Western Australian
Auditor General's Report

Management of Medical Equipment

Report 8: May 2017

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WESTERN AUSTRALIAN AUDITOR GENERAL'S REPORT

Management of Medical Equipment

Report 8
May 2017

THE PRESIDENT
LEGISLATIVE COUNCIL

THE SPEAKER
LEGISLATIVE ASSEMBLY

MANAGEMENT OF MEDICAL EQUIPMENT

This report has been prepared for submission to Parliament under the provisions of section 25 of the *Auditor General Act 2006*.

Performance audits are an integral part of the overall audit program. They seek to provide Parliament with assessments of the effectiveness and efficiency of public sector programs and activities, and identify opportunities for improved performance.

This audit assessed whether the management of medical equipment in public hospitals is efficient and effective.

I wish to acknowledge the staff at the hospitals we visited and the agencies included in this audit.

COLIN MURPHY
AUDITOR GENERAL
25 May 2017

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Auditor General's overview

Patient safety is the priority in all aspects of running a hospital. Having the right amount and type of medical equipment, and keeping it well maintained so that it is ready when it is needed, is a key part of delivering safe patient care.

Thankfully, it is very rare that the failure or lack of medical equipment causes serious incidents or harm to patients. But the risk of incidents is not being minimised, and all hospitals need to take action to review their own maintenance procedures and performance.

The Department of Health has identified the management of medical equipment as an area that needs reform. I agree. Significant efficiencies are available in how these assets are managed, through better information, better planning and smarter procurement. Realising the efficiencies now would be timely given the government's financial position and the need to control the costs of healthcare.

I have provided recommendations to support and extend the improvements planned by the Department, and I have done so with the new health governance structures in mind. The new area health boards have a clear opportunity to have an impact by taking responsibility and accountability for this key part of patient care.

Executive summary

Introduction

This audit assessed whether the management of medical equipment in public hospitals is efficient and effective. We focused on the management of medical equipment at the Department of Health, Health Support Services, the North, South, and East Metropolitan Health Services, and the WA Country Health Service (WACHS). The audit covered the period July 2013 to December 2016.

We visited 8 hospitals which in 2015-16 accounted for:

- 43% of the total value of all medical equipment that cost $5,000 and above
- 36% of all patients treated in public hospitals.

Metropolitan hospitals	Country hospitals
Sir Charles Gairdner Hospital	Kalgoorlie Regional Hospital
Royal Perth Hospital	Esperance Hospital
Armadale Kelmscott Memorial Hospital	Geraldton Regional Hospital
Rockingham General Hospital	Carnarvon Hospital

Table 1: Sample hospitals

The audit scope did not include the Child and Adolescent Health Service or hospitals managed under public private partnerships, for example St John of God Midland Public Hospital, and outsourced facilities management arrangements such as Fiona Stanley Hospital.

Background

Introduced in July 2016, the *Health Services Act 2016* changed the governance of WA Health, moving decision-making closer to service delivery and patient care. As system manager the Department of Health is responsible for overall management, performance and the strategic direction of WA Health.

The Health Services Act provided for the establishment of 6 health service providers, of which, 5 are board-governed statutory authorities, legally accountable for the delivery of health services. The sixth is Health Support Services (HSS), governed by a Chief Executive reporting through the Director General Department of Health. HSS is WA Health's Shared Service Centre, providing a suite of technology, supply, workforce and financial services to Western Australia's public health services.

Each health service should provide safe, high quality, efficient and economical health services. They are also responsible for the management of medical equipment within their hospitals. It should be noted that the new boards were not responsible for the management of medical equipment before July 2016.

Having the appropriate medical equipment in the right place at the right time, fit for purpose and well maintained, is essential for the delivery of good quality healthcare.

Medical equipment is vital for the diagnosis, treatment, and rehabilitation of patients. Equipment ranges from small, inexpensive items such as thermometers that cost less than $100, to expensive complex items like computer tomography (CT) scanners, magnetic resonance image (MRI) equipment, and radiosurgery equipment costing several million dollars.

Health Support Services maintain accounting records of medical equipment when the original purchase cost is $5,000 and above. About 19,000 items valued at $625 million are in this category in all WA public hospitals. Hospitals also hold thousands of medical equipment items that cost less than $5,000.

Medical equipment can be technically complex and require specialist expertise to use, maintain and repair. It generally has an expected life of between 5 and 10 years depending on the type of equipment. The actual life will also depend on a wide range of factors including how often it is used, how reliable it is and how well it is maintained.

The unavailability or failure of equipment can present significant risks to patients, staff and service delivery – risks that the health system needs to manage.

Individual health service providers and hospitals are responsible for managing their own equipment, including planning, acquisition, maintenance, repair and disposal.

Medical equipment is funded through capital projects, special programs, the Medical Equipment Replacement Program (MERP), hospital operational funds, special purpose accounts (for example hospital trust funds), gifts and donations. The Department of Health is currently responsible for administering MERP which was introduced in 2004 as a system wide approach to fund the replacement of medical equipment.

The Western Australian Policy Advisory Committee on Technology (WAPACT), part of the Department of Health, evaluates new high cost health technologies, including medical equipment, expected to exceed $250,000 in annual or single acquisition cost.

In September 2015, the Department of Health identified the need to undertake reform in the management of the MERP, including the development of a governance framework that articulated roles, responsibilities and accountabilities of the program.

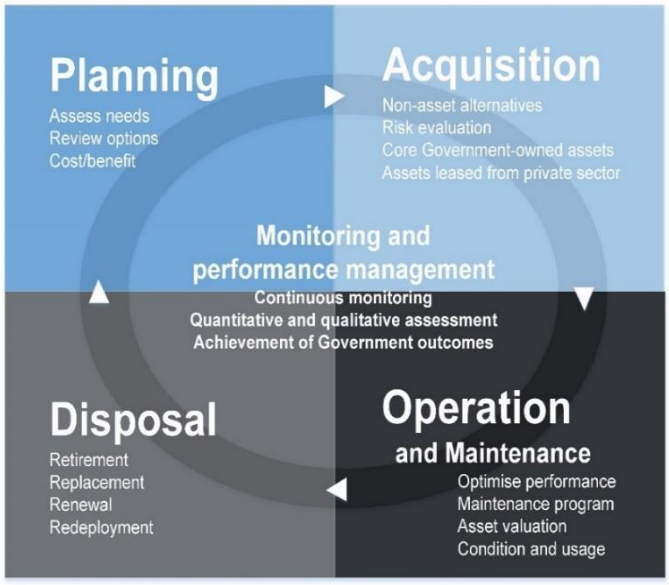
Although the WA Health's Strategic Asset Plan – Phase 1 approved in November 2015, identified key areas to reform, this was deferred pending the outcome of our audit.

