximum maintenance expenditure limits should be established to ensure that it is more economic and operationally effective to perform corrective maintenance than to replace the equipment.</p> <p>Availability of repair parts The availability of repair parts meeting the manufacturer's specifications is essential in keeping equipment serviceable. Even though a piece of equipment is relatively new, its life can be shortened if repair parts are no longer available.</p> <p>Obsolescence that inhibits or prohibits modern medical practice Out-of-date medical equipment will need to be upgraded to remain at the leading edge of technology and clinical practice.</p> <p>Reliability of equipment If an item of equipment has a high incidence of breakdowns affecting its availability, it should be considered for replacement.</p>
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Source: Based on American Society for Healthcare Engineering (ASHE).

3.6 According to hospitals, provided equipment poses no clinical or safety risks to patients or staff, it was rarely replaced at the end of its recommended useful life. Although new equipment is generally more sophisticated, more user-friendly and offers improved images and faster patient throughput than the equipment it replaces, the extent of new equipment acquisitions is restricted because of the associated high cost and availability of funding.

3.7 We acknowledge that, where equipment is working well, can be maintained, and has not been superseded by a significantly improved model, there is no need for the item to be replaced. However, ongoing use of equipment that has exceeded its life expectancy without planning for its eventual replacement increases the risk of disruptions to service delivery. For example, funds may not be available to replace or upgrade the equipment when required or manufacturers may cease supporting the equipment by discontinuing the provision of spare parts or servicing the equipment.

RESPONSE provided by Secretary, Department of Human Services

Decisions to replace medical equipment need to take into account other factors than ideal life expectancy including utilisation, patient safety and affordability. The ASHE Guidelines are concerned only with life expectancy and do not take into account these other factors.

RESPONSE provided by Chief Executive Officer, Monash Medical Centre

Life expectancy is determined normally pre-purchase, based on manufacturer's information, in-house and external product knowledge and technical expertise, Therapeutic Goods Administration and ECRI information and experience of other hospitals and users. Many factors are considered in determining lifetime expectancy and the result is a lifetime being assigned to each item recorded in the asset register. Life expectancy is a critical factor to support any business case for large capital purchases, which are considered by the Board of Directors, and lesser capital items, which are approved by Executive. Department heads, unit managers, biomedical engineers etc. have a very good knowledge of equipment life expectancy both at the time of purchase and throughout equipment life (i.e. it is a moveable quantity). Purchasing managers, finance managers, executive etc. are well informed prior to approving capital purchases.

The factors listed in Table 3A are routinely considered in determining life expectancy. However, life expectancy is a highly variable factor also determined by the type of use the equipment will be put to. ASHE might be a useful guide to the measure of life expectancy, but other expert knowledge and information is utilised to consider the many variables that determine this factor. In some cases, it is likely the ASHE may underestimate useful lifetime of certain equipment. For example, general purpose X-ray units are classified with an 8 year life expectancy. In reality, such units, if correctly maintained, owing to their simplicity and basic radiographic use, can continue to function normally over a significantly longer period without any compromise to patient care or operational efficiency. Digital Subtraction Angiography units are given an 8 year lifetime. However, cardiovascular Digital Subtraction Angiography units are rated at 10 years. They are essentially the same thing! General purpose X-ray equipment is far less sophisticated and far less maintenance intensive than sophisticated Digital Subtraction Angiography X-ray equipment.

Similarly, equipment used in a quiet ward in a regional hospital will have a totally different life expectancy to the same equipment used in a busy emergency department in a major metropolitan hospital. Equipment used in a regional hospital operating theatre will have a totally different life expectancy to equipment that is "always on" in a busy metropolitan operating theatre.

RESPONSE provided by Chief Executive Officer, Monash Medical Centre - continued

Department heads, unit managers etc. are well informed regarding age, condition and performance of their medical equipment. They are also generally well informed about new and emerging technologies. Generally, equipment is not replaced with new technology due to competing priorities for funding, not necessarily due to high cost.

The time lag between identification of equipment requirements and eventual approval and replacement can surpass life expectancy. A major impediment is the extent of capital funding available.

Condition of medical equipment

3.8 Hospitals are responsible for ensuring that their medical equipment is adequate and in particular that it can be used safely and effectively. This requires maintaining equipment in a condition that enables it to perform the functions for which it is intended, and complies with the relevant health and safety standards. Information about the condition of medical equipment is critical for informing decisions on modification, refurbishment, finding an alternative use for, or disposal of, such assets.

3.9 As only 2 (Monash and Latrobe) of the 19 sample hospitals had assessed the condition of their medical equipment, the audit team physically inspected around 4 300 items at the 19 sample hospitals. The condition of each item was assessed using a 5 point rating scale which is extensively used by the specialists we engaged to assess the condition of medical equipment in hospitals. All of the 19 sample hospitals agreed with our method for assessing equipment condition and the rating assigned to each item. Details of the ratings are shown in Table 3B.

**TABLE 3B
RATINGS FOR ASSESSING EQUIPMENT CONDITION**

Ratings	Explanation of rating
1 = Poor	The equipment should be replaced immediately. Equipment is unreliable with excessive downtime and spare parts are no longer available or difficult to obtain.
2 = Fair	The equipment should be replaced in the next 1-3 years. Equipment is still reliable but is nearing the end of its life with downtime increasing. The equipment has been surpassed by newer technology offering improvements to procedures or treatment.
3 = Good	The equipment should not be replaced. Equipment is reliable. Although it may not be the latest technology, it is able to perform procedures and treatment where it is required.
4 = Very good	The equipment should not be replaced. Equipment is not new but still at the leading edge of technology and offers many of the latest features. It is reliable with minimal downtime.
5 = Excellent	The equipment is in as new condition and should not be replaced. Equipment is brand new, probably the latest technology, under warranty, very reliable and operates to specifications.

Source: ECRI.

RESPONSE provided by Secretary, Department of Human Services

Immediate replacement is not the only option for equipment in poor condition. Where utilisation is low, consideration should also be given to decommissioning the equipment.

RESPONSE provided by Chief Executive Officer, Monash Medical Centre

Equipment condition is frequently assessed, at minimum, during regular, routine quality assurance testing. Unsafe equipment is not in use. Older equipment may be in use if safe, functional and adequate for the purpose even if not the most technically advanced. Recent examples of forward planning to replace equipment include Diagnostic Imaging, Anaesthetics, Newborn Services, Intensive Care Unit and Emergency. Limited capital resources is the key reason older equipment is not replaced, not lack of enthusiasm.

EQUIPMENT ASSOCIATED WITH HEART ATTACK, CHEST PAIN AND HIP REPLACEMENT

Equipment exceeding ASHE life expectancy

3.10 Table 3C shows, at August 2002 at each of our 19 sample hospitals, the number of medical equipment items, associated with heart attack, chest pain and hip replacement, and the number and percentage exceeding ASHE life expectancy.

**TABLE 3C
EQUIPMENT ASSOCIATED WITH HEART ATTACK, CHEST PAIN AND HIP REPLACEMENT
EXCEEDING ASHE LIFE EXPECTANCY AT 19 SAMPLE HOSPITALS, AUGUST 2002**

Hospital	Items assessed	Items exceeding ASHE life expectancy	Equipment past ASHE life expectancy	Replacement value of equipment exceeding ASHE life expectancy (a)
	(no.)	(no.)	(%)	(\$'000)
The Alfred	695	422	61	10 104
Austin	360	198	55	4 872
Ballarat	257	51	20	2 045
Barwon	188	41	22	945
Bendigo	137	76	55	2 842
Box Hill	131	66	50	2 172
Colac	47	12	26	460
Echuca	48	15	31	800
Frankston	254	145	57	2 364
Goulburn Valley	76	19	25	381
LaTrobe	93	32	34	246
Monash	923	398	43	8 209
Northern	102	35	34	778
Portland	48	22	46	894
Royal Melbourne	463	319	69	3 990
Wangaratta	66	23	35	1 165
West Gippsland	64	10	16	226
Western	241	140	58	2 781
Wimmera	55	5	9	223
Total	4 248	2 029	(b) 48	45 497

(a) Replacement value was determined by ECRI based on its medical equipment cost database.

(b) Represents average for the 19 hospitals.

Source: Victorian Auditor-General's Office, sample of 19 hospitals, 2002.

3.11 As shown in Table 3C, 48 per cent of medical equipment items associated with 3 common causes of hospital admission in the 19 sample hospitals had exceeded the ASHE life expectancy benchmark. The replacement value of this equipment was around \$45 million. For individual hospitals, the level of equipment that exceeded the ASHE life expectancy benchmark ranged from 9 per cent to 69 per cent and with replacement values of \$223 000 to \$10.1 million.

3.12 Table 3D shows that within this group of equipment, infusion pumps are the prevalent type of equipment that exceed their life expectancy benchmark.

**TABLE 3D
SUMMARY OF THE KEY EQUIPMENT ASSOCIATED WITH
HEART ATTACK, CHEST PAIN AND HIP REPLACEMENT AT 19 SAMPLE HOSPITALS,
AUGUST 2002**

<i>Equipment item</i>	<i>Items assessed</i>	<i>Items exceeding ASHE life expectancy</i>	<i>Equipment past ASHE life expectancy</i>	<i>Replacement value of equipment exceeding ASHE life expectancy (a)</i>
	<i>(no.)</i>	<i>(no.)</i>	<i>(%)</i>	<i>(\$'000)</i>
Anesthesia units	105	14	13	1 638
Defibrillator/monitors	190	53	28	798
Electrocardiographs, multichannel	93	19	20	186
Electrosurgical units	91	28	31	423
Infusion pumps	2 166	1 261	58	4 042
Orthopedic surgery kit	24	2	8	115
Physiologic monitoring systems, acute care	377	109	29	3 280
Physiologic monitoring systems, acute care (multiple bed with central station)	41	16	39	6 396
Radiographic units	124	53	43	6 932
Scanning systems ultrasonic	61	1	2	427
Ventilators	236	85	36	1 699
Sterilising units	80	20	25	1 600
Washers for cleaning surgical instruments	40	19	47	1 504

(a) Replacement value was determined by ECRI based on its medical equipment cost database.

Source: Victorian Auditor-General's Office, sample of 19 hospitals, 2002.

3.13 As Table 3D highlights, more than half the infusion pumps and over a third of washers, radiographic units, physiologic monitoring systems - acute care (multiple bed with central station) and ventilators, had also exceeded the ASHE life expectancy benchmark.

3.14 Based on this assessment, considerable funding is likely to be required in the near future by hospitals to enable them to replace those assets that may no longer be suitable for use. As such, it will be incumbent on hospitals to properly plan for this eventuality. Further comment on future funding requirements of hospitals is detailed in paragraphs 3.17 to 3.19.

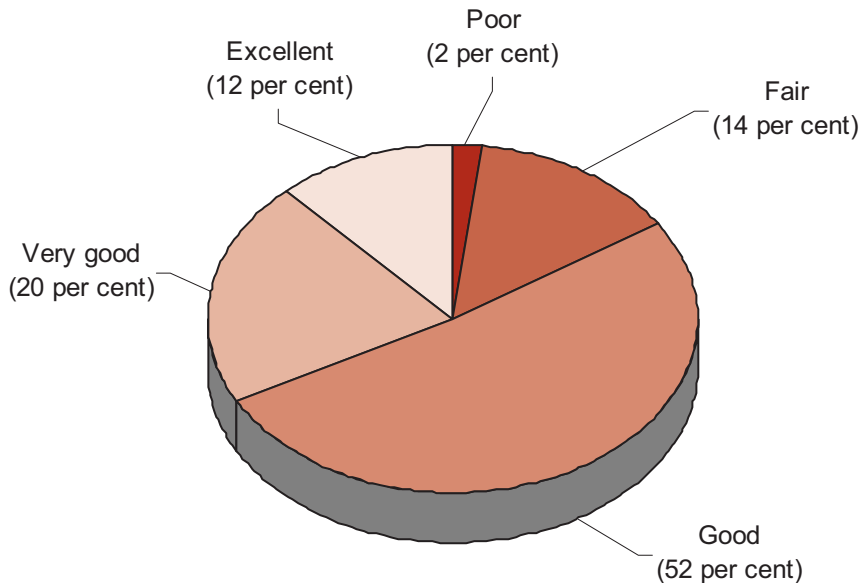
RESPONSE provided by Chief Executive Officer, Monash Medical Centre

Monash Medical Centre has a strategic plan in place for replacement of diagnostic imaging equipment. The initial 3 year plan is currently being implemented and the further 3 year plan is at an advanced stage of development. From the data gathered by ECRI, the diagnostic imaging equipment value (for equipment exceeding ASHE lifetime) is \$5 million. Replacement of this equipment is included in the strategic plan.

Current condition of equipment

3.15 Chart 3E shows the condition of around 4 300 items of equipment associated with the 3 selected causes of admission (heart attack, chest pain and hip replacement) as assessed by the audit team in August 2002.

CHART 3E
**CONDITION OF EQUIPMENT ASSOCIATED WITH HEART ATTACK,
 CHEST PAIN AND HIP REPLACEMENT, AUGUST 2002**



Source: Victorian Auditor-General’s Office, sample of 19 hospitals, 2002.

3.16 As shown in Chart 3E, 2 per cent of the equipment was assessed as “poor” requiring immediate replacement, and 14 per cent was in “fair” condition but requiring replacement within the next one to 3 years. Around 90 per cent of the equipment assessed as in “poor” or “fair” condition had exceeded the ASHE life expectancy benchmark. Within this group of equipment, 26 items had exceeded the ASHE life expectancy benchmark by 10 years, 8 by 11 years, 6 by 12 years, 5 by 13 years and 4 by 17 years or more.