What does good management involve?

Effective asset management of medical equipment not only supports service delivery, it also enables the health system to achieve value for money from the equipment. Good asset management is a continuous process that includes:

- sound planning and an understanding of business need to determine what equipment is required
- acquisition processes that represent value for money and comply with State Supply Commission requirements
- good maintenance and monitoring programs that ensure equipment remains in good condition, is used to full capacity and its expected life is maximised
- performance management and monitoring including comprehensive and accurate asset information to aid decision-making
- disposal of equipment that is no longer required.

The stages of the asset management cycle are highlighted in Figure 1.



Source: Victoria, Department of Health 2012 (modified by OAG)

Figure 1: Asset management cycle

Audit conclusion

Equipment failure or unavailability due to repair or maintenance rarely has a serious impact on patient care. However, it does cause incidents and inefficiencies. The risk of adverse events was also increased because preventative maintenance for 16% of equipment we sighted was not done on time, and yet the un-serviced equipment remained available for use. Keeping to maintenance schedules is even more important as 36% of equipment we sighted across our 8 sample hospitals had exceeded its expected life.

Although we found little evidence of equipment shortages, we cannot provide assurance that hospitals are achieving value for money from their management of medical equipment. Health service providers, and hospitals, cannot answer key asset management questions, such as how much equipment is needed, the cost efficiency of maintaining or replacing existing equipment, or whether high value equipment is used to its full capacity. This is because hospitals and health service providers are not capturing or effectively using information on equipment and do not have a strategic asset management approach for medical equipment.

This lack of a strategic asset management approach is impacting efficiency:

- leasing equipment is not routinely considered as an acquisition option
- procurement is generally not aggregated to obtain lowest cost from a supplier
- available funding determines equipment replacement priorities and decisions are not always based on robust information.

For the majority of hospitals and health service providers, no one has clear responsibility for managing medical equipment and its costs. Responsibility is dispersed across health service staff, biomedical engineers, hospital operations managers, heads of clinical service areas and central health department staff. This reduces accountability and efficiency.

Key findings

- **Equipment failure** – Our 8 sample hospitals reported that 107 (0.4%) of 26,325 clinical incidents between February 2014 and August 2016 were caused by medical equipment failure or malfunction. Two of these were incidents where serious harm or death could have been caused. Over a similar period, they reported that 94 theatre cases and 586 imagery appointments were cancelled due to equipment failure or unavailability (less than 1% of the total number of cases and appointments). We were unable to assess if these rates are high as hospitals do not use targets as a tool for monitoring and reducing the frequency of failure. **(**page 13)

- **Servicing equipment** – 41 items of equipment (16% of our sample), including critical items such as an intensive care unit ventilator, were un-serviced within required timeframes. Servicing of some items was overdue by 1 year or more. Servicing helps ensure that the equipment is reliable and safe to use. (page 14)

- **Age of equipment** – 36% of equipment (10,000+ items) in the 8 hospitals is older than its expected life, increasing the risk to service delivery and patient care. Old equipment can be fit for purpose but keeping it operating may not represent value for money. No assessment is done as to whether retention rather than replacement is the most cost effective option. We estimated the replacement cost to be around $140 million. Because health service providers do not have replacement values for all equipment, we have used a number of assumptions to derive our estimate and it is an indicative estimate of total replacement cost. (page 16)

- **A strategic approach** – Health service providers do not have a strategic asset management approach to medical equipment and are not capturing or effectively using key information. Hospitals have not determined what equipment they need, what they have, what their maintenance costs are or what it would cost to purchase what they need. Replacement and purchasing decisions and actions are not sufficiently informed, prioritised or coordinated. (page 17)

- **Responsibility** – There is a lack of clear responsibility for managing medical equipment and its costs amongst the majority of health service providers and hospitals. Responsibility is spread across health service staff, biomedical engineers, hospital operations managers, heads of clinical service areas and central health department staff. This reduces accountability and efficiency. (page 17)

- **Replacement strategies** – Health service providers and hospitals do not have asset management strategies or plans for medical equipment needs beyond 12 months. None had strategies for addressing gaps between replacement needs and available funding. (page 18)

- **Replacement processes** – Processes mainly involve adding or removing equipment from lists provided by individual clinical service areas and hospitals, or equipment identified by biomedical engineers. The basis for how equipment gets on the lists is neither clear nor consistent but is not based on key value for money drivers or a longer-term view of clinical services and demand. (page 18)

- **Medical equipment information** – Comprehensive and timely equipment information is not consistently captured, and when it is, it is often not used to inform decision-making. (page 18)

- **Use of MERP** – MERP was introduced to address the backlog in equipment replacement but a lack of clear business rules to define how the funds can be used has seen funds spent on purchasing new additional equipment. (page 20)

- **Purchasing options** – Health service providers and hospitals do not routinely consider all acquisition options such as contracting the service, leasing the equipment, or reallocating surplus medical equipment from other sites. As a result, it is not evident that they obtain best value for money. (page 21)
- **Reallocating surplus equipment** – The processes for reallocating surplus equipment is not effective. We found 1,200 items of unused medical equipment that cost $7.2 million sitting for at least 2 years in Fremantle Hospital stores. (page 21)
- **Effective purchasing** – Opportunities are missed to aggregate equipment purchases across hospitals and thereby obtain better prices from suppliers. Each health service provider is responsible for purchasing its own equipment. (page 22)
- **Acquisition timelines** – The time taken to acquire high value equipment through open tender process is often slow – our sample showing the average time was 17 months with some cases (defibrillators and patient monitors) taking more than 2.5 years. (page 23)
- **Underspending** – A combination of a lack of strategic planning and long procurement times has contributed to a significant underspend in the MERP. Between 2013-14 and 2015-16, a total of $76.6 million was spent out of $121.7 million in available funds. Underspending has resulted in government withdrawing nearly $15 million from MERP. (page 23)