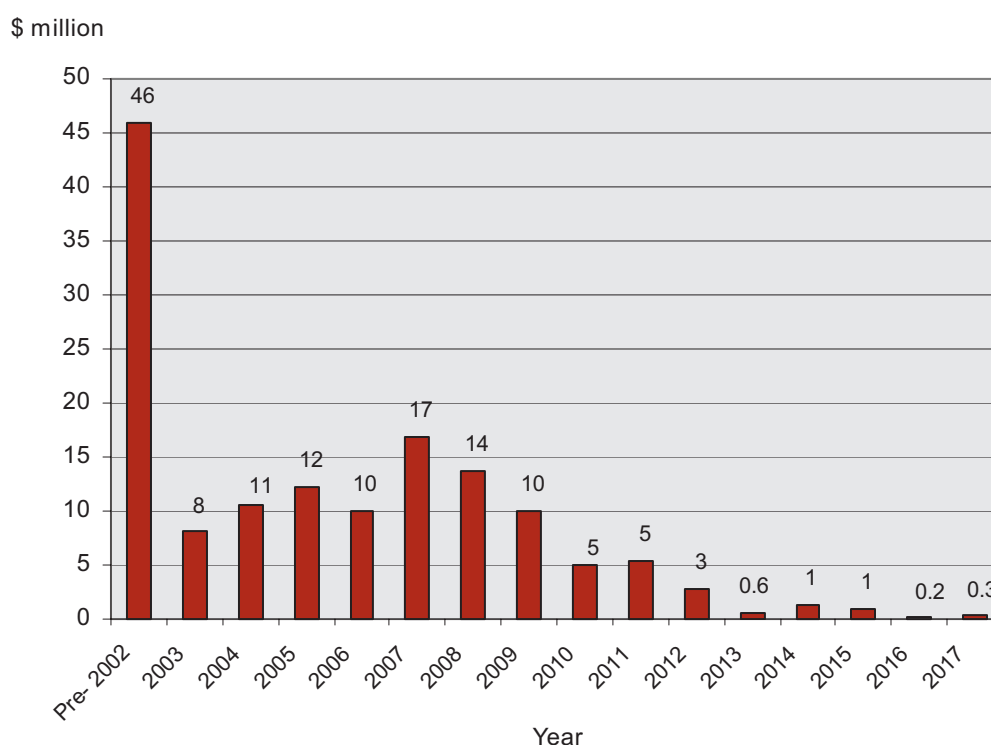
RESPONSE provided by Secretary, Department of Human Services

The decision on replacement of medical equipment should take into account not only the condition but also whether replacement can be justified, taking into account patient safety, staff safety, utilisation, and the costs of maintaining and operating the equipment.

Current and future funding requirements

3.17 Chart 3F shows the anticipated replacement cost (at August 2002) of the equipment associated with the 3 common causes of admission, in the 19 sample hospitals, over the next 15 years based on the ASHE life expectancy benchmark (i.e. equipment that will exceed the ASHE life expectancy benchmark over the next 15 years and, therefore, may need to be replaced).

**CHART 3F
FUTURE FUNDING REQUIREMENTS, EQUIPMENT RENEWAL**



Source: Victorian Auditor-General’s Office, sample of 19 hospitals, 2002.

3.18 As shown in Chart 3F, significant spending is likely to be required by hospitals in the near future to enable their equipment items associated with the 3 common causes of hospital admissions to be maintained or upgraded. At January 2003, equipment assessed as beyond its life expectancy benchmark was valued at \$46 million. Over the next 15 years, an additional \$98 million will also be required to replace equipment items that will exceed their life expectancy benchmark over that period. In this regard, Chart 5A in Part 5 of this Report shows that the Department’s funding for medical equipment has increased significantly over the last 4 years compared with prior years.

3.19 Our assessment of the condition of equipment associated with 3 hospital admissions identified that around \$20.3 million will be required by hospitals over the 3 year period to 2005 to replace equipment that was in “poor” to “fair” condition.

MAJOR EQUIPMENT ITEMS

Equipment exceeding ASHE life expectancy

3.20 Our assessment against the ASHE life expectancy benchmark of the 62 major equipment items identified that, at August 2002, 12 had exceeded their life expectancy. Details are shown in Table 3G.

**TABLE 3G
MAJOR EQUIPMENT EXCEEDING ASHE LIFE EXPECTANCY,
AUGUST 2002**

<i>Hospital</i>	<i>Purchase year</i>	<i>ASHE life expectancy</i>	<i>Expected replacement year</i>
Positron emission tomography scanners -			
Austin	1993	8	2001
Magnetic resonance imaging systems -			
The Alfred	1993	8	2001
Linear accelerators -			
The Alfred	1992	7	1999
The Alfred	1992	7	1999
Barwon	1991	7	1998
Barwon	1992	7	1999
Computed tomography scanners -			
Royal Melbourne	1993	8	2001
Austin	1993	8	2001
Digital subtraction angiography systems -			
Ballarat	1993	8	2001
Box Hill	1993	8	2001
Barwon	1992	8	2000
Royal Melbourne	1989	8	1997

Source: Victorian Auditor-General's Office, sample of 19 hospitals, 2002.

3.21 An additional 6 items will exceed the ASHE life expectancy benchmark by the end of 2002 comprising:

- one magnetic resonance imaging system (Royal Melbourne);
- one linear accelerator (The Alfred);
- 2 computed tomography scanners (Monash, Royal Melbourne); and
- 2 digital subtraction angiography systems (Royal Melbourne).

3.22 Ongoing use of aged equipment can impact on the quality of patient care. The Royal Melbourne Hospital stated that 2 of its 3 computed tomography scanners are very old, having been purchased in 1993 and 1994. These units are slow and their images are below the quality of more recent units. This situation creates many operational problems when booking patients and the poor image quality creates difficulties when interpreting the images.

RESPONSE provided by Secretary, Department of Human Services

The Department has not to date supported the funding of non-MBS licensed Positron Emission Tomography (PET) scanners and Magnetic Resonance Imaging (MRI) systems included in Table 3G. For example, there is only one licensed PET scanner at the Austin and Repatriation Medical Centre and the Department recently provided \$4.05 million funding towards the new PET scanner at the Austin and Repatriation Medical Centre.

The industry accepted life expectancy for linear accelerators is 10 years.

Box Hill Hospital acquired a new Digital Subtraction Angiography System (DSA) in 2001-02.

RESPONSE provided by Chief Executive Officer, Austin and Repatriation Medical Centre

Two linear accelerators are in service at the Austin. Their installation dates were 1992 and 1994. This would normally give expected replacement dates of 1999 and 2001 (as for the Alfred and Barwon linear accelerators included in Table 3G, and paragraph 3.21).

Because of a major upgrade in 2000 and 2001, respectively, their expected life was revised, on advice from the supplier, to 2005 and 2006, respectively.

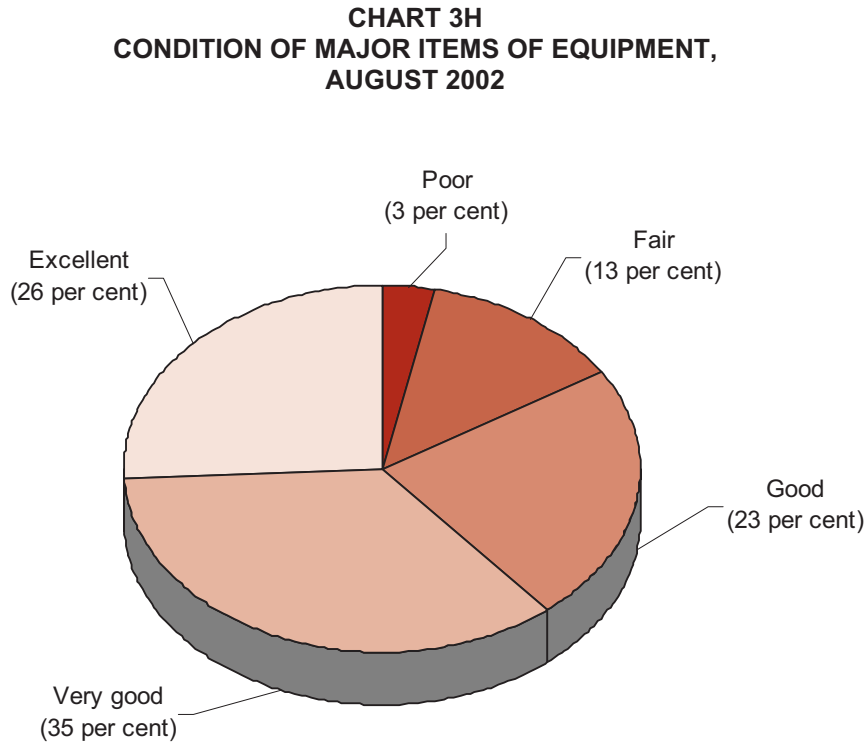
However, our experience of serviceability over the last 12 months, in particular, the number of days out of service due to breakdown (see Table 4H), has lead us to conclude that the machines have reached their serviceable life. These machines are now considered (by the Austin and Repatriation Medical Centre) due for replacement.

RESPONSE provided by Chief Executive Officer, Monash Medical Centre

Computed Tomography Scanner replacement at Monash Medical Centre has been strategically planned and is proceeding. The ECRI surveyor assessed the condition of the unit to be replaced as "very good". It remains supported and maintained by the manufacturer (Siemens).

Current condition of equipment

3.23 Chart 3H shows the results of our assessment at August 2002 of the condition of the 62 major items of equipment.



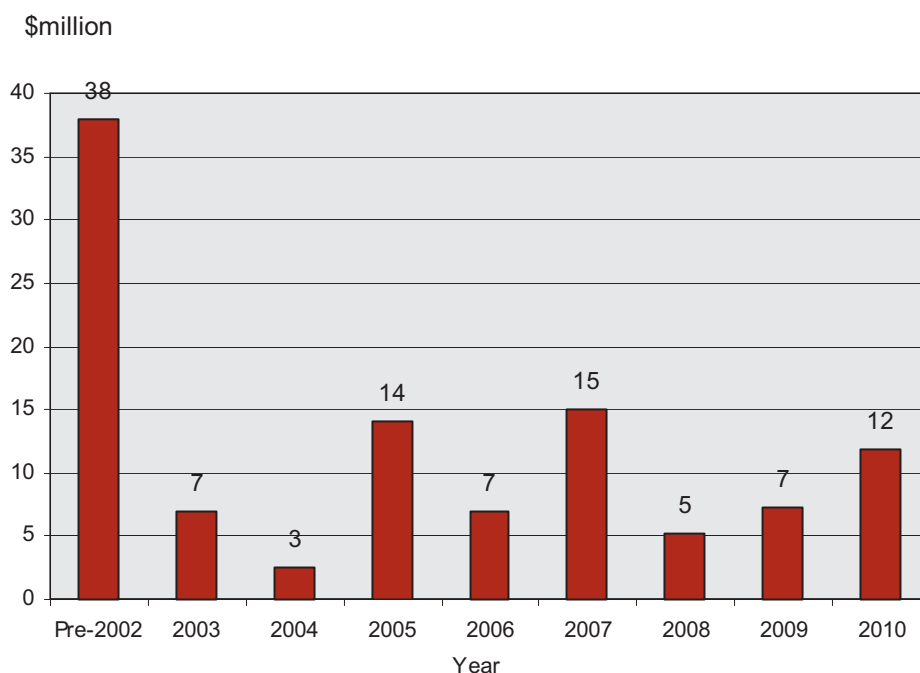
Source: Victorian Auditor-General's Office, sample of 19 hospitals, 2002.

3.24 As shown in Chart 3H, 3 per cent of major equipment items were assessed as “poor” requiring immediate replacement and 13 per cent were assessed as “fair” requiring replacement within the next one to 3 years. Around 80 per cent of the equipment assessed as “poor” or “fair” had exceeded the ASHE life expectancy benchmark.

Current and future funding requirements

3.25 Chart 3I shows the anticipated replacement cost (at August 2002) of the 62 major equipment items, in the 19 sample hospitals, over the next 8 years, based on the ASHE life expectancy benchmark (i.e. equipment that will exceed the life expectancy benchmark over the next 8 years and, therefore, may need to be replaced).

**CHART 3I
FUTURE FUNDING REQUIREMENTS, EQUIPMENT RENEWAL**



Source: Victorian Auditor-General's Office, sample of 19 hospitals, 2002.

3.26 As shown in Chart 3I, significant spending is likely to be required by hospitals in the near future to enable their major equipment items to be maintained or upgraded. At January 2003, equipment assessed as beyond their life expectancy (5 linear accelerators, one PET scanners, 2 MRI systems, 4 CT scanners and 6 DSA systems) were valued at \$38 million. Over the next 8 years, an additional \$70 million will be required to replace major equipment items that will also exceed their life expectancy benchmark over that period.

3.27 Our assessment of the condition of major equipment items also identified that around \$21.7 million will be required by hospitals over the 3 year period to 2005 to replace equipment that was in “poor” to “fair” condition.

AUDIT CONCLUSION

3.28 Our audit has identified that public hospitals require substantial spending now and over the next 5 years to replace medical equipment that has reached the end of its life expectancy benchmark. This is consistent with the findings of past reviews initiated by the Department dating back to 1995.

3.29 There is a real risk that, due to an emerging funding gap, hospitals may not be able to replace medical equipment as and when required. This in turn may compromise the quantity and quality of patient care. This situation has, in part, resulted from poor asset management practices by hospitals and in particular a failure to properly plan for their equipment needs beyond a 12 month period. Our assessment of these practices is detailed in Part 4 of this report.

RESPONSE provided by Chief Executive Officer, Monash Medical Centre

Monash Medical Centre has very good asset management practices, which involve Materials Management, Health Technology Services (Biomedical Engineering), Engineering Services etc. working together and with users and suppliers/manufacturers. Consideration of equipment replacement needs, particularly for large capital items, commences as equipment approaches the end of its useful life. Appropriate selection may take a number of years, depending on foreseen technical developments and anticipated cost. New equipment is purchased with a view to technical superiority and expectations of reasonable life expectancy, with the knowledge that funding is difficult to come by. If capital funding allocation is an annual event then multi-year planning is to an extent limited by the allocation process.

Part 4

Adequacy of medical equipment management practices

INTRODUCTION

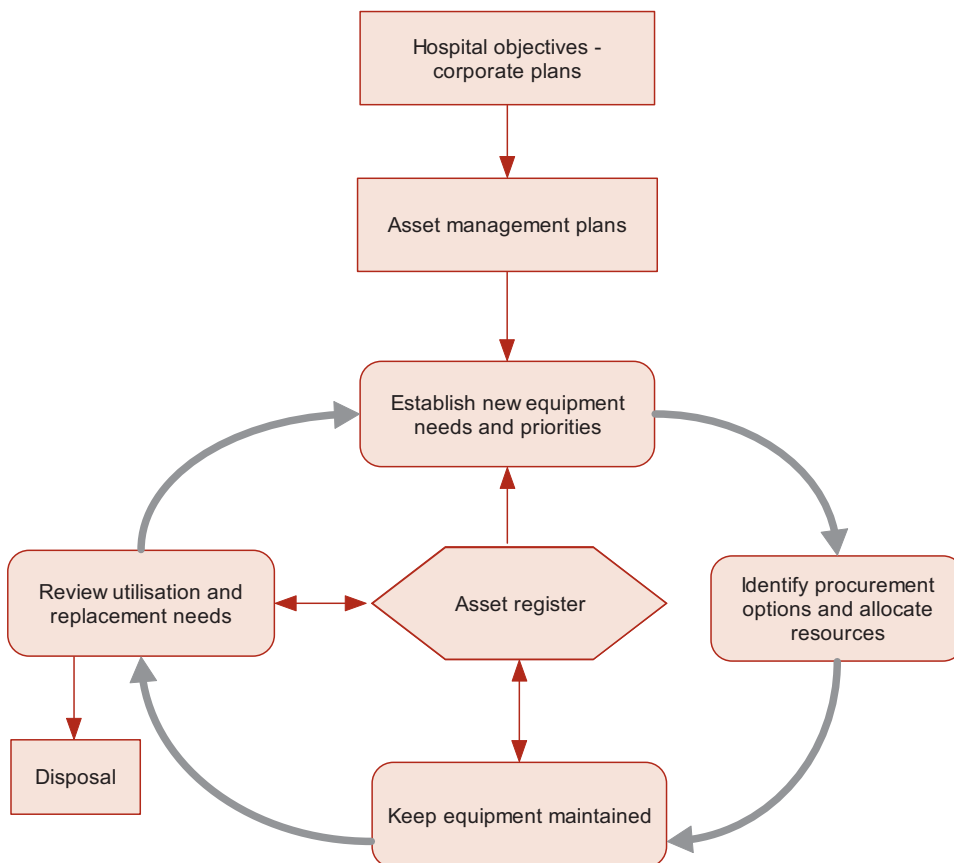
4.1 It is incumbent on hospitals to ensure the medical equipment needed by staff to deliver agreed levels of patient care is available as and when required. This includes managing its finances to meet the cost of maintaining and replacing equipment, and that this equipment is used as efficiently and effectively as possible.

4.2 Hospitals, therefore, need:

- mechanisms to ensure that medical equipment is acquired on the basis of assessed and prioritised need; and
- decisions on medical equipment acquisition, maintenance, use and replacement to be made on the basis of complete and reliable information recorded in an asset register.

4.3 Chart 4A shows the key components of medical equipment management.

**CHART 4A
MANAGEMENT CYCLE FOR MEDICAL EQUIPMENT**



Source: Based on UK National Audit Office Report *The Management of Medical Equipment in NHS Acute Trusts in England*, 1999.

4.4 This Part of the report examines, for 19 sample hospitals, the policies, practices and systems for managing medical equipment assets, including the procurement of new equipment.

DEVELOPMENT OF ASSET MANAGEMENT PLANS

4.5 Asset management plans provide the means through which likely future equipment needs are identified, criteria for prioritising needs are set and informed decisions on spending priorities are made. Decisions based on asset management plans should lead to greater efficiency in the use of medical equipment. A key output from the plan should be a prioritised equipment procurement program, regularly updated, that addresses the most serious and urgent needs of hospitals.

4.6 The Asset Management Series developed by the Department of Treasury and Finance (refer Part 2 of this report) requires entities to establish systems and processes to support the preparation of 5 year forward asset strategies covering acquisition, maintenance, refurbishment, redeployment and disposal, together with the attendant capital and operating costs.

4.7 Our audit found that the asset management policies and practices of hospitals were not consistent, in all respects, with either the Asset Management Series (guidelines), or industry best practice. There was little consensus on the asset management process, and no consistent structure for asset management planning across hospitals. Of the 19 hospitals visited:

- none had established comprehensive asset management plans that showed the current condition and utilisation of medical equipment, expected future demand for medical services and the cost of sustaining that level of service in the longer-term;
- only one (Barwon) was in the process of developing an asset management plan;
- 2 (Colac and Austin) had determined their future equipment needs for new buildings under construction; and
- in all cases, complete and accurate information was not available to enable preparation of an asset management plan (e.g. age profile, condition of the asset base and expected future replacement requirements and associated costs).

4.8 We found that hospital planning processes tended to focus on current or short-term needs with little or no consideration of the future replacement of equipment. This contrasts with best practice which would involve a 5 to 10 year forward estimate of funding requirements. According to hospitals, a major factor influencing their current practices was that the level of funding likely to be provided by the Department of Human Services beyond a 12 month period was not known.

4.9 The hospitals' capacity to undertake long-term planning was also impeded by their failure to establish suitable policies to guide decisions on the replacement of medical equipment, including criteria such as life expectancy of equipment, technological obsolescence and availability of spare parts.

4.10 Notwithstanding any uncertainty with future funding levels from the Department, it is important that hospitals plan for their future replacement needs, determine the magnitude of gaps between what funding is required and what is expected to be available, and then develop strategies to manage the gap. As shown in Part 3 of this report, significant spending will be required by hospitals in the very near future to address equipment replacement.

RESPONSE provided by Chief Executive Officer, Monash Medical Centre

Monash Medical Centre makes reasonable attempts at having a prioritised equipment procurement program. Limited funding has failed to support this effort.

Life expectancy, technological obsolescence and spare parts availability are all known and understood. Monash closely liaises with manufacturers and suppliers. Therapeutic Goods Administration and ECRI are monitored for useful, supporting information. Attendance at meetings, seminars and dialog with manufacturers/suppliers is encouraged to keep abreast of the latest technological advances.

MEDICAL EQUIPMENT ASSET REGISTERS

4.11 An effective asset management system is dependent on a well-kept asset register that contains complete and up-to-date information on the acquisition, maintenance and disposal of assets. In addition to facilitating compliance with statutory reporting obligations, the register should provide all the information needed for planning and managing assets.

4.12 For hospitals, the benefits of such information include:

- a good basis for prioritising equipment needs and determining whether new or additional medical equipment is needed;
- identifying how and when maintenance is to be conducted and how much this costs;
- records on the utilisation of medical equipment;
- records that medical equipment has been properly tested before being used;
- ease in locating medical equipment; and
- minimising safety risks (e.g. medical equipment subject to a manufacturer's recall can be quickly identified).

4.13 Over the past decade, reviews initiated by the Department of Human Services to assess the adequacy of asset registers held by public hospitals have identified a number of deficiencies.

4.14 A 1995 report titled *Capital Investment in Victorian Public Hospitals* (covering 53 hospitals), prepared for the Department, commented that most registers were unsuitable and generally incomplete. A review undertaken by the Department in 1998 of registers held by a number of major hospitals found that their completeness and accuracy was still unsatisfactory. The major problems were that:

- historical data was incomplete or missing;
- recording methods were inconsistent between hospitals and within the same hospital; and

- determining the age of assets was difficult as purchase dates were replaced with revaluation dates.

4.15 The 2001 review by the Monash University Centre for Biomedical Engineering (MUCBE) found that, in general, the asset systems and processes within hospitals were sufficient for day-to-day financial control. However, there were several hospitals that needed to improve the accuracy of their major capital equipment register. The main weaknesses identified in the review were that:

- Various fixed asset registration systems did not, in general, interface with other hospital systems. Only a minority of registers actually interfaced with the general ledger and none were actually interfacing with other systems such as programmed maintenance;
- Software used across the State was fragmented with very few hospitals using similar systems;
- One major health service (Royal Children's Hospital and Royal Women's Hospital) regularly downloaded its equipment register to the biomedical engineering department to review the replacement cost of each item. Other hospitals had failed to link their asset registers to the biomedical engineering database, even though this was possible;
- Some newly established equipment registers lacked historical data;
- There was frequently no process for clinical departments to confirm the content of asset registers;
- The useful life of an asset was not always adjusted following an expensive upgrade or upgrades sometimes appeared as a separate asset register item;
- Large systems sometimes appeared on an asset register as a single item, or alternatively as a list of many items; and
- There was a significant variation between hospitals in cost thresholds for both recording and depreciating an item.

4.16 Our examination of the 19 sample hospitals' asset registers highlighted that significant weaknesses still existed with hospitals' medical equipment information systems and accountability frameworks. The Department of Human Services has not addressed the findings of the MUCBE review in relation to asset registers, as its priority was to tackle the \$104.8 million medical equipment replacement backlog identified by MUCBE.

4.17 Specific weaknesses our audit identified were that:

- While the quality of asset data maintained by hospitals was adequate for financial statement reporting and accounting purposes, there was a substantial gap between this information and that required to efficiently and effectively manage assets (e.g. information on the condition and utilisation of equipment was not maintained);

- While responsibility for the physical condition, use, functionality and financial performance of assets was delegated to the biomedical or engineering departments, most hospitals did not provide regular asset management reports to their executive management (e.g. details of cost, age, utilisation levels, physical condition, maintenance backlogs and replacement requirements). The absence of such information may impact on the soundness of decision-making by senior management or provision of timely advice on emerging asset management issues;
- There were a variety of sources of equipment information, namely, engineering records, biomedical engineering records and finance records. Only 3 hospitals maintained one asset register (Royal Melbourne, Western and West Gippsland), most had 2 registers and some had 3. Those hospitals that maintained multiple registers did not periodically ensure each was complete and accurate. An excessive number of registers within a hospital limits the potential to readily cross-link information from different sources, increases the risk of gaps or duplication in coverage and is likely to encourage different approaches to medical equipment management. It also makes the consolidation of information for strategic overview problematic;
- Asset descriptions were not standardised; and
- The conduct of physical inspections was infrequent (e.g. 29 of the 91 hospitals had not undertaken a stocktake since 2000). The Government's asset management policy states that stocktakes of assets should be carried out at periodic intervals, normally annually, with the results reconciled with the asset register. Failure to regularly inspect equipment assets is not conducive to confirming their existence and determining their physical condition.

4.18 Issues associated with the quality of assets registers have been drawn to the attention of hospital management in successive financial statement audits undertaken by the Office. While hospital management have responded positively to previous audit recommendations, the results from this audit indicate limited progress has been made.

4.19 We recognise that the nature of medical equipment technology is such that the development and maintenance of an asset information system requires skilled persons with a sound knowledge of medical equipment technology and skills in database management. It is also time consuming and costly to develop and maintain registers and plans. However, hospitals need to consider the risks occasioned by the limited asset information they currently hold relative to the costs and benefits of enhanced systems.

Recommendations

4.20 We recommend that:

- hospitals, in consultation with the Department:
 - prepare asset management plans for their medical equipment which incorporate, as a minimum, 5 year forecasts of funding requirements;

- develop a single asset register, using standard classifications to describe the medical equipment and specified details of the equipment, which is linked to the key user groups within the hospital;
- develop and use guidelines which reflect industry best practice to periodically assess the life expectancy of their equipment; and
- regularly determine the condition of their medical equipment using a standardised assessment system; and
- the Department:
 - consider options to support the introduction of better information technology systems for the management of medical equipment; and
 - assess the merits of linking a proportion of funding allocations to the quality of the asset management practices adopted by individual hospitals.

RESPONSE provided by Chief Executive Officer, Monash Medical Centre

Monash Medical Centre's asset register ("Hardcat") software is maintained by Materials Management. A close relationship exists between Materials Management and Health Technology Services, Engineering, Computer Services to ensure the accuracy of the asset register. Materials Management heavily involve the technical departments in equipment specification and selection which results in the best possible outcome for the end user and Monash Medical Centre. Health Technology Services operates "Facility Exec" software to track equipment service history. Asset details are shared with "Hardcat" so that only one, unique asset assignment exists for any item of medical equipment. An electronic comparison is made between "Hardcat" and "Facility Exec" at least annually. Significant differences in data have not been noted.

The Monash University Centre for Biomedical Engineering review has not, to date, been made available to us, to enable recommendations to be reviewed.

Asset descriptions are based on a medical equipment nomenclature system devised by ECRI (who conducted this review) and has been in use for over 20 years.

A proposal has been put to the Department of Human Services, via the Victorian Health Association on behalf of the Biomedical Engineering Focus Group (which represents biomedical engineering across Victoria), to put resources toward the development of a single asset management database that will meet the needs of all. That is, purchasing, finance, biomedical etc. Currently, no software system on the market achieves this. Most, at best, provide a compromise of functionality.

DETERMINING EQUIPMENT PRIORITIES

4.21 It is essential that clinicians have access to the medical equipment they need to deliver high quality patient care. A properly planned approach to determining medical equipment needs is a key part of the management of medical equipment. To achieve this, hospital management should have adequate data to inform decision-making thus ensuring that any proposal for medical equipment investment is in line with hospital priorities.

4.22 Most hospitals had arrangements in place for determining their medical equipment priorities. All hospitals had either a senior executive or an equipment committee, comprising both finance and medical staff, who collated equipment requests from each department annually and developed a prioritised equipment list.

4.23 In most hospitals, departments were required to justify their requests for new and/or replacement equipment by addressing a number of criteria including:

- utilisation of the equipment, e.g. number of patients treated, revenue generated, and downtime;
- whether replacement medical equipment is available which provides better treatment or diagnosis; and
- the cost of maintaining the equipment.

4.24 We found that replacement considerations were reactive in that they were overwhelmingly linked to the Department's annual funding process and to the internal annual allocation of any surpluses generated by particular hospital departments or faculties. As a result, the hospitals' medical equipment acquisition and replacement programs were short-term, typically 12 months and, therefore, generally less than the life of the relevant assets.

4.25 Most of the hospitals indicated that a strategic replacement program had not been determined due to funding uncertainty. One hospital (Alfred) stated that it had attempted to develop asset management plans but due to financial constraints the plans had either not been sustainable or could not be implemented.

4.26 A significant backlog in equipment purchases has been identified by the MUCBE review. The failure of hospitals to identify their equipment needs beyond a 12 month period has contributed to a high proportion of equipment being used beyond its life expectancy (refer Part 3 of this report) and a high level of unmet equipment procurements. We do acknowledge that the effort to establish future equipment needs is significant, but we maintain that such information is crucial to inform strategic decision-making regarding the mix and quantum of services provided by hospitals and that equipment purchases funded by the Department are appropriate.