Recommendations

1. **The Department of Health should by June 2018:**
    a. **develop an overarching policy for the management of medical equipment**
    b. **take a proactive role in guiding health service providers in developing long-term medical equipment asset management strategies and plans**
    c. **determine whether the MERP should be the appropriate vehicle to fund the replacement of medical equipment**
    d. **subject to MERP continuing to fund the replacement of medical equipment, develop clear guidelines for the management of the program**
    e. **consider establishing a single medical equipment register that includes all items of equipment held by health service providers.**
2. **The Department of Health, Health Support Services and health service providers should by June 2018:**
    a. **ensure that the medical equipment procurement process includes the consideration of alternative options (contracting out, lease, using surplus assets) to purchasing**
    b. **use medical equipment plans to identify opportunities to aggregate procurement and standardise equipment to maximise value for money.**
3. **Health service providers and hospitals should by June 2018:**
    a. **allocate clear responsibility for the management of medical equipment**
    b. **establish hospital medical equipment baselines (number and type of assets) that are subject to periodic review to ensure they meet agreed service requirements and demand, and to avoid maintaining surplus equipment**
    c. **develop asset management strategies and plans for medical equipment which include a minimum of 5 year forecasts of funding and equipment replacement needs**
    d. **establish a single register of all medical equipment that includes all relevant information and ensure that it is accessible to key users within hospitals**
    e. **develop consistent guidelines and periodically assess the life expectancy of medical equipment**
    f. **regularly monitor and report on the performance and condition of medical equipment at executive management and board level**
    g. **investigate all items of equipment listed as missing, confirm its location, and where necessary take disposal action for equipment that is no longer held or required.**

Agency responses

Department of Health

The Department of Health notes the Office of the Auditor General's findings in respect of the management of medical equipment, and accepts and supports its recommendations and timeframes.

Since late 2015 the Department has been aware that strong reform is needed in the management of medical equipment to ensure that hospitals, patients and the community receive the best return on their investment. A subsequent internal review identified many of the issues that appear in this report, and much work has already been done to reform this area of health.

The Department will continue to roll out these significant system-wide reforms, including embedding strategic asset planning and management into the WA health system, to ensure that we can continue to deliver high quality care to all Western Australians.

Note: This is a summary extract, the full response is shown in Appendix 2.

East Metropolitan Health Service

East Metropolitan Health Service (EMHS) is pleased that EMHS Health Technology Management Unit is acknowledged within the report in a positive light. EMHS also noted the challenges on health service providers that are raised within this report in maintaining an efficient and effective health technology program that manages equipment repair and servicing with strategic planning and equipment replacement. This report and its recommendations will be used to continue to improve the strategic management and day-to-day governance of medical equipment through EMHS.

EMHS accepts all recommendations within the report, relevant to EMHS as a health service provider.

Health Support Service

Health Support Service (HSS) thanks the OAG for the report and notes the findings and recommendations. HSS will work with both the Department of Health and the patient facing health service providers to support ongoing improvements in procurement efficiency in the planning, acquisition and management of medical equipment across the WA health system.

North Metropolitan Health Service

North Metropolitan Health Service (NMHS) accepts and agrees with the recommendations from the audit. The audit has highlighted the need for better delineation of responsibilities between health service providers, Health Support Services and Department of Health on the role of asset management and governance.

South Metropolitan Health Service

South Metropolitan Health Service (SMHS) recognises and welcomes the opportunity for further improvement. SMHS will seek to address the audit concerns, improve strategic management and oversight of medical equipment, and address the historical deficiencies.

Note: This is a summary extract. The SMHS response is shown in full in Appendix 2.

WA Country Health Service

WA Country Health Service WA Country Health Service (WACHS) welcomes the findings and recommendations of the Office of the Auditor General's audit and is committed to addressing those recommendations accepted by the organisation.

Note: This is a summary extract. The WACHS response is shown in full in Appendix 2.

Audit focus and scope

The audit assessed whether the management of medical equipment in public hospitals is efficient and effective and focused on 3 lines of inquiry:

1. Do hospitals effectively plan for the replacement and addition of medical equipment?
2. Is the procurement of medical equipment timely and cost effective?
3. Are hospitals maximising the effective life of equipment?

We focused on the management of medical equipment at the Department of Health, Health Support Services, the North, South, and East Metropolitan Health Services, and the WA Country Health Service (WACHS). The audit covered the period July 2013 to December 2016. We visited 8 hospitals which, in 2015-16, accounted for 43% of the total value of all medical equipment that cost $5,000 and above, and 36% of all patients treated in public hospitals:

- Sir Charles Gairdner Hospital
- Royal Perth Hospital
- Rockingham General Hospital
- Armadale Kelmscott District Memorial Hospital
- Geraldton Regional Hospital
- Carnarvon Hospital
- Kalgoorlie Regional Hospital
- Esperance Hospital.

In conducting the audit we:

- reviewed policy, guidelines, processes and procedures for managing medical equipment at Health, health services and hospital level
- interviewed staff at the Department of Health, selected health service providers and the 8 sample hospitals
- reviewed key documents and analysed equipment data
- tested a sample of equipment purchased through MERP at the 8 hospitals against policies and guidelines
- reviewed and sighted surplus items of medical equipment held at Fremantle Hospital
- reviewed meeting minutes of the Medical Equipment Replacement Committee and equipment replacement decisions.

Data specific to the 8 sample hospitals is detailed in Appendix 1.

We did not assess the planning and management of medical equipment within the Child and Adolescent Health Service or hospitals managed under public private partnerships, for example St John of God Midland Public Hospital, and outsourced facilities management arrangements such as Fiona Stanley Hospital.

This was a broad scope performance audit, conducted under section 18 of the *Auditor General Act 2006* and in accordance with Australian Auditing and Assurance Standards. Performance audits focus primarily on the effective management and operation of agency programs and activities. The approximate cost of tabling this report is $718,000.

Audit findings

Equipment failure rarely has a serious impact on patient care, but does cause incidents and inefficiencies

We saw little evidence of equipment failure or unavailability due to repairs or maintenance having a serious impact on individual patient care. However, it does cause inconvenience and inefficiency.

The 8 hospitals reported that 94 theatre cases and 586 imagery appointments were cancelled in the last 3 years because of equipment failure or unavailability. This was less than 1% of the total number of cases and appointments. The number of reported clinical incidents caused by equipment failure was also low and the vast majority caused moderate or no harm to patients.

Although hospitals record cancellations of operations and imaging services, and clinical incidents, they do not capture data to quantify the inefficiency and inconvenience caused by medical equipment failure or unavailability. These include:

- borrowing equipment from other clinical service areas and hospitals
- delaying theatre cases and imagery appointments
- referring patients to other public and private hospitals
- emergency purchases through procurement exemptions.

We recognise that hospitals have to manage demand and their capacity to deliver clinical services. We also recognise that equipment may fail at any time and there are circumstances when these are the appropriate risk management treatment or contingency to take.

Majority of reported incidents cause moderate or no harm to patients

WA Health requires hospitals to record all clinical incidents in the Clinical Incident Management System. The severity of each case is rated using a severity assessment code (SAC) based on the potential consequence associated with the incident:

- SAC 1: Incidents or near misses where serious harm or death is/could be caused
- SAC 2: Incidents or near misses where moderate harm is/could be caused
- SAC 3: Incidents or near misses where minimal or no harm is/could be caused.

There were 26,325 clinical incidents reported in the 8 sample hospitals between February 2014 and August 2016 of which 107 (0.4%) related to equipment failure or malfunction. Two were SAC1, 13 were SAC2 and 92 were SAC3 incidents or near misses.

In the context of hospital patient volumes, these are quite low numbers of incidents. However, it is unclear if the incident rates are acceptable as the health service providers and hospitals do not maintain targets or thresholds.

Hospital – health service provider	SAC 1	SAC 2	SAC 3	Total
Sir Charles Gairdner – NMHS	0	3	31	34
Royal Perth – EMHS	1	6	34	41
Armadale Kelmscott – EMHS	0	1	11	12
Rockingham – SMHS	0	1	3	4
Geraldton – WACHS	1	2	7	10
Carnarvon – WACHS	0	0	1	1
Kalgoorlie – WACHS	0	0	2	2
Esperance – WACHS	0	0	3	3
Total	**2**	**13**	**92**	**107**

Table 2: Reported clinical incidents involving equipment malfunction or unavailability – February 2014 to August 2016

The 2 SAC1 incidents where serious harm or death could have been caused were:

- during a procedure at Royal Perth Hospital when 2 different defibrillators failed to administer shock to a patient
- in Geraldton Regional Hospital, a surgeon used a drill bit that broke off and remained in a patient post-surgery.

The incident at Royal Perth Hospital related to autoclaving of the defibrillator paddles. The incident was investigated and the East Metropolitan Health Service has advised that recommendations relating to the incident have been implemented. This includes experienced cardiothoracic theatre nurses checking the paddles prior to use and a review of defibrillators and paddles testing.

WACHS also advised that the incident in Geraldton Regional Hospital was investigated resulting in the replacement of all drill bits in the equipment tray.

Un-serviced equipment on hospital floors is an ongoing operational risk

Preventative maintenance activities should be performed as an integral element of a medical equipment management program. It is important that medical equipment is calibrated correctly, is safe to use and is inspected in accordance with its preventative maintenance schedule.

We sampled 263 items of medical equipment at the 8 hospitals to check compliance with maintenance schedules. We found:

- all equipment (83 items) in our sample at Sir Charles Gairdner Hospital and Geraldton Regional Hospital were inspected and maintained according to service specifications
- 23% (41 items) of the sampled equipment at the other 6 hospitals were not serviced within the required timeframe, or did not have stickers on the equipment to show when they were last inspected. Of these, 7 were overdue by 1 year or more including an infusion pump, an intensive care unit ventilator and a patient warming unit. These items were located on hospital floors and available for use in areas such as the emergency department and intensive care unit.

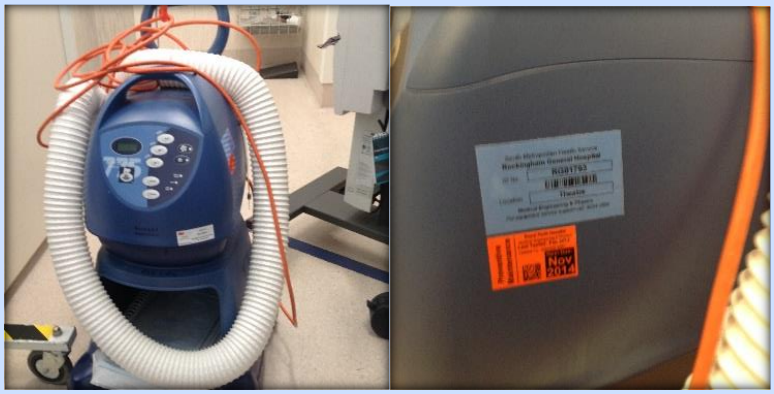
None of these 6 hospitals had effective systems that in a timely way, transferred equipment requiring maintenance from the hospital floor to a service point. Allowing un-serviced equipment to remain on the hospital floor creates a reliability and safety risk and increases the chance of incidents.