RESPONSE provided by Chief Executive Officer, Austin and Repatriation Medical Centre

We disagree with the conclusion that hospitals have failed to identify equipment needs beyond a 12 month period and that this has contributed to equipment being used beyond its life expectancy. The Austin identifies all new and replacement equipment needs, and then through a prioritisation process decides what items will be purchased in the current financial year. Limited financial resources are the reason that some equipment has not been able to be replaced before it reaches its life expectancy, and why it is ineffective to attempt to plan specific purchases beyond a 12 month horizon.

Unmet procurements

4.27 Hospitals need to have available sufficient medical equipment to support the efficient and effective delivery of patient care. Excessive levels of equipment are potentially wasteful, while insufficient or unsuitable equipment potentially impacts upon the effective treatment of patients.

4.28 Table 4B details unfunded targeted equipment requests (estimated) at the 19 sample hospitals at August 2002 (i.e. equipment requested but not funded by the Department).

TABLE 4B
UNFUNDED EQUIPMENT REQUESTS, AUGUST 2002

<i>Equipment</i>	<i>Equipment items requested</i>	<i>Replacement cost</i>
	<i>(no.)</i>	<i>(\$'000)</i>
Ultrasound equipment	5	1 750
CT scanners	3	3 600
MRIs	2	6 000
General X-ray equipment	2	340
Gamma camera	1	800
Linear accelerator (a)	3	9 650
Digital subtraction angiography equipment	1	1 200
Total	17	23 340

(a) Includes submission by Barwon Health in November 1999 for 2 linear accelerators which was not part of the targeted equipment requests.

Source: Victorian Auditor-General's Office, sample of 19 hospitals, 2002.

4.29 The 19 sample hospitals provided many examples that demonstrated patient outcomes could be improved by the purchase of new medical equipment. The reasons most frequently cited by hospitals to support the above procurements were that:

- existing equipment is ageing and in need of replacement;
- the availability of parts for existing equipment was problematic;
- better diagnosis/treatment can be achieved with newer equipment;
- patient throughput can be improved; and
- contingencies, such as equipment breakdown, can be readily accommodated.

4.30 Further comment on unfunded targeted equipment requests is detailed in paragraphs 5.17 to 5.21 of this report.

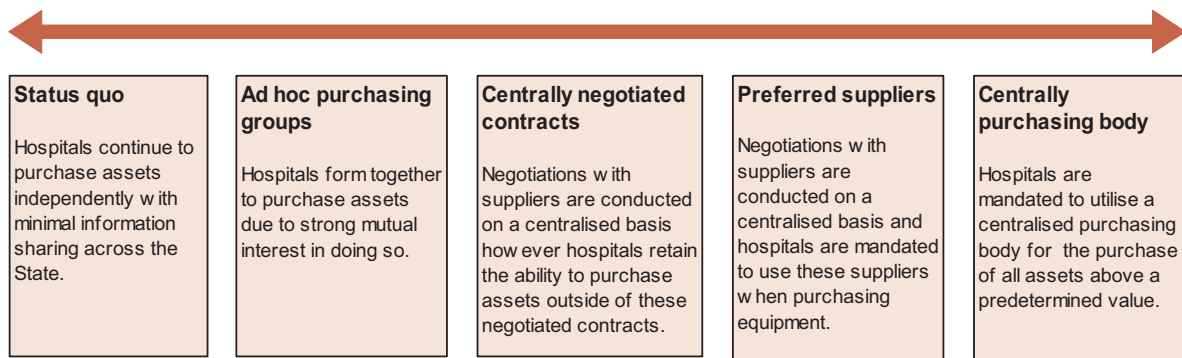
PROCUREMENT OF MEDICAL EQUIPMENT

4.31 Across Victoria, hospitals and health services purchase equipment, services and goods in excess of \$750 million per year. These items are supplied by more than 2 000 individual vendors and cover in excess of 30 000 items¹. Value-for-money in the procurement of equipment requires a cost-benefit analysis of equipment requirements which looks at life cycle costs, an assessment of the way in which these are purchased, including the performance of suppliers, and identification of options for achieving price reductions and improving the quality of service.

Purchasing options

4.32 The 2001 MUCBE review, explored a range of purchasing options for hospitals which are outlined in Chart 4C.

CHART 4C
SPECTRUM OF PURCHASINGS OPTIONS



Source: Monash University Centre for Biomedical Engineering.

4.33 The MUCBE review recommended that, as hospitals are required to purchase a wide range of medical equipment, a combination of options would provide the best outcome for hospitals and the Department of Human Services. Specifically, it was envisaged these would facilitate improved value-for-money while maintaining a balance of control and flexibility at the hospital level.

Centralised purchasing practices

4.34 Most States have in place some form of centralised purchasing arrangement for medical equipment. Both New South Wales and Queensland have centralised contracting as a key element in their procurement strategy.

¹ Future Procurement Arrangements in Victoria Consultation Paper, Department of Human Services, November 2000.

4.35 In New South Wales, for example, approximately 20 per cent (\$220 million) of hospital products are purchased centrally and the remainder are purchased by hospitals individually or through Area Health Service arrangements. There are also one-off collaborative purchasing arrangements or alliances between individual hospitals. Savings of around 5 per cent (\$9.5 million) per annum have been achieved in New South Wales through centralised purchasing arrangements².

4.36 In Victoria, a 1999 Ministerial Review of Health Care Networks found that restructuring of the system into metropolitan health networks in 1995 had encouraged a consolidated approach to procurement among the network hospitals. However, the buying power of the entire State was not aggregated with a view to reducing procurement costs.

4.37 Subsequently, the Ministerial Review recommended that centralised purchasing arrangements be established for Victoria's public hospitals. In July 2001, Health Purchasing Victoria was established to facilitate reform of the procurement system for Victorian hospitals and health services. To date, most of Health Purchasing Victoria's activity has been related to medical consumables but it is envisaged that this activity will expand to encompass medical equipment.

Hospital practices

4.38 For the purposes of assessing the adequacy of hospital procurement policies and practices, we used guidelines developed by the Victorian Government Purchasing Board. In particular we assessed whether:

- procurement planning was aimed at ensuring that equipment to be acquired meets the hospital's requirements;
- a documented procurement policy existed outlining the hospital purchasing processes;
- a tender process is used for the purchase of larger equipment items (i.e. over \$100 000); and
- tender offers are evaluated in a consistent manner against evaluation criteria adopted for the tender.

4.39 Our examination of 9 of the 19 sample hospitals identified that, overall, most had established procurement policies which were generally in line with the Victorian Government Purchasing Board guidelines and that they had complied with their policies. However, some departures with accepted practice were noted in that:

- Although all 9 hospitals justified the need for equipment by preparing business cases that demonstrated the expected net benefits, they varied considerably in quality within and between hospitals. Common failings we identified included:
 - inadequate appraisal of different funding options;
 - inadequate specifications of equipment functionality; and

² *ibid*, pp.7-8.

- failure to adequately assess the full cost of the equipment based on life cycle costing;
- One hospital (Barwon) had no formal procurement policy (except for an instrument of delegations) and one (Frankston) did not always comply with its own policy; and
- Although all 9 hospitals had a policy for public tenders, only one hospital (Austin) instigated a public tender process in line with the Victorian Purchasing Board guidelines (i.e. for items costing in excess of \$100 000 and above). Seven hospitals instigated a public tender for items costing in excess of \$50 000 and one for \$5 000 and above. Further, although an evaluation panel was established to evaluate the tenders against criteria in all cases, only 4 hospitals (The Alfred, Box Hill, Melbourne and Western) assigned weightings to the criteria.

4.40 We also found that 16 of the 19 sample hospitals have continued to purchase equipment independently of each other with minimal information sharing across the State. It was rare for hospitals to consolidate their combined purchasing powers and expertise in the procurement of medical equipment. However, except for centralised purchasing for consumables, other options proposed by MUCBE aimed at improved value-for-money had not been pursued.

Recommendation

4.41 The Department of Human Services and hospitals should pursue opportunities for improved value-for-money in the procurement of medical equipment.

RESPONSE provided by Chief Executive Officer, Wangaratta District Base Hospital

Wangaratta prefers the co-ordinated approach towards the purchase of biomedical equipment. All equipment purchases are processed via a Clinical Equipment Committee ensuring that biomedical input is received. The standardisation on a rural regional level of such items as infusion pumps would provide significant purchasing power for disposable elements and other infusion components.

RESPONSE provided by Acting Chief Executive Officer, Western Health

Western Health has some purchasing advantages under the Shared Services program. With the devolution of the previous North Western Health Care Network various departments, such as supply, were maintained as “Shared Services”. Under this system, Royal Melbourne Hospital, Northern Hospital, Melbourne Extended Care Rehabilitation Services, Sunshine Hospital, Williamstown Hospital and Western Health all purchase medical equipment through one supply department (based at Royal Melbourne Hospital). This system does enable improved value for money purchases compared to if the Health Services sharing this arrangement were purchasing equipment independently, although benefits are not to a scale that a Statewide system would provide.

MAINTENANCE OF MEDICAL EQUIPMENT

4.42 The adoption of effective maintenance practices by hospitals is essential if medical equipment is to function as intended. It is also important to prevent equipment breakdowns that could interrupt the delivery of healthcare services or be potentially harmful to patients or staff. The particular mix of maintenance procedures adopted by hospitals should be determined with due regard to the risks and consequences of equipment failure.

4.43 Given the sophistication of modern medical equipment, maintenance practices can be very complex, requiring expertise in a broad range of specialities such as electronics, computers, mechanical systems, pneumatics, chemicals and optical systems. Generally, hospitals use a combination of in-house maintenance staff (biomedical or engineering departments) and external maintenance services, such as those provided by the equipment supplier, or a third-party provider.

4.44 For major items of equipment, virtually all maintenance is carried out under comprehensive service contracts. The service is provided by either the vendor or by multi-vendor service companies. The in-house biomedical engineering department generally provide a first-response service, checking the equipment for simple faults before calling the contractor, and at some hospitals they also monitor the service contracts.

RESPONSE provided by Chief Executive Officer, Monash Medical Centre

At Monash Medical Centre, medical equipment maintenance contracts are managed by Health Technology Services. Biomedical Engineering screening is normal inclusion, which reduces contract prices by up to 20 per cent. Contracts are reviewed annually. Performance is monitored continually. Prices, terms and conditions are negotiated. User department heads are involved in the establishment and annual review of contracts to verify contractor performance and adequacy of the contacted support.

Conduct of maintenance

4.45 Medical equipment should be maintained in accordance with appropriate standards determined from manufacturers' recommendations, guidelines in Australian standards, past history, level of use and risk assessments. Within Australia, Standards Australia has promulgated a standard specifically for medical equipment, AS3551: *Technical management programs for medical devices*. The Department of Human Services' Radiation Safety Unit has also developed standards for maintaining major imaging and radiotherapy equipment.

4.46 Generally, medical equipment is subjected to 2 types of maintenance:

- preventative maintenance is planned maintenance carried out on a periodic basis to correct defects or replace parts to ensure that the equipment will not break down; and
- corrective maintenance is unplanned maintenance which is carried out on a needs basis when there is a breakdown of the equipment.

4.47 Based on our examination of policies, practices and assessment of the condition of medical equipment, overall, we found that the equipment had been well maintained by the 19 sample hospitals. However, as commented below, some hospitals could potentially reduce their maintenance costs if greater consideration is given to adopting risk-based principles when determining the nature and frequency of preventative maintenance.

4.48 Specific comments on hospital maintenance practices are outlined in the following paragraphs.

RESPONSE provided by Chief Executive Officer, Monash Medical Centre

The application of risk-based principles is routinely applied at Monash Medical Centre. Contracts are varied in level and frequency of preventative maintenance, and levels of breakdown maintenance support, according to the nature and criticality of the equipment. This process involves the user, the supplier/support contractor and Health Technology Services. It works well, due to the close working relationship maintained between these parties.

Maintenance standards

4.49 All 19 sample hospitals had maintained equipment in accordance with the Australian standard and those set by the Department of Human Services' Radiation Safety Unit. Hospitals had also adopted planned preventative maintenance, taking into account manufacturers' recommendations on maintenance frequencies. Some hospitals strictly followed maintenance frequency schedules set by the medical equipment suppliers while others had adopted a risk-based approach. Based on operating experience, location and age of equipment, and with full consideration of safety issues, these hospitals developed their own schedules to save costs.

4.50 For example, several country hospitals schedule preventative maintenance more frequently than the manufacturers' recommendations to prevent expensive breakdowns and significant inconvenience and risk to patients. To reduce this cost, maintenance is scheduled so that the provider can service a range of medical equipment items at a number of nearby hospitals in a single visit.

4.51 We consider some scope exists to improve the efficiency of maintenance. If the experiences of hospitals in varying the frequency of maintenance schedules set by equipment suppliers were shared, other hospitals may identify opportunities to reduce maintenance costs without compromising safety. However, hospitals would need to take into account their potential exposure should they substantially vary maintenance schedules from those recommended by manufacturers.

4.52 Opportunities for cost savings may also exist if hospitals adopt internationally recognised risk assessment standards. Through classifying equipment as high, medium or low risk, the nature and frequency of maintenance may be varied accordingly.

Scheduling of maintenance

4.53 The inspection and preventative maintenance of medical equipment should be scheduled to minimise the impact on service delivery. We found that in a number of instances maintenance was carried out during, rather than outside, normal business hours, as this was less expensive. In these circumstances, the treatment of patients was rescheduled in a timely manner as the contractor usually provided a maintenance schedule outlining the preventative maintenance timelines.

4.54 We found that, when equipment was removed from the hospital for repair or because it had failed, other arrangements were entered into to minimise any disruption to the delivery of patient care. For example, equipment was borrowed from other departments or from other hospitals, the biomedical engineering department or third-party service provider loaned the equipment, or the vendor supplied loan equipment.

Quality standards

4.55 The quality of medical equipment maintenance can be enhanced through adherence to a recognised quality standard. Accreditation to the standards promulgated by the International Organisation for Standardisation, for example, requires a maintenance organisation to develop a quality plan, define customers and their needs, document procedures; and monitor and improve the maintenance process on a continuous basis. It requires external certification and for accredited organisations to be subject to external audit on a regular basis.