Hospital	Total items sighted	Did not have maintenance stickers	Overdue 1 to 6 months	Overdue 6 to 12 months	Overdue 12 months or more	Total	%
Sir Charles Gairdner	57	0	0	0	0	0	0
Royal Perth	44	0	4	1	1	6	14
Kalgoorlie	34	6	1	0	2	9	26
Esperance	31	5	0	0	0	5	16
Rockingham	24	0	2	0	3	5	21
Carnarvon	27	7	0	0	0	7	26
Geraldton	26	0	0	0	0	0	0
Armadale Kelmscott	20	4	4	0	1	9	45
Total	263	22	11	1	7	41	16

Table 3: Items sighted that were not serviced within the required timeframe

Ventilator used to assist patients breathing. Located in an intensive care unit – 16 months overdue for preventative maintenance

Infusion pump used to deliver nutrients or medication. Located in an emergency department – 15 months overdue for preventative maintenance



Patient warming unit – used to prevent unintended hypothermia in surgical patients. Located in theatre, 21 months overdue for preventative maintenance

Figure 2: Examples of medical equipment on hospital floors that were more than 1 year overdue for service

Keeping to maintenance schedules is even more important when 36% of equipment is older than its expected life

A significant proportion of equipment is older than its expected life, increasing the risk to service delivery and patient care. A key to mitigating these risks is to meet inspection and maintenance schedules, and to make well-informed decisions about when to replace ageing equipment.

We found that 10,432 items of equipment (36% of all medical equipment) in the 8 sample hospitals was older than its expected life (Table 4). The purchase price of this equipment was $85 million. We estimated that replacing it could cost around $140 million. Sir Charles Gairdner Hospital was the only hospital that recorded replacement costs. Because the other hospitals do not have replacement costs, we have used a number of assumptions to derive our estimate and it is an indicative estimate of total replacement cost.

Hospital	No. of items	No. of items exceeding expected life	Percentage
Royal Perth	13,600	6,904	51%
Sir Charles Gairdner	9,357	2,600	28%
Rockingham	2,280	281	12%
Armadale Kelmscott	2,065	244	12%
Geraldton	765	132	17%
Kalgoorlie	722	170	24%
Esperance	338	50	15%
Carnarvon	252	51	20%
Total	**29,379**	**10,432**	**36%**

Table 4: Items of equipment that had exceeded its expected life

Note: WACHS equipment data does not include all items of equipment held at the sampled hospitals, however this was the best available data – source biomedical engineering databases.

Although old equipment can be fit for purpose, keeping it may not represent value for money. It may be old technology and/or costly to maintain and repair. We would expect management to regularly monitor equipment that had exceeded its expected life. However, neither the hospitals nor their health service provider has assessed whether retention rather than replacement is most cost effective.

This gap in asset management is partly because accountability for the equipment and its cost is spread across multiple people and groups, and partly because most of the hospitals and health service providers do not have or use the information they need to make these assessments.

Seven of the hospitals did not have estimated replacement costs. In WACHS, the biomedical engineering database used to manage medical equipment did not include information on equipment life expectancy and purchase costs were not recorded for all items. This means that equipment replacement decisions lack rigour.

Efficiency gains are missed because asset management of medical equipment is not effective

We cannot provide assurance that hospitals are achieving value for money from their asset management of medical equipment. Health service providers and hospitals cannot answer key asset management questions, such as how much equipment hospitals need, what equipment each hospital has, whether high value equipment is used to its full capacity, or what the full cost of purchasing and maintaining equipment is.

Consequently, health service providers cannot take a strategic asset management approach for medical equipment including for replacement and purchasing decisions. This reduces efficiency. Ensuring that hospitals have the right medical equipment in the right place at the right time requires effective asset management at all levels of the health system. This involves:

- clear responsibility for medical equipment at the board, health service and hospital level, together with sound policies
- comprehensive and timely information to support strategic and operational management of medical equipment
- planning, needs assessment and procurement processes that are cost effective, comply with State Supply Commission requirements and ensure equipment is available when needed
- management and maintenance of medical equipment.

Responsibility and overall accountability is unclear

Responsibility at the board, health service and hospital level for managing medical equipment, its costs and associated operational and financial risks, is unclear for the majority of health service providers and hospitals. Responsibility is dispersed across health service staff, biomedical engineers, hospital operations managers, heads of clinical service areas and central health department staff. This reduces accountability and efficiency.

Health Technology Management Unit (HTMU) based in Royal Perth Hospital was the nearest to what we expected to find. The unit supports the East and South Metropolitan Health Services and is responsible for:

- maintaining medical equipment information
- servicing and maintaining medical equipment
- facilitating transfer and deployment of equipment
- centralised procurement of medical equipment funded under MERP.

However, the unit is not responsible for imagery equipment or medical equipment at Fiona Stanley Hospital, Peel Health Campus and St John of God Midland Public Hospital.

A serious impediment to effective asset management in the system is the lack of routine reporting to senior management and health service boards on the performance, ongoing costs, and condition of existing equipment. It is therefore very difficult for them to manage risk and determine whether hospitals have the assets needed to support current and future services, that equipment is safe to use, and is managed efficiently.

Healthcare standards in other jurisdictions identify the strategic importance of medical equipment, and mandate that there should be clear responsibility at board, area health service and the hospital level for equipment, together with sound policies and information management.

Health service providers and hospitals do not have robust asset management strategies and plans

Health service providers and hospitals do not have asset management strategies or plans for medical equipment needs beyond 12 months. None had strategies for addressing gaps between replacement needs and available funding.

Planning for equipment replacement is the responsibility of the health service providers and the hospital that owns the equipment, with guidance and direction from the Medical Equipment Replacement Working Party. The working party is chaired by the Department of Health Systems Manager and has representatives from HSS and each health service provider.

The current replacement process mainly involves adding or removing equipment from lists provided by individual clinical service areas and hospitals, or equipment identified by biomedical engineers. New and replacement medical equipment can also be purchased through capital works projects and national initiatives like the renal dialysis service expansion program.

The basis for how equipment is selected for replacement and prioritised is neither clear nor consistent across the hospitals we visited. It is not based on key value for money drivers or a longer-term view of the equipment inventory in the context of clinical services and demand.

Also not clear is the process for deciding which items on the list are purchased, given that the level of replacement is determined by the annual funding allocation from MERP, and the availability of additional money from hospital operational funds, trust funds and donations.