4.56 Accreditation, therefore, provides assurance that maintenance processes are properly documented, and that clear procedures and comprehensive systems of record keeping are in place.

4.57 We found that in 9 of the 19 sample hospitals, the maintenance service provider (internal or external) was not accredited under a recognised quality standard.

***RESPONSE** provided by Chief Executive Officer, Monash Medical Centre*

Health Technology Services, Monash Medical Centre achieved ISO9002-1994 certification in 1996. It will achieve conversion to ISO9001-2000 by the end of 2003. The scope of certification includes Biomedical Engineering, Medical Physics, Instrument Technology, Medical Photography and Telecommunications. It undergoes a full day, external, surveillance audit 6 monthly, and an extensive, 2 day, external re-certification audit 3 yearly.

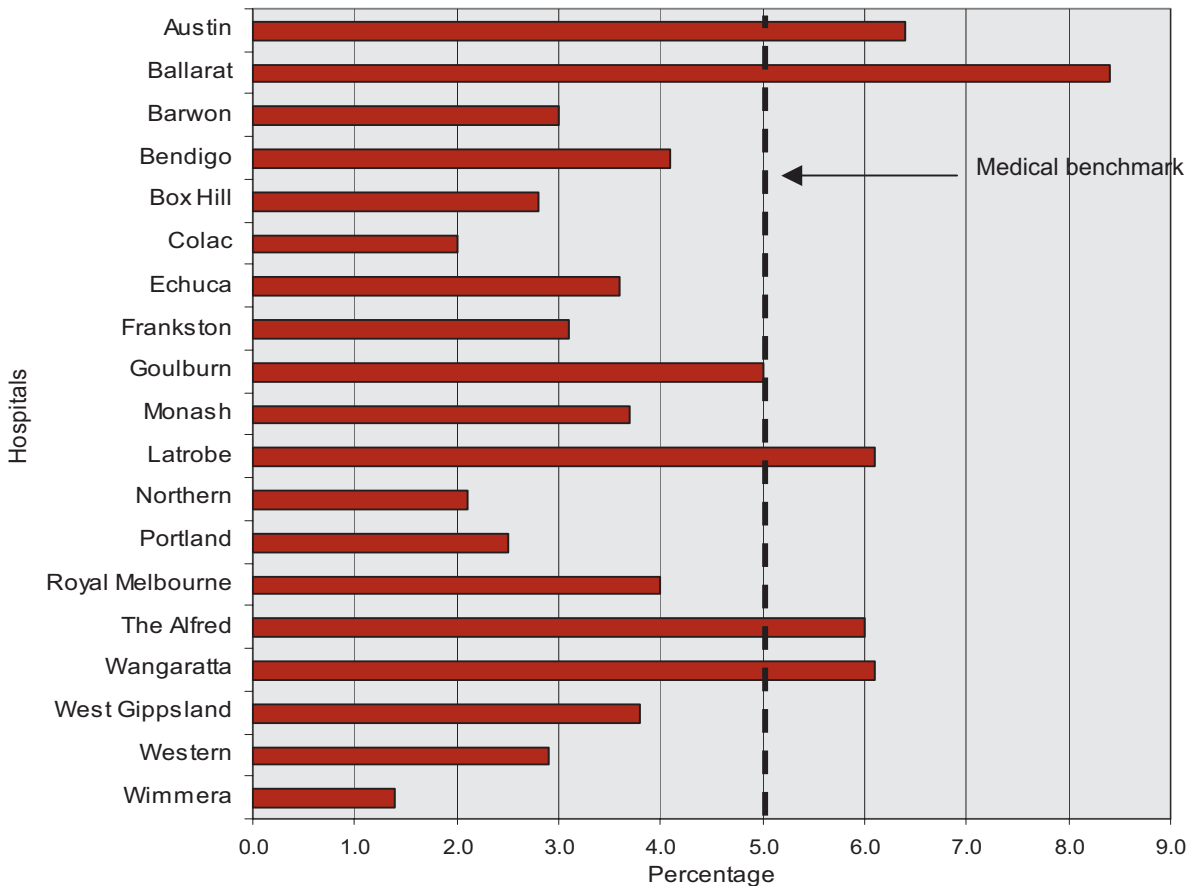
Cost of maintaining equipment

4.58 Medical equipment maintenance costs incurred by hospitals are primarily funded from the equipment and infrastructure maintenance grants allocated by the Department of Human Services. As this funding is also used for purchasing minor equipment items, some hospitals need to generate additional funds to meet their maintenance responsibilities.

4.59 The amount expended annually on maintaining equipment is dependant on a range of factors such as the sophistication of equipment, age, condition and utilisation. Based on the medical benchmark, on average a hospital should be expending an amount equivalent to around 5 per cent of the replacement cost of its equipment³.

4.60 We found that in 2001-02, expenditure on medical equipment maintenance by the State’s 91 hospitals for all equipment items (including the 2 groups of equipment examined in detail) totalled \$26.1 million. This is equivalent to about 3.5 per cent of the replacement value of medical equipment. For the 19 sample hospitals, maintenance expenditure for all equipment totalled \$14.3 million in 2000-01, and \$16 million in 2001-02. This is equivalent to about 5 per cent of the replacement value of medical equipment, although this percentage varied widely between hospitals as shown in Chart 4D.

**CHART 4D
MAINTENANCE COST AS PERCENTAGE OF REPLACEMENT VALUE,
2001-02**



Source: Victorian Auditor-General’s Office, sample of 19 hospitals, 2002.

³ A 1997 study undertaken in the United States of America by Cohen (Validating Medical Equipment Repair and Maintenance Metrics) reported that maintenance expenditure on equipment equated to 5.2 per cent of replacement value and that this was satisfactory.

4.61 Chart 4D shows that the level of maintenance expenditure expressed as a percentage of equipment replacement value, ranged from 8.4 per cent for Ballarat to 1.4 per cent for Wimmera. There are a number of reasons for this variation, including:

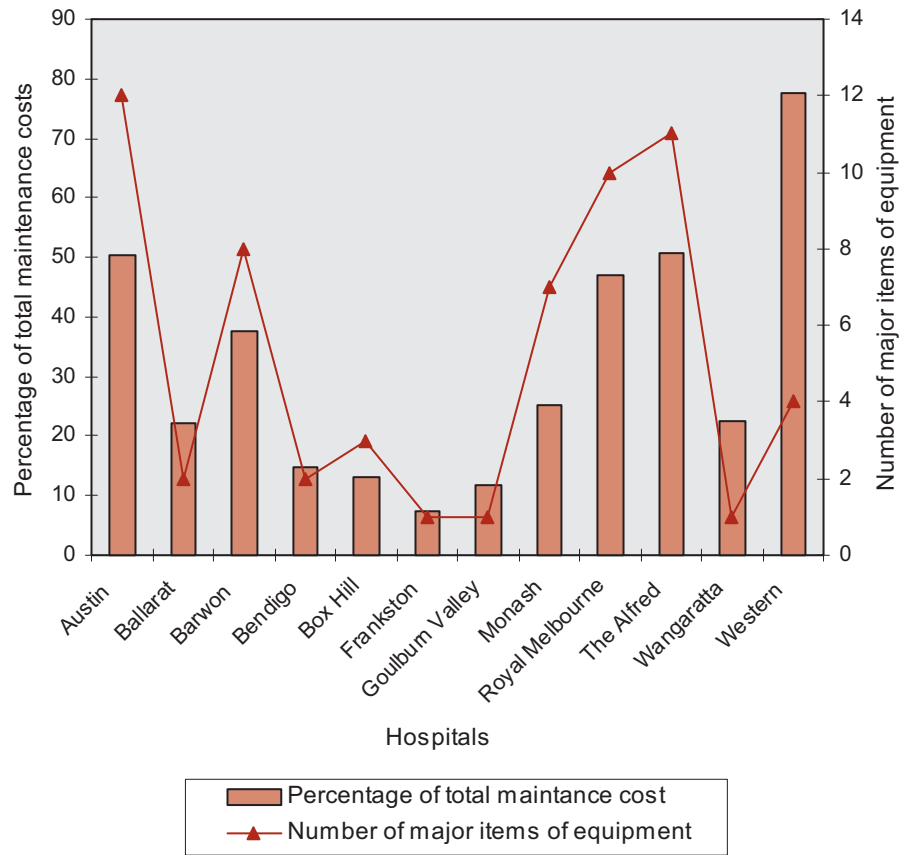
- Size, location and type of hospital;
- Patient mix, which requires different types of medical equipment;
- Quality of management information about medical equipment. While most equipment maintenance departments operate some form of computerised maintenance system that records maintenance details, there was no standard for such systems and consequently considerable variety;
- Economies of scale in that some hospitals had a suite of equipment from the same manufacturer resulting in a cheaper overall maintenance contract;
- Some items of medical equipment are more expensive to maintain, e.g. computed tomography scanner; and
- Average age of medical equipment. Newer equipment has higher maintenance costs due to the adherence to manufacturers' maintenance schedules, the nature of equipment hardware and the requirements to keep associated software up-to-date.

4.62 The variations in maintenance costs indicate that, for some hospitals, opportunities may exist to reduce their costs of maintaining equipment.

Maintenance costs of major equipment items

4.63 Our analysis of maintenance costs of major equipment items for those hospitals that operated this equipment is shown in Chart 4E.

CHART 4E
MAINTENANCE COSTS OF MAJOR EQUIPMENT ITEMS AS A
PERCENTAGE OF TOTAL MAINTENANCE COSTS, 2001-02



Source: Victorian Auditor-General's Office, sample of 19 hospitals, 2002.

4.64 Chart 4E shows that for hospitals with major equipment items, such as MRIs, CT scanners, linear accelerators, DSAs and PET scanners, maintenance of this equipment forms a large portion of the total maintenance costs of those hospitals. For example, the Austin (50 per cent) Barwon (38 per cent), Royal Melbourne (47 per cent), and The Alfred (51 per cent) all had large numbers of imaging equipment and high maintenance costs.

4.65 Maintenance of the 62 large items of equipment as a percentage of replacement value was around 6 per cent as shown in Table 4F.

TABLE 4F
MAINTENANCE AS PERCENTAGE OF
REPLACEMENT VALUE, LARGE ITEMS, 2001-02

<i>Equipment item</i>	<i>Percentage</i>
Positron emission tomography scanner	6
Magnetic resonance imaging system	5
Linear accelerator	2
Computed tomography scanner	11
Digital subtraction angiography system	5
Average	6

Source: Victorian Auditor-General's Office, sample of 19 hospitals, 2002.

4.66 Table 4F also shows the maintenance costs of certain equipment items, such as computed tomography scanners, accounted for around 11 per cent of their replacement cost. This was primarily due to the need to replace the X-ray tube every one to 2 years at an estimated cost of around \$100 000. For some hospitals this cost was included in the contracted maintenance cost and was around 14 per cent of the equipment replacement value. Where the maintenance contract excluded the cost of replacing X-ray tubes, the annual maintenance cost was around 5 per cent of equipment replacement value.

4.67 Both CT scanners operated at the Austin, (which are leased), and the one at Western, had exceptionally high maintenance costs as a percentage of replacement value: 21 per cent, 18 per cent and 23 per cent, respectively. The maintenance contract for these CT scanners includes the X-ray tubes.

Recommendations

4.68 We consider that the hospitals should:

- adopt risk-based principles when determining the nature and frequency of preventative maintenance; and
- evaluate the costs and benefits of their in-house maintenance department obtaining external quality accreditation.

RESPONSE provided by Acting Chief Executive Officer, Western Health

Western Health has 2 CT scanners. The new General Electric scanner is leased. (The lease cost is inclusive of maintenance.) The second CT machine is an old Siemens machine, which is only used as a back-up and has a maintenance contract.

UTILISATION OF MEDICAL EQUIPMENT

4.69 An important responsibility for asset managers is to ensure that maximum benefit is derived from their assets. Accordingly, asset managers need to be mindful where, for example, equipment is no longer effective in performing the activities required of it, it is in less than optimum condition, or demand for the services it delivers or supports has reduced. Underutilised equipment should be identified and the reasons for this examined and, as far as possible, rectified.

4.70 We found that, except for 4 metropolitan hospitals (The Alfred, Austin, Monash and Royal Melbourne), the utilisation of major equipment items is not monitored on a regular basis. In general, information on equipment utilisation is only communicated to hospital management annually when considering equipment replacements and is only confined to those items that were deemed to need replacement. As a result, any potential problems arising from underutilised equipment may not be known by hospital management.

Major equipment items

4.71 Our examination of the utilisation of medical equipment in the 19 sample hospitals was confined to the 62 major items, as utilisation information for the medical equipment used in the treatment of heart attack, chest pain and hip replacement is not routinely compiled by hospitals.

4.72 In examining utilisation levels of the 62 major items of equipment, we identified patient throughput over a 12 month period. Table 4G shows the highest and lowest level of utilisation during 2001-02 for each item of equipment (full details of utilisation levels are shown in Appendix C).

TABLE 4G
NUMBERS OF PATIENTS TREATED DURING 2001-02

<i>Equipment item</i>	<i>Highest number of patients treated per year</i>	<i>Lowest number of patients treated per year</i>
Positron emission tomography scanner	Austin (a) 2 000	Royal Melbourne (b) 200
Magnetic resonance imaging system	Austin 5 700	Royal Melbourne 2 000
Linear accelerator	Austin and The Alfred 500	The Alfred 400
Computed tomography scanner	The Alfred 10 500	Austin (c) 200
Digital subtraction angiography system	Box Hill 2 826	Bendigo 330

(a) Estimate as this machine was purchased during the period.

(b) This machine performs functions in addition to those of a positron emission tomography scanner. The total number of patients treated per 12 months was 3 500.

(c) Equipment is only used for back-up and research purposes.

Source: Victorian Auditor-General's Office, sample of 19 hospitals, 2002.

4.73 Our analysis shows that individual hospitals have different levels of equipment utilisation depending upon their location, size and complexity. Several equipment items appeared to have less than optimal utilisation which, according to the hospitals, may be due to a reduced level of demand from patients, medical personnel or both.

4.74 We found that the newer and more advanced units were more heavily utilised due to their capacity for both better imaging (effectiveness) and processing patients in a shorter time span (efficiency). Several equipment items in metropolitan Melbourne had operated for longer hours relative to those in other hospitals, primarily due to patient load. For example, CT scanners at the Austin and The Alfred, both purchased in 2001, operated 7 days a week 24 hours a day and treated 8 080 and 10 500 patients per year, respectively. Older units, such as the CT scanners purchased in 1993 by Royal Melbourne and Austin hospitals, tended to be used less frequently given their lesser image quality and slower speed of operation. These machines treated 2 211 and 200 patients, respectively, in 2001-02.

4.75 While it is difficult to make definitive judgements as to whether the level of equipment usage is adequate or otherwise, on face value we consider scope exists to improve utilisation levels. Conversely, hospitals may need to consider the cost-effectiveness of continuing to operate and maintain equipment that is not regularly used.

Major equipment downtime

4.76 Based upon discussions with our specialists, the unavailability of major equipment items should not exceed 9 days per annum. We found that the number of days one or more of the 62 items of major equipment were unavailable for use due to breakdowns (i.e. downtime) was relatively low. Over the period July 2001 to June 2002:

- 11 items (18 per cent) had no downtime;
- 35 items (56 per cent) had 1 to 4 days downtime;
- 8 items (13 per cent) had 5 to 9 days downtime; and
- 8 items (13 per cent) had 10 or more days downtime.

4.77 As shown in Table 4H, of the 8 items with 10 or more days downtime, half were linear accelerators, which were 10 years old and had exceeded their ASHE life expectancy benchmark.

TABLE 4H
DOWNTIME IN EXCESS OF 10 DAYS
(days)

<i>Hospital/equipment items</i>	<i>Downtime</i>
Royal Melbourne - Magnetic resonance imaging system	10
Austin - Linear accelerator	15
Linear accelerator	10
Barwon - Linear accelerator	11
Linear accelerator	17
Digital subtraction angiography system	14
The Alfred - Computed tomography scanner	10
Computed tomography scanner	10

Source: Victorian Auditor-General's Office, sample of 19 hospitals, 2002.

4.78 We consider that for this type of equipment downtime of around 3.6 days per year (i.e. one per cent) is acceptable, but 10 days and above is excessive.

Equipment libraries

4.79 Although utilisation of minor items of equipment is not normally monitored, an option minimising the risk of underutilising such equipment is through establishing hospital-based libraries to facilitate equipment sharing. Those items of equipment, such as infusion pumps, nebulisers and other portable devices, which are commonly used throughout a hospital, could be centrally stored for accessing by staff from different internal departments.

4.80 A 1999 United Kingdom National Audit Office Report, *The Management of Medical Equipment in NHS Acute Trusts in England*, showed that 22 per cent of acute hospitals in England operated a medical equipment library and derived benefits such as:

- helping to standardise equipment and optimise use;
- improved access to medical equipment for maintenance;
- provision of safer storage and, thereby, reduced breakages;
- ensuring equipment is complete with necessary accessories; and
- facilitation of training in the use of equipment as it is loaned out.

4.81 We noted that 3 (Frankston, Wangaratta and Western) of the 19 sample hospitals operated a medical equipment library for infusion pumps.

Recommendation

4.82 We recommend that hospitals regularly monitor the utilisation levels of major equipment items. Where utilisation is less than optimal, options such as sharing within and between hospitals should be explored.

RESPONSE provided by Chief Executive Officer, Monash Medical Centre

Equipment libraries may have some application and benefits in some circumstances, but do not necessarily lead to the benefits suggested as a consequence. Certainly at Monash Medical Centre, the benefits listed are routinely considered as equipment is specified and selected. Committees such as the Medical Technology Advisory Committee which represents clinical users, Materials Management, Biomedical Engineering etc. take particular note of such factors as standardisation, safety, training and intended utilisation in guiding Monash Medical Centre in appropriate equipment selection, particularly for items such as infusions pumps which are deployed across the entire health service. Careful consideration is also given to cost of ownership.

Infusion pumps are inexpensive compared with the cost of consumables over the equipment lifetime. (Some infusion pump manufacturers give their pumps to hospitals free of charge, knowing they will recoup their costs many times over in consumable supplies. However, technical superiority of the product is often neglected by some hospitals in light of these seemingly fantastic deals, which long-term, often prove very poor value. These types of deals should be treated with suspicion and not excitement!)

RESPONSE provided by Chief Executive Officer, Monash Medical Centre - continued

Hospital wards and clinical departments purchase equipment according to their individual needs and the services they are required to provide. These factors frequently change according to pressures placed on clinical departments and strategies adopted by Monash or the hospital system to improve services. Financial constraints do not allow for significant quantities of redundant equipment and, in general, equipment resources are stretched. Wards, in particular, (including cross-campus wards), share equipment resources on a daily basis. They have a culture of working as a team, which is a culture, promoted from executive level, down to the shop floor. Non-centralised equipment libraries exist inadvertently as a consequence of the team effort.

RESPONSE provided by Chief Executive Officer, Wangaratta District Base Hospital

The utilisation of certain equipment items, such as infusion pumps, has been a much debated issue at Wangaratta. The paucity of literature or adequate guidelines addressing the usage or application of these products has cost implications. The maintenance of all IVT infusions on infusion pumps is cost prohibitive while patient care outcomes and nursing resource issues impact on the application of these items of equipment. Little evidence exists to provide direction on the usage of these pumps in terms of which patient type should utilise this equipment.

Part 5

Role of the Department of Human Services

INTRODUCTION

5.1 This Part of the report examines the processes put in place by the Department of Human Services for allocating equipment funding to public hospitals, including the nature of information requested from hospitals and the prioritisation of submissions. We have also commented upon the role of the Department in improving the asset management practices of hospitals.

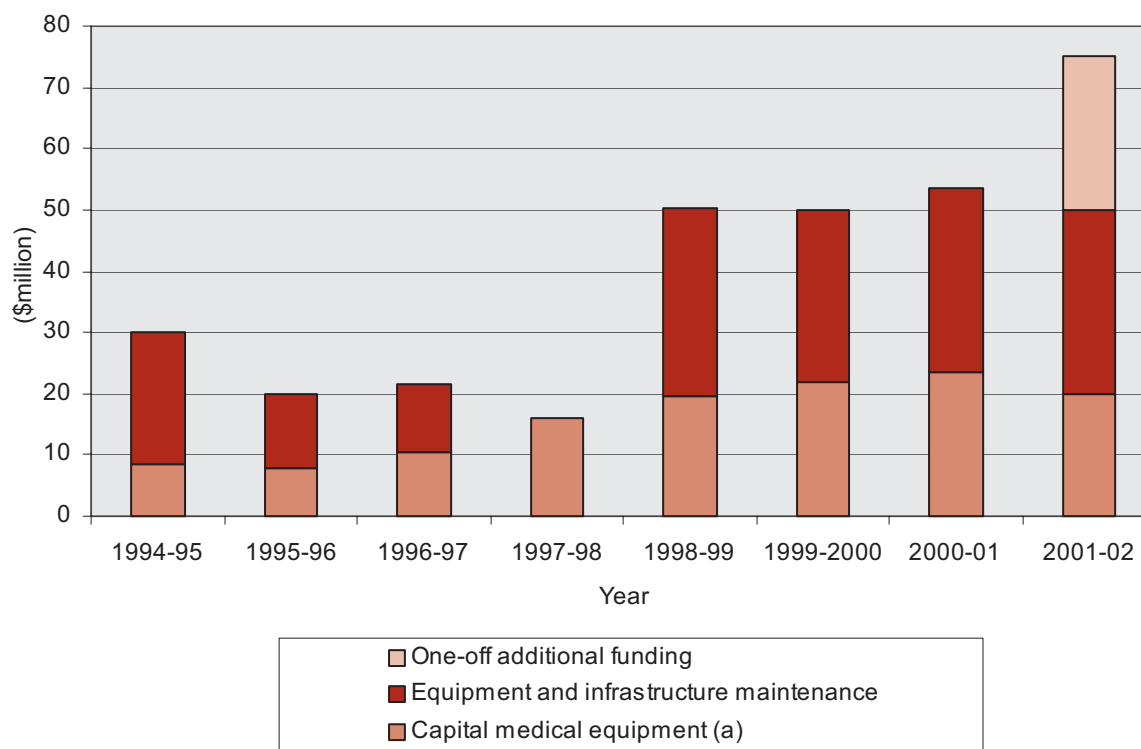
FUNDING OF MEDICAL EQUIPMENT

5.2 Key elements of a funding model include:

- appropriate criteria set by the funding agency, and linked to the purposes for which the funds are being provided, required to be met by the entity seeking the funding;
- requirement for entities seeking funding to provide reliable information to facilitate assessment of funding requests; and
- clearly defined processes for assessing funding requests which contribute to transparent and consistent assessments.

5.3 Funding for medical equipment and maintenance is provided annually by the Department of Human Services through equipment and infrastructure maintenance grants, the Capital Medical Equipment Program (comprising targeted equipment grants and special equipment acquisitions) and capital developments. Funds allocated are to be fully committed by hospitals in the same financial year. Amounts allocated by the Department over the 8 year period to 2001-02 are shown in Chart 5A.

**CHART 5A
MEDICAL EQUIPMENT AND MAINTENANCE FUNDING ALLOCATIONS**



(a) Capital medical equipment funding includes \$17.5 million in 1998-99 and \$4 million in 1999-2000 for Y2K.

Source: Department of Human Services.

5.4 As Chart 5A shows, the Department’s funding for medical equipment has increased significantly over the last 4 years compared to prior years, particularly in 2001-02. This was due to an additional \$25 million provided in May 2002 from a State Budget surplus. The one-off additional allocation was provided for the replacement and upgrade of obsolete medical and other equipment and for equipment items which contributed to:

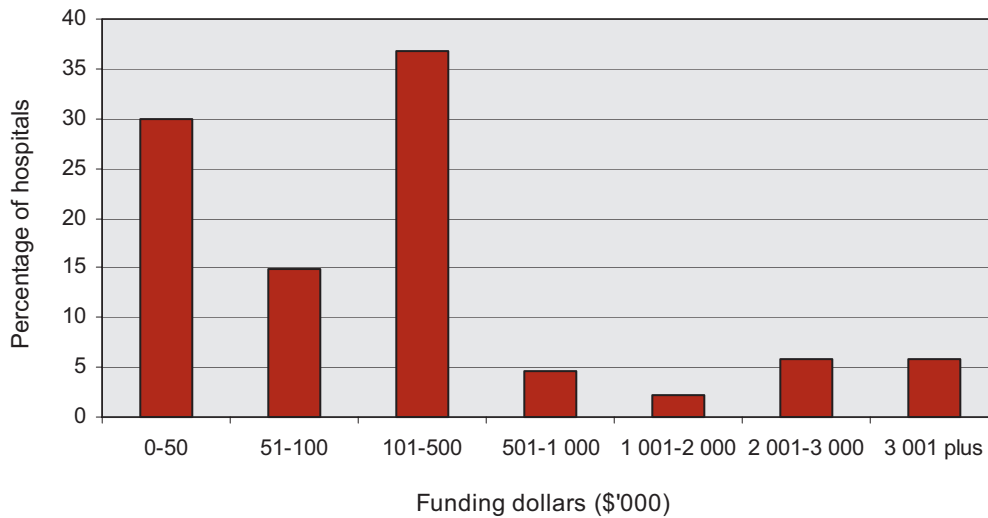
- reducing a replacement backlog;
- improving patient and staff safety and amenity;
- increased patient activity; and
- productivity gains.

Equipment and infrastructure maintenance grants

5.5 Equipment and infrastructure maintenance funding was introduced in 1993-94 and has been fairly stable from year-to-year with \$30 million provided in 1998-99, \$28 million in 1999-2000, and \$30 million in 2000-01 and 2001-02. These funds are allocated to hospitals based largely upon the quantum of patient throughput. Grants can be used to replace or maintain hospital infrastructure, plant and equipment.

5.6 Our analysis of the Department’s allocations for 2001-02 showed that 16 hospitals (18 per cent) received \$500 000 or more and 26 hospitals (29 per cent) received less than \$50 000. Chart 5B shows the distribution of funds.

**CHART 5B
EQUIPMENT AND INFRASTRUCTURE MAINTENANCE FUNDING
BY SIZE OF GRANT, 2001-02**



Source: Department of Human Services.

5.7 While we acknowledge the Department’s basis for allocating funds is directly related to the number of services provided, it may not reflect the relative needs of individual hospitals, particularly when their existing equipment stock and condition, their capacity to raise funds and the nature of the patient services offered is taken into account.

Targeted equipment funding

5.8 Targeted equipment funding was introduced in 1994-95 and involves annual submissions by hospitals to the Department for funding to acquire major capital equipment items. For metropolitan, Geelong and large rural hospitals, submissions can be made for equipment items costing \$200 000 and above, and for small rural hospitals the threshold is \$50 000 and above. Prior to July 2002, the threshold for metropolitan hospitals (and Geelong) was \$300 000. Hospitals are required to justify their funding request by completing a standard business case form indicating:

- whether the equipment is new, additional or a replacement item;
- key functions of the equipment;
- alternative asset/non-asset options considered;
- likely consequences/risks if equipment is not purchased;
- estimated equipment cost; and
- whether funding has been sought from other sources.

5.9 Although the use of standard business case forms has ensured consistency and improved the quality of applications, some useful information is not requested by the Department:

- Full cost, or life cycle costing, which should be used in the assessment of medical equipment selection and acquisition, as well as the hospital's capacity to meet these costs. The initial purchase price of medical equipment must be considered in the context of other costs such as installation, maintenance and operating expenses that are incurred over the equipment's lifetime;
- Current and/or expected utilisation of the equipment item;
- The current operating condition and frequency of breakdown of the equipment to be replaced; and
- The number of patients awaiting treatment and the waiting time for treatment.

5.10 We consider that the provision of this information by hospitals would provide the Department with a stronger basis for determining the relative needs of hospitals and, hence, funding priorities.

5.11 The process for assessing targeted funding submissions differs slightly between metropolitan and rural hospitals. Metropolitan hospitals submit their applications directly to the Department's Programs Branch located in Melbourne. Submissions from rural hospitals are initially assessed by the Department's local regional office, which then makes recommendations to the Rural and Regional Health and Aged Care Service Division. Final recommendations are then made to the Minister for Health by the Programs Branch (metropolitan submissions) and the Rural and Regional Health and Aged Care Service Division (rural submissions), having regard to Statewide priorities and budget parameters.