Hospitals did not have equipment baselines to assess if they have the right type and amount of equipment to meet patient demand

We could not definitively establish if the 8 sample hospitals have the equipment they need. Although we found little evidence of equipment shortages, it was not possible to tell if the hospitals had the right mix and quantity of equipment. This was because there was no baseline for the equipment needed to deliver the range and volume of clinical services.

Hospital equipment needs are driven by current and projected service demands captured in the Department of Health's 10-year clinical services framework. This describes the clinical services a hospital will provide and the estimated patient numbers. From this, hospitals can derive an estimate of how much and what equipment they need. We expected that hospitals would have this baseline and use it to demonstrate how much equipment they needed and regularly check whether the number and type of assets held enabled them to meet patient demand. This would then support decisions on which new equipment to buy and which existing equipment to replace, and ensure the type and mix of equipment supported any changes in clinical practice.

This was not the case at any of the 8 hospitals. None of them could demonstrate how much and what type of equipment they needed based on clinical services plans, and did not have this information to support equipment procurement and replacement decisions. It is therefore very difficult for management to know if they have the right equipment, in the right place, to deliver clinical services and provide the required level of patient care.

There is no complete picture of medical equipment as the information is not consistently captured

Comprehensive and timely equipment information is not captured consistently, and when it is, it is often not effectively used to inform decision-making.

The Department of Health, health service providers and hospitals do not have comprehensive registers of medical equipment. As a result, they cannot reliably answer key questions, such as how many items they have, the location of all equipment, whether high

value equipment is used to its full capacity or the cost effectiveness of maintaining versus replacing aging equipment.

The *Australian/New Zealand standard for management programs for medical equipment* states that records are established and maintained to provide evidence of adequate and effective operation of the equipment management program. Although we found multiple registers, none provided a complete list of equipment held in each hospital.

A fixed asset register (FAR) holds information on equipment valued at $5,000 and above for all metropolitan and country hospitals. Although the FAR supports financial statement and accounting needs, it lacks all the information required to efficiently and effectively manage medical equipment. Around 76% of equipment held at our sampled hospitals cost less than $5,000, though we expect that the FAR records the majority of total equipment values.

Biomedical engineers within health service providers have databases to manage equipment maintenance and repairs. These are the most accurate equipment registers and include high and low value items. However, the completeness of the information varied and the information was not readily accessible to hospital managers and heads of clinical services. None of the databases contained a full list of equipment. For example:

- 1 health service did not include equipment under service contracts. The sampled hospitals in that health service could not provide us with a complete list of all the medical equipment they owned
- information collected on equipment repair costs was inconsistent
- data on imaging equipment in individual hospitals was not always included in the biomedical engineering databases. For example, about 20% of Sir Charles Gairdner Hospital's and 58% of Rockingham Hospital's imaging equipment is not recorded in the database.

Disposal of equipment

Disposal of equipment is not always in accordance with the Department of Health Asset Management, Transfers and Disposal Policy. Hospitals are required to document asset transfers or disposals for equipment that is no longer required. Nearly half (48%) of equipment from our sample that was funded for replacement, did not have a completed transfer form. Without these, we were unable to establish if the items had been disposed of, were in storage or still in use.

Some 1,254 items of equipment in biomedical engineering registers were recorded as missing or not located during scheduled maintenance. If they are still held, it is important they are located and that preventive maintenance is carried out to ensure they are reliable and safe to use. Health service providers should investigate all items of equipment listed as missing, confirm its location, and dispose of equipment no longer held or needed.

It is not clear how much money is spent and MERP lacks well-defined guidelines

Medical equipment is funded through capital projects, special health programs, the Medical Equipment Replacement Program (MERP), hospital operational funds, special purpose accounts (for example hospital trust funds), gifts and donations. Medical equipment can be purchased, leased or funded through facilities management contracts (for example medical equipment within Fiona Stanley Hospital).

It is not clear how much money is spent on medical equipment across the health system. We estimated that public hospitals spent $133 million procuring new and replacement equipment in the last 3 years. The Department of Health subsequently advised that public hospitals spent over $200 million when medical equipment repair and maintenance costs, maintenance contracts and leased equipment costs are included. The estimated cost is detailed in Table 5.

However, the total cost does not include a significant amount of equipment purchased as furniture, fixtures, and equipment within capital projects (new and refurbished hospitals), or equipment costs included within facilities management arrangements.

	2013-14 ($)	2014-15 ($)	2015-16 ($)
MERP	30,735,000	20,753,000	25,082,000
Medical equipment (funded from operational funds and special purpose accounts)	15,978,160	24,687,459	29,111,967
Medical equipment (repairs and maintenance)	10,198,492	7,280,243	5,848,281
Medical equipment (maintenance contracts)	14,046,007	17,084,333	9,290,696
Medical equipment (lease)	1,074,346	1,025,744	701,081
Estimated total medical equipment expenditure	**72,032,005**	**70,830,779**	**70,034,025**

Source: Department of Health and OAG

Table 5: Estimated cost of medical equipment in the last 3 years

The Department of Health is responsible for administering MERP. The program was introduced in 2004 as a system wide approach to fund the replacement of existing medical equipment and address a backlog of equipment that needed to be replaced.

We were unable to establish whether the backlog has reduced since the establishment of MERP. The previous calculations were based on the value of items in backlog across all hospitals in the state. However based on our 8 sample hospitals the backlog appears to be relatively unchanged. Health believe that across the system the number of items that are older than its expected life may have reduced. This is because there has been significant infrastructure development with new hospitals or redeveloped facilities coming on line. However, Health does not have quantified evidence to confirm its view.

MERP lacks clear business rules to define how the funds can or cannot be used. This means that there is little guidance for the hospitals or directive to the Medical Equipment Replacement Working Party to enforce compliance and improve its oversight for the program. We also found that:

- MERP funds were not only used to replace existing equipment; they were also used to procure new additional equipment. We reviewed 65 procurements in the last 3 years and found that 8 items (12%) did not replace existing equipment
- in 1 instance, the item purchased did not fit with the definition of medical equipment. Royal Perth Hospital purchased a controlled sheet bender used for the repair, development and manufacture of clinical equipment, valued at $60,000 using MERP funds.