Regional offices

5.12 Our examination of the 5 regional (rural) offices of the Department identified that scope existed to improve their process for assessing funding submissions. Only one regional office (Grampians) had developed formal criteria for assessing the priority of applications, and although they were generally adequate they were not weighted, and had only been recently developed. The remaining 4 regional offices used informal criteria to assess applications and these varied across offices.

5.13 We also found that, as regional staff had limited knowledge of, or experience with medical equipment or seek such knowledge, potential existed for uninformed assessments of hospital equipment priorities. Staff did not routinely refer to the findings of the MUCBE review (which identified equipment that should have been replaced by 2001), as an information source for identifying the relative equipment needs of hospitals.

5.14 Other concerns with the Department's regional (rural) offices raised by our 19 sample hospitals, and with which we concur, included:

- Staff need to be adequately experienced, trained, and have sufficient expertise in relation to assessing medical equipment requests;

- Feedback should be provided to hospitals on funding submissions. We also noted that, although considerable time and effort was spent by hospitals in preparing applications, they were not formally informed of the reasons for unsuccessful applications. This could lead to hospitals wasting their time and effort in preparing a submission and it detracts from the transparency of the process; and
- A longer and more certain time frame is required by hospitals to prepare submissions. We also noted that, as the Department may invite funding submissions from hospitals at any time during the year, hospitals might not be in a position to properly respond in the required time frame. Greater certainty with the timing of the Department's request for submissions would assist hospitals to be better prepared to respond.

5.15 An example of the short time frame for preparing submissions occurred in May 2002 when the Department made available \$25 million for major equipment items. Submissions were sought from hospitals in May, approved by the Department in the same month and then funds were to be expended by hospitals by the end of June 2002. The Department informed audit that as it was not possible in all instances to have equipment purchased prior to 30 June, hospitals were required to ensure that the expenditure was committed prior to 30 June. Hospitals were not required to submit the usual detailed equipment proforma for each item requested and instead could submit a prioritised list of equipment based on items identified under the 2001-02 Targeted Equipment Program submissions.

5.16 We consider the time frame set by the Department in this instance was unreasonably short which put at risk the efficient and effective use of equipment funding allocations. This risk was further compounded by the failure of hospitals to have in place proper asset management plans as discussed in Part 4 of this report.

RESPONSE provided by Secretary, Department of Human Services

The establishment of the Rural Health Services Branch Service Development Group will provide the opportunity to standardise the evaluation process and to provide expert support to Rural Regional Offices in their evaluation of submissions and provide an informed overview of regional priorities in the context of departmental and Statewide priorities.

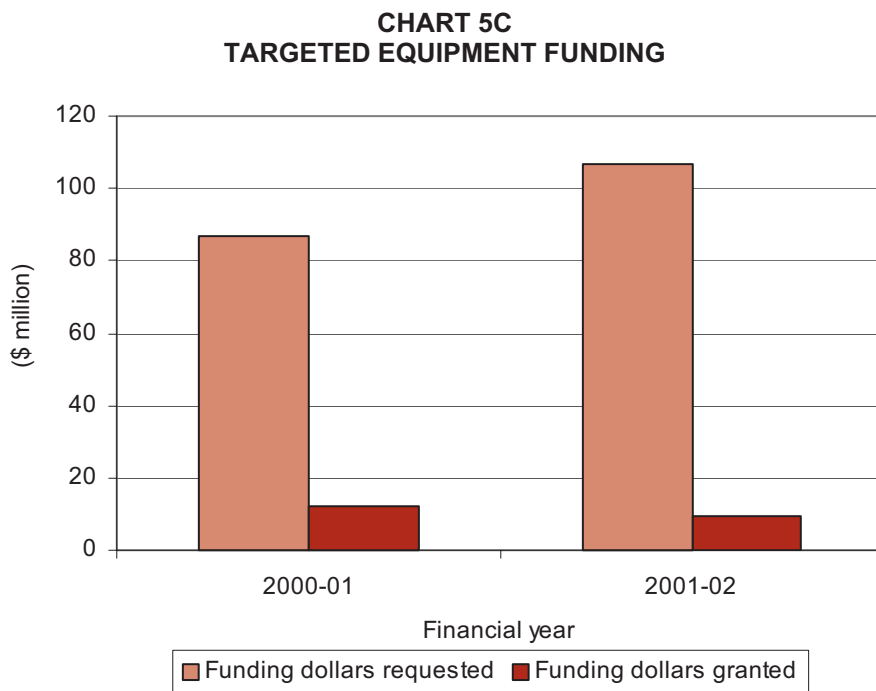
The Department instructed health services and hospitals to consult asset registers when putting forward priorities to the Department. Additionally, information such as age and life expectancy of the equipment was sought from hospitals.

The additional \$25 million that was made available to the Department in 2001-02 was part of the Budget Supplementation through Treasurer's Advance for 2001-02 ("budget surplus"). These funds were in the form of one-off funds and were made available for Acute Health (acute public hospitals) and Dental Health, as opposed to Targeted Equipment funds. The Department of Human Services did not receive notification that they would receive this funding from the Treasurer until May 2002.

All Metropolitan Health Service Chief Executives or their representatives were telephoned and the circumstances and conditions of funding were explained. All Metropolitan Health Services agreed that they would still submit for these funds. The Rural and Regional Health and Aged Care Services Division rang the Department's Regional Offices and requested them to provide the same information to rural hospitals.

Level of funding allocations

5.17 We found that there was a large disparity between the quantum of targeted equipment funding and equipment requested by hospitals relative to that ultimately allocated by the Department. Chart 5C shows the amount of funds requested by hospitals in 2000-01 and 2001-02, compared with the amount approved by the Department.



Source: Department of Human Services.

5.18 Chart 5C highlights that, for 2000-01, the Department approved 14 per cent of major medical equipment funding applied for by hospitals and 9 per cent in 2001-02. We consider that if the large disparity between funds requested and that allocated continues (assuming hospital requests represent genuine needs) hospitals may be forced to continue to use equipment which should otherwise be replaced.

5.19 By way of illustration, in February 2002, Barwon engaged Monash University Centre for Biomedical Engineering to conduct a detailed review of its capital equipment assets. The Centre was required to develop a 3 year, risk-based equipment replacement and acquisition plan where the working life of lower priority items was extended and the useful life of higher priority items left unchanged.

5.20 The Centre subsequently determined that over the 3 year period to 2004-05, the hospital would require funding of \$17.4 million. However, over the same period it was expected that only \$10.5 million would be available from all sources, including the Department, for equipment acquisition and replacement.

5.21 As indicated in my *Report on Public Sector Agencies* presented to Parliament in February 2003, the overall financial condition of the public hospital sector deteriorated in 2001-02. To this extent, the capacity for hospitals to meet equipment funding gaps is declining. That report stated that although the current Parliamentary Appropriation arrangements are based on the full cost of service delivery, including non-cash amounts such as depreciation, grants provided to hospitals by the Department do not cover depreciation. This shortfall is partially met through capital grants allocated in part on the basis of hospital submissions.

RESPONSE provided by Secretary, Department of Human Services

The funding allocated by the Department as shown on Chart 5C is for the Targeted equipment Program only and does not include the additional one-off funding provided in 2001-02 (\$25 million), equipment pre-commitments funded under the Acute Health Capital Equipment Program (\$3.04 million in 2000-01 and \$7.35 million in 2001-02) or equipment funded by the Department through capital developments or other programs.

Alternatives sources of funding pursued by hospitals

5.22 Aside from the Department, hospitals pursue funding from a range of sources, including:

- internally generated surpluses and revenue from business units;
- corporate sponsorship;
- donations;
- bequests;
- targeted mail-outs to former patients; and
- community fundraising such as car raffles.

5.23 We found that 18 of the 19 sample hospitals examined had pursued other sources of funding to supplement the funding for medical equipment received from the Department. On average, 33 per cent in 2001-02 (24 per cent in 2000-01) of the total amount expended by hospitals on procuring medical equipment was derived from such alternate sources. The percentages ranged from 5 per cent (Echuca, Wangaratta) to 50 per cent (Barwon, The Alfred).

5.24 Hospitals have been pro-active in developing strategies to contain medical equipment costs. Practices adopted included:

- negotiating with suppliers to get the “best” price;
- borrowing equipment from suppliers and other hospitals;
- seeking contracts where equipment is supplied at nil or low cost in return for the purchase of a guaranteed quantity of consumables; and
- leasing equipment.

5.25 With respect to leasing, while over the long-term it can be a costly option compared with purchasing, it can also have a number of advantages for hospitals, including:

- providing more flexibility to adapt to changing technology, thus minimising the risk of a less than optimum life span due to equipment obsolescence;
- reducing the need for large, uneven capital outlays; and
- transferring the risks of ownership to the lessor.

5.26 Five of the 19 hospitals examined in detail had entered into one or more equipment leasing arrangements in the last 2-3 years due, primarily, to the lack of capital funding available. However, leasing may increase annual operating costs and may be unsustainable for some hospitals.

5.27 By way of illustration, one hospital (Barwon) was acquiring 2 new CT scanners. As the estimated purchase cost of \$2 million equated to almost the hospital's entire annual equipment grant, other acquisition options such as leasing were being considered. In another hospital (Austin), 2 CT scanners were leased at a cost of \$205 000 and \$190 000 per machine per year, which equates to 20.5 per cent and 19 per cent of their full replacement cost. A further \$210 000 and \$178 000 per machine per annum is to be paid by the hospital to maintain the scanners. Over the period of the leases (5 years) it will cost the hospital around \$1.03 million and \$950 000 per machine (excluding maintenance costs) which compares with the purchase cost of around \$1 million.

5.28 In another hospital (Royal Melbourne), a contract was entered into in April 1998 to purchase an MRI for a cost of \$1.9 million. Due to unforeseen circumstances, the hospital sought to withdraw from the contract prior to taking possession of the machine but was unsuccessful. The hospital subsequently agreed to lease the MRI for a period of 7 years for a total cost, including maintenance, of \$4.3 million. Had the hospital purchased the MRI the total cost, including maintenance (approximately \$95 000 per annum), would have been \$2.6 million over the same period.

5.29 The funding conditions of targeted equipment grants provided by the Department precludes the use of these funds for leasing equipment. Given that in some instances leasing may be a more cost-effective option for acquiring equipment than outright purchase, this funding condition could hinder the effective use of scarce resources.

***RESPONSE** provided by Chief Executive Officer, Austin and Repatriation Medical Centre*

The Austin lease cost quoted here includes some consumables which are not included in the outright purchase price. The comparison to outright purchase price is therefore invalid.

Recommendations

5.30 We recommend that the Department:

- obtain additional information from hospitals to facilitate a more stringent assessment of their major equipment needs (e.g. life cycle costs, utilisation levels, equipment condition and backlog of patients to be treated);

- enhance the transparency and rigour of its selection and prioritisation process by developing standard criteria for its regional offices to assess applications, and ranking the relative importance of each criterion;
- provide hospitals with a formal response for funding submissions not supported; and
- review the level of equipment funding currently provided to hospitals in the context of their future equipment replacement and maintenance needs, including the funding of depreciation costs.

RESPONSE provided by Chief Executive Officer, Goulburn Valley Health

Traditionally, hospitals in rural communities were the primary focus of community support and fundraising for hospitals was the norm. With the increasing number of community and support organisations competing for the limited funds available in rural communities, there is a tendency for the community, particularly in the larger towns and cities, to see the hospital as a government-funded body and as a result funds raised that were previously directed to hospitals are directed to smaller community-based organisations. Most hospitals have one or more active auxiliaries made up of volunteers that fund smaller items of equipment.

With the increasing pressure on health services the amount of dollars available to self-fund vary with the financial viability of each organisation. A number of small hospitals have sufficient capital reserves to fund the type of equipment required in those organisations. Others have used any accumulated capital funds to support the operations of the hospital and now have limited capability to self-fund equipment. In looking at alternative ways to fund equipment purchases in the future there needs to be some recognition of the financial capacity of organisations to self-fund equipment in order to get the best value out of limited equipment funding available.

RESPONSE provided by Chief Executive Officer, Wangaratta District Base Hospital

Wangaratta seeks recognition in its funding grants for its regional support status to district hospitals within its catchment. An increase in emergency and elective throughput activity at Wangaratta over recent years has resulted in increased pressures on biomedical equipment and patient care practices. Closure of specialist services, for example, obstetrics in regional district hospitals, has impacted on the delivery of neonatal care with associated impacts on specialised equipment requirements. Also, the recently completed Acute Redevelopment Project at Wangaratta has enhanced the capability of the Critical Care Unit (Paediatric and Adult), Post-Operative Recovery Unit, Oncology Unit, and the Renal Dialysis Unit.

THE DEPARTMENT'S ROLE IN IMPROVING MEDICAL EQUIPMENT ASSET MANAGEMENT

5.31 Our audit has found potential for improvement to medical equipment management by hospitals. Although hospitals operate as autonomous entities, the Department of Human Services could provide a higher level of support, commensurate with its central overview function.

5.32 Aspects in which the Department could provide a lead role include:

- *Strategic framework.* Given its role as principal funder, the Department should develop an overarching strategic framework for medical equipment management over the long-term (say 5 years). The framework would provide vision, direction and priorities for managing medical equipment and form the basis for future capital funding decisions, including the allocation of resources to hospitals. Decisions regarding new equipment funding in the State Budget and allocation of funding would be considered in line with the strategy; and
- *Asset management plans and guidance to hospitals on the sound management of medical equipment.* The Department's main responsibilities would be to provide the policy framework and context, to set priorities and criteria at a State level, and to provide forecasts of funding allocations.

5.33 In 2002, the Grampians Regional Office of the Department determined that scope existed for its staff to provide guidance to hospitals on the sound management of equipment, including a strategic approach to equipment planning within the health sector.

5.34 One option the Grampians Regional Office is currently considering is centred on the development of hospital asset management plans that would form the basis of a regional plan covering more than one year. A working group comprising the Grampians Regional Office and hospital CEOs, in collaboration with the Department's Melbourne office is to be established to develop a regional plan. The benefit of this approach is that hospitals would be involved in setting priorities and, as a result, gain a higher degree of certainty about the priority in which medical equipment items would be funded.

5.35 At present, there is no requirement for hospitals to routinely provide medical equipment or other asset information to the Department. The only medical information submitted to the Department by hospitals is contained in the targeted equipment submissions (as discussed above in paragraphs 5.8 to 5.11).

5.36 We consider such information would assist the Department to better understand the present and future equipment investment requirements across the State and, in turn, assist the development of a strategic asset framework.

Recommendations

5.37 We recommend that the Department:

- develop a strategic framework for managing medical equipment; and
- adopt a more pro-active role in guiding hospitals in the development of medical equipment asset management plans.

RESPONSE provided by Chief Executive Officer, Wangaratta District Base Hospital

Wangaratta supports the recognition that health facilities require assistance in the establishment of asset registers. In this regard, Wangaratta advocates that the Department of Human Services actively supports the overall process through the development of appropriate guidelines and financial support to rural health services for the development and implementation of asset registers.

Appendix A

Conduct of the audit

AUDIT OBJECTIVES AND SCOPE

The objective of the audit was to assess the efficiency and effectiveness of the management, maintenance and replacement of major medical equipment by the public health sector in Victoria. In particular, the audit assessed the:

- current condition of medical equipment in the sector and the resources associated with this equipment;
- adequacy of plans and strategies established by public hospitals to manage medical equipment; and
- adequacy of plans and strategies established by public hospitals to maintain and replace medical equipment assets over the long-term.

As it was not practicable to examine the full range of medical equipment used by hospitals, the audit focused on 2 groups of equipment: items used for the treatment of 3 common hospital presentations (heart attack, chest pain and hip replacement), and 5 of the most costly items of equipment (refer to Appendix B for details). The audit did not extend to an examination of furniture and fittings (e.g. beds), information technology (e.g. electronic patient booking systems), nor did it include consumable items (e.g. intravenous drug sets).

The audit undertook detailed examinations for a sample of 19 of the State's 91 public hospitals. To assist in selecting hospitals, data was obtained from the Department of Human Services (DHS) on the number of elective and emergency cases for these 3 presentations (Victorian Admitted Episodes Dataset for 2000-01). We then used this data to:

- Identify hospitals that treated all 3 presentations and include them in the sample. This represented 7 hospitals;
- Identify hospitals that treated 2 of the 3 presentations. From this group, hospitals were selected according to:
 - Location – metropolitan, regional and rural – we sought hospitals from all categories; and
 - Region or network – we made sure that all regions (DHS) and networks were represented, and none were over-represented; and
- Exclude hospitals that had a specialised focus (e.g. Women's and Children's, Peter MacCallum generally do not treat the 3 presentations), or operate under different funding arrangements (e.g. St Vincent's operates on a service provider basis).

Through this process, we selected 19 hospitals, all of which treated heart attack and hip replacement and 7 that treated all 3 presentations. The hospitals selected are shown in Table A1.

**TABLE A1
HOSPITALS SELECTED FOR EXAMINATION**

<i>Hospital group</i>	<i>Total number in Victoria (a)</i>	<i>Number included in the audit</i>	<i>Hospitals selected</i>
Metropolitan	20	8	The Alfred, Austin and Repatriation Medical Centre, Frankston Hospital, Northern Hospital, Box Hill Hospital, Monash Medical Centre (Clayton), Royal Melbourne Hospital, and Western Health.
Regional	16	9	Ballarat Health Services, Barwon Health (Geelong), Bendigo Health Care Group, Echuca Regional Health, Goulburn Valley Health (Shepparton), New Latrobe Regional Hospital (Traralgon), Wangaratta District Base Hospital, West Gippsland Healthcare Group (Warragul), and Wimmera Health Care Group (Horsham).
Rural	55	2	Colac Community Health Services (Colac), and Portland and District Hospital.
Total	91	19	

(a) Acute hospital campuses – does not include sub-acute services.

Source: Department of Human Services.

For 2000-01, the hospitals selected for examination captured approximately 60, 75 and 70 per cent of the total State emergency and elective admissions for heart attack, chest pain and hip replacement, respectively. Total admissions across the State for these presentations in 2000-01 were around 3 200, 2 100 and 2 700, respectively.

Across our sample of 19 hospitals, we examined a total of 4 310 equipment items (4 248 used for the treatment of the 3 common presentations and 62 of the 5 most costly items). In terms of the latter group of equipment, this sample equated to around 80 per cent of that used by all Victorian public hospitals and replacement value of individual items ranged from \$520 000 to \$3.8 million.

Certain medical equipment data was also collected from all public hospitals (e.g. value of all equipment items used by the hospital, and annual maintenance and replacement expenditure). The audit also inquired into the existence of asset registers including the conduct of physical inspections by hospitals to confirm the existence of equipment assets and their internal reporting processes.

The audit also covered the Department of Human Services (Programs Branch and 5 regional offices).

AUDIT METHODOLOGY

The audit methodology comprised:

- Examination of policies and procedures of 19 hospitals relating to assessments for new or replacement equipment. The unfulfilled requests to the Department of Human Services for equipment from all hospitals were also examined;
- Interviews with administrators and clinicians from the 19 hospitals about long-term planning for equipment acquisition and replacement, and maintenance services;
- Collection of data from the sample of 19 hospitals relating to the medical equipment being examined, including utilisation, and engineering indices of equipment condition and safety;
- Examination of equipment maintenance records in 19 hospitals;
- Interviews with staff from the Department of Human Services (Programs Branch) and its 5 regional offices involved in the allocation of equipment funding;
- Examination of departmental policy and procedure documentation relating to the allocation of equipment funding, including funding requests submitted by hospitals; and
- Collection of a range of medical equipment data from all Victorian public hospitals.

PERIOD COVERED BY THE AUDIT

The audit examined the medical equipment management practices of hospitals and condition and life expectancy of equipment at August 2002. Procurement policies and practices were examined at February 2003. Certain medical equipment data, including funding allocations, was also collected covering the period June 1999 to June 2002.

COMPLIANCE WITH AUDITING STANDARDS

The audit was performed in accordance with Australian Auditing Standards applicable to performance audits and, accordingly, included such tests and other procedures considered necessary in the circumstances.

ASSISTANCE TO THE AUDIT TEAM

Specialist assistance was provided by:

- ECRI (formerly the Emergency Care Research Institute) which undertook a detailed assessment of the medical equipment at the sample of 19 hospitals; and
- Dr Leo Maher, Director of Cardiology, Cardiovascular Investigation Unit, Royal Adelaide Hospital and Professor John Russell, Director, Research and Development, Department of Anaesthesia and Intensive Care, Royal Adelaide Hospital. Each provided specialist advice on the types of equipment used for the 3 common presentations and any potential clinical implications associated with inadequate maintenance of equipment.

I am grateful for the support and assistance provided to my officers and specialists by the management and staff of the 19 hospitals, and the Department of Human Services.

Appendix B

**Equipment items
associated with
heart attack, chest
pain and hip
replacement**

TABLE B1
EQUIPMENT ITEMS ASSOCIATED WITH HEART ATTACK,
CHEST PAIN AND HIP REPLACEMENT

<i>Equipment item</i>	<i>Description</i>
Anaesthesia units	Used to administer anaesthetic gases and monitor a patient's physiological status while under anaesthesia.
Defibrillator/monitors	Delivers an electrical shock to the heart via 2 charged paddles to restore rhythm when the heart is in ventricular or atrial fibrillation.
Electrocardiographs (ECGs)	Measures the electrical activity of the heart. Wires from the machine lead to electrodes that are connected to various points of the patient's body. The electrical activity of the heart is read by the machine and represented as a tracing.
Electrosurgical units	Emits a uni or bi-polar current via a wire to a hand-held diathermy instrument. The instrument is applied to incised tissue to cause coagulation and stop capillary bleeding.
Infusion pumps	Administers exact doses of parenteral fluids and drugs to patients. A single use "giving set", through which fluids and drugs are administered, is fed through the pump and connects with a catheter into a patient's vein or artery.
Orthopaedic surgery kit(s)	Collections of surgical instruments designed for specific orthopaedic procedures, may include drills and saws.
Physiologic monitoring systems, acute care	Electronic monitoring systems that monitor a patient's vital signs (e.g. cardiac rhythm, blood pressure, oxygen saturation) and display them on a screen. More advanced units are fitted with alarm systems that signal when a patient's vital signs are outside set parameters.
Radiographic units (X-rays)	A generic term used to describe radiographic (X-ray) imaging equipment. Includes fixed and portable radiographic units.
Scanning systems ultrasonic (ultrasound units)	Non-invasive imaging equipment that scans anatomical structures and some physiological function using ultrasonic sound waves.
Ventilators	Machines containing bellows that inflate and deflate the lungs of patients who cannot breathe by themselves. Patients are connected to ventilators by an endotracheal tube and oxygen is sent down the tube into the patient's lungs.
Sterilising units (sterilisers)	Describes a variety of sterilising equipment such as autoclaves and flash sterilisers.
Washers	Units that clean surgical instruments prior to sterilisation.

Appendix C

Utilisation of major equipment items

TABLE C1
NUMBER OF PATIENTS TREATED PER COMPUTED TOMOGRAPHY SCANNER,
AUGUST 2002

<i>Hospital</i>	<i>Number of equipment items</i>	<i>Hours staffed per week</i>	<i>Number of patients per 12 months</i>	<i>Number of patients per hours staffed</i>
Austin	(1)	168	8 080	0.92
	(2)	50	8 320	3.20
	(3)	40	200	0.10
Ballarat	(1)	50	6 000	2.31
Barwon	(1)	50	7 243	2.79
	(2)	40	2 000	0.96
Bendigo	(1)	45	5 500	2.35
Box Hill	(1)	55	6 333	2.21
Goulburn Valley	(1)	40	4 737	2.28
Monash	(1)	48	2 400	0.96
	(2)	65	7 500	2.22
Royal Melbourne	(1)	168	6 382	0.73
	(2)	70	6 243	1.72
	(3)	84	2 211	0.51
The Alfred	(1)	55	8 300	2.90
	(2)	168	10 500	1.20
	(3)	20	(a)	(a)
Wangaratta	(1)	40	3 700	1.78
Western	(1)	50	1 750	0.67
	(2)	70	5 750	1.58

(a) Total patients per year not available as equipment has been in service less than a year.

Source: Victorian Auditor-General's Office, sample of 19 hospitals, 2002.

TABLE C2
NUMBER OF PATIENTS TREATED PER MAGNETIC RESONANCE IMAGING SYSTEMS,
AUGUST 2002

<i>Hospital</i>	<i>Number of equipment items</i>	<i>Hours staffed per week</i>	<i>Number of patients per 12 months</i>	<i>Number of patients per hours staffed</i>
Austin	(1)	70	5 700	1.57
Barwon	(1)	70	4 000	1.10
Monash	(1)	78	4 800	1.18
	(2)	78	4 800	1.18
Royal Melbourne	(1)	40	5 000	2.40
	(2)	78	2 000	0.49
The Alfred	(1)	78	4 400	1.08

Source: Victorian Auditor-General's Office, sample of 19 hospitals, 2002.

**TABLE C3
NUMBER OF PATIENTS TREATED PER ANGIOGRAPHY MACHINE,
AUGUST 2002**

<i>Hospital</i>	<i>Number of equipment items</i>	<i>Hours staffed per week</i>	<i>Number of patients per 12 months</i>	<i>Number of patients per hours staffed</i>
Digital subtraction angiography				
Austin	(1)	40	1 600	0.77
	(2)	40	1 600	0.77
Ballarat	(1)	20	660	0.63
Barwon	(1)	40	600	0.29
Bendigo	(1)	20	330	0.32
Box Hill	(1)	40	809	0.39
Monash	(1)	45	2 160	0.92
Royal Melbourne	(1)	40	1 000	0.48
	(2)	40	1 845	0.89
The Alfred	(1)	40	1 040	0.50
	(2)	40	2 100	1.01
Western	(1)	54	1 358	0.48
Cardiac catheterisation laboratory				
Austin	(1)	40	1 000	0.48
	(2)	45	1 312	0.56
Barwon	(1)	40	600	0.29
	(2)	34	980	0.55
Box Hill	(1)	40	2 826	1.36
Frankston	(1)	30	980	0.63
Monash	(1)	60	2 200	0.71
	(2)	50	1 800	0.69
Royal Melbourne	(1)	40	950	0.46
	(2)	50	1 200	0.46
The Alfred	(1)	50	2 200	0.85
	(2)	50	2 200	0.85
Western	(1)	45	1 670	0.71

Source: Victorian Auditor-General's Office, sample of 19 hospitals, 2002.

**TABLE C4
NUMBER OF PATIENTS TREATED PER POSITRON EMISSION TOMOGRAPHY SCANNER,
AUGUST, 2002**

<i>Hospital</i>	<i>Number of equipment items</i>	<i>Hours staffed per week</i>	<i>Number of patients per 12 months</i>	<i>Number of patients per hours staffed</i>
Austin	(1)	20	(a) 1 400	1.35
	(2)	44	(b) 2 000	0.87
Royal Melbourne	(1)	32	(c) 200	0.12

(a) Includes only clinical work. Research is additional.

(b) New unit estimate for first full year of operation.

(c) This machine performs functions in addition to those of a positron emission tomography scanner. The total number of patients treated per 12 months was 3 500.

Source: Victorian Auditor-General's Office, sample of 19 hospitals, 2002.

**TABLE C5
NUMBER OF PATIENTS TREATED PER LINEAR ACCELERATOR,
AUGUST 2002**

<i>Hospital</i>	<i>Number of equipment items</i>	<i>Hours staffed per week</i>	<i>Number of patients per 12 months (a)</i>	<i>Number of patients per hours staffed</i>
Austin	(1)	55	500	0.17
	(2)	55	500	0.17
Barwon	(1)	40	450	0.22
	(2)	40	450	0.22
The Alfred	(1)	40	400	0.19
	(2)	40	450	0.22
	(3)	40	500	0.24

(a) This figure is low because patients may receive multiple treatments.

Source: Victorian Auditor-General's Office, sample of 19 hospitals, 2002.

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(a) This report is included in Part 3.2, Human Services section of the *Report on Ministerial Portfolios*, June 2001.

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