MERP was established prior to the introduction of the *Health Services Act 2016*, an Act that has changed the governance of WA Health by moving decision-making closer to service delivery and patient care. Health services providers are now separate, board-governed statutory authorities, legally accountable for the delivery of health services. It is not clear whether MERP remains the most appropriate vehicle to fund the replacement of medical equipment under these new arrangements.

Health service providers and hospitals do not routinely consider all options during acquisition

Hospitals generally purchase their medical equipment but it is not evident that this method of acquiring equipment always provides best value for money.

Procurement processes do not require routine consideration of alternatives such as contracting the service, leasing the equipment, or obtaining surplus medical equipment from other sites. Health advised that leasing equipment would increase the gap between the state price (cost) and the national efficient price under Federal activity based funding.

An opportunity to make better use of surplus equipment is evident. Processes for reallocating surplus equipment is not effective with equipment sitting unused in Fremantle Hospital. We found 1,200 items of surplus equipment from various closed hospitals and services in storage at Fremantle Hospital and no assessment or decision on what to do with it. The original purchase cost of the equipment was $7.2 million, 43% was still within its expected life and 17% of items were less than 3 years old.

The South Metropolitan Health Service advised that it had made considerable effort to reallocate or dispose of surplus equipment. However, some of the remaining equipment could have been transferred to hospitals that purchased similar items within the last 2 years, or are using similar equipment that is older than its expected life. The longer these items stay in storage, the less likely they will be fit for purpose.

Figure 3: Unused equipment in Fremantle Hospital stores

We also found 450 items of equipment within the Royal Perth Hospital Disaster Store. The majority of the equipment had exceeded its expected life. About 60 items were less than 3 years old. The East Metropolitan Health Service advised that they were reviewing the list with the aim to recommend on items no longer deemed suitable or supportable. This will be provided to the Royal Perth Hospital Emergency Management Unit for their consideration.

Figure 4: Equipment held in the Royal Perth Hospital Disaster Store

Equipment utilisation, performance, maintenance and repair information is not used in decisions to keep or replace equipment

Decisions to keep or replace medical equipment should be informed by an assessment of relative costs of repair against replacement, use and expected future service demands.

None of the 8 hospitals used available information to monitor repair costs or equipment use and compare it with replacement costs to make a judgement about how long to keep equipment.

Without this information, hospitals may choose to replace equipment earlier than needed or, more likely, keep the equipment beyond its economic life such that maintenance and repair costs become more than replacement costs.

We found 3,004 items (10% of all equipment held) where repair costs had exceeded the original purchase price by $1.65 million. Of these, 71% had exceeded its expected life. The 3,004 items did not include WACHS hospitals as we were unable to reconcile purchase costs, expected life and repair costs from data provided.

Hospitals are not routinely reviewing the expected medical life and the accounting life of medical equipment classed as fixed assets (valued $5,000 and above). There can be significant differences between the length of the medical and accounting life. Hospitals can incur additional depreciation costs to an annual operational budget when equipment fails before the end of its accounting life. This can impact the decision on when to replace equipment.

WACHS regional staff provided examples of where hospitals retained equipment that had reached the end of its expected life because the items still had years remaining in the accounting life over which to apportion the depreciation charge.

The effect of spreading the cost of the asset through depreciation over a longer period, is that the amount charged in each year is lower, thus reducing the impact on the operating result for that year. Disposing of equipment before the end of its accounting life will require the hospital to incur the full remaining depreciable value of the asset in the disposal year.

Holding onto equipment after it has passed its medical life can be false economy:

- the equipment may no longer be reliable or safe
- repairs may be frequent and costly
- storing outdated and unused equipment has a cost.

The Department of Health requires hospitals to review the remaining accounting and medical life of equipment each year. Changes in the expected life needs to be reflected in the accounting life.

Procurement is not always aggregated to achieve value for money across the health system

Each health service provider is responsible for purchasing its own equipment. The effect of a disaggregated approach to purchasing is that opportunities can be missed to make financial savings across the health system through aggregated purchasing and the standardisation of equipment. Aggregating purchases provides better bargaining power and opportunities for cost savings.

The department advised us that Health Support Services and the Office of Chief Procurement Officer has over the last few years worked closely with the Department of Finance and the health service providers to promote aggregated procurement to achieve value for money. One example is the aggregated procurement of 3 CT scanners for Royal Perth and Sir Charles Gairdner hospitals.

WACHS also uses a centralised procurement process to purchase equipment for all regional hospitals and advised that this has delivered efficiencies through aggregated procurement and standardised equipment throughout regional hospitals which has lowered maintenance costs.

However, we found examples of missed opportunities to take a strategic and aggregated approach to purchases and get a better financial outcome for the state:

- in 2015, Royal Perth, Armadale Kelmscott Memorial, and Sir Charles Gairdner hospitals purchased physiological monitors from the same supplier to the value of $4 million under 3 separate contracts. These procurements could not be made through a whole-of-Health contract as they were over the value threshold. In the same period, WACHS also purchased similar items to the value of $500,000 through a whole-of-Health contract
- in 2015, Royal Perth, Armadale Kelmscott Memorial and Bentley hospitals purchased endoscopic equipment under 2 separate tenders to the value of $2.2 million. In less than a year, an additional tender for similar equipment was underway for Rockingham and Fremantle hospitals.

Lengthy replacement times for high value equipment can affect service delivery and has led to the reallocation of MERP funding

Methods for purchasing medical equipment can vary, depending upon values, existing contract arrangements and special circumstances. Methods include direct purchasing, requests for quotations, common use arrangements or whole-of-Health contracts, and open tenders for items with a total contract value of more than $250,000.

Procurement of equipment purchased through open tender is often slow. Our sample of items purchased through open tender in the last 3 years took an average of 17 months to acquire. In 2 cases, procurement for defibrillators and patient monitors took more than 2.5 years. If not planned, long replacement times can put effective service delivery at risk.

A combination of a lack of strategic planning and long procurement times has contributed to a significant underspend in the MERP and ultimately to a reallocation of funding.

Between 2013-14 and 2015-16, a total of $76.6 million was spent out of $121.7 million in available funds. The underspending resulted in funding withdrawn from MERP in 2013-14 and 2014-15 of $12.5 million and $2.3 million following government mid-year reviews. The reallocation of this funding has directly affected the health systems equipment replacement backlog.

Procurement policies are mostly followed

Hospitals generally comply with procurement policies though we identified some breaches.

On 3 occasions in 2016, requests for exemption from State Supply Commission and Health procurement policy were made for reason of emergency purchases after the purchases had occurred. These were:

- a neurosurgery microscope at Sir Charles Gairdner Hospital valued at $400,000 – exemption was sought from competitive tendering. The item had been on the equipment replacement list since 2011 (see case example below)
- a mini C-arm (imaging machine) at Royal Perth Hospital valued at $90,000 which the hospital had been trialling since September 2015. The purchase was made when the hospital could no longer extend the trial period
- an implant system purchased through SMHS with a value of USD $155,000 which was urgently required for heart surgery.

Case example

Sir Charles Gairdner Hospital (SCGH) – Neurosurgery Microscope

SCGH is a tertiary hospital that provides a comprehensive range of adult clinical services. It has 13 operating theatres that perform elective and emergency surgery and is currently WA's principal hospital for neurology.

The hospital purchased neurosurgery microscopes in 2004 and 2008. Since then both have had a significant number of repairs with the 2008 microscope the subject of 46 individual repair work orders. The hospital put both microscopes on the equipment replacement list in 2011.

In January 2016, 1 of the microscopes failed during surgery but was repaired by the hospital's technicians. A faulty part in the other microscope had caused it to lose focus during surgery. To minimise the impact on service delivery and patient care, SCGH borrowed a microscope from Osborne Park Hospital for a week and 1 from Fiona Stanley Hospital for 3 weeks as a stopgap solution.

In February 2016, 1 of the microscopes failed again and was out of service for 2 days until repaired. To minimise impact on service delivery and patient care, the hospital obtained a new microscope from the manufacturer for a 4-week trial.

On 23 May 2016, SCGH approved an emergency purchase for a new microscope. Because the exemption request was retrospective this meant the hospital bypassed the required approval process.

Appendix 1: Health service providers, hospital profiles and medical equipment data

Listed below is a profile of 4 of the state's 5 public hospital service providers along with a description of:

- the number of items of medical equipment they hold, its purchase cost and estimated replacement value where known
- the number of items of medical equipment that had exceeded its estimated life and the health service providers assessed risk of their aging equipment
- the number of items of medical equipment where service and repair costs have exceeded the original purchase cost.

East Metropolitan Health Service

The East Metropolitan Health Service (EMHS) administers health services for over 700,000 people living in Perth's east metropolitan area. It has 5 hospitals that provide a combination of tertiary, secondary and specialist health care services including; emergency and critical, state trauma, elective and emergency surgery, mental health, women's, children's and neonates services:

- Armadale Kelmscott Memorial Hospital
- Bentley Health Service
- Kalamunda District Community Hospital
- Royal Perth Hospital
- St John of God Midland Public Hospital.

Armadale Kelmscott Memorial Hospital

Armadale Kelmscott Memorial Hospital (AKMH) is a 290 bed general hospital. It operates a 24-hour emergency department and also provides maternity, paediatric, medical, renal dialysis, surgery, mental health and allied health services. The hospital also provides community mental health, aged care, rehabilitation services and eligible dental services.

In 2015-16, AKMH managed more than 28,000 inpatient separations, more than 59,000 emergency department attendances and more than 105,000 outpatient occasions of service.

Medical equipment items at AKMH

Equipment type	No. of items	As % of all equipment	Purchase cost ($)	% by value	Estimated replacement cost ($)
Major items over $50K	45	2%	3,942,863	25%	* unavailable
Minor above $5K < $50K	607	29%	9,442,665	60%	* unavailable
Minor below $5K	1,108	54%	2,338,869	15%	* unavailable
Items with no purchase cost recorded	305	15%	unavailable	-	* unavailable
Total	**2,065**	**100%**	**15,724,397**	**100%**	*** unavailable**

* This information was not recorded in the hospital biomedical engineering database.

Medical equipment items that had exceeded its expected life – risk

Model risk	Total number of items	No. of items that have exceeded the estimated life	Purchase cost ($) of items that have exceeded the estimated life
19 Most critical	3	1	27,474
18	19	3	58,564
17	40	6	537,961
16	195	5	44,232
15	224	12	135,025
14	57	4	12,664
13	164	28	400,330
12	75	11	68,634
11	188	32	228,023
10	26	0	0
9	33	9	80,675
8	64	1	895
7	56	4	15,510
6	14	2	0
5	44	5	11,650
4	2	1	806
3	1	0	0
2	20	11	40,431
1	27	6	70,478
0 Least critical	813	103	700,911
Total	**2,065**	**244**	**2,434,263**

Note. East and South Metropolitan Health Service calculates risk using 5 categories – the equipment function, clinical application, maintenance, experience and the environment it is used (19 most critical to 0 least critical).

Medical equipment items where service and repair costs have exceeded original purchase cost

	Number of items	Total original purchase cost ($)	Total service and repair cost ($)
Not within expected life	95	55,715	112,901
Within expected life	10	19,932	28,166
Total	**105**	**75,647**	**141,067**

Royal Perth Hospital

Royal Perth Hospital (RPH) is a 450-bed tertiary hospital located in the centre of Perth. It provides a comprehensive range of adult clinical services including general surgical and medical services, emergency and trauma services, mental health and rehabilitation and aged care. RPH medical and surgical services do not include obstetrics.

In 2015-16, RPH managed more than 51,700 inpatient separations, more than 72,200 emergency department attendances and more than 254,000 outpatient occasions of service.

Medical equipment items at RPH

Equipment type	No. of items	As % of all equipment	Purchase cost ($)	% by value	Estimated replacement cost ($)
Major items over $50K	243	2	47,660,956	54	* unavailable
Minor above $5K < $50K	1,902	14	28,305,073	32	* unavailable
Minor below $5K	11,461	84	12,689,133	14	* unavailable
Total	**13,606**	**100**	**88,655,162**	**100**	*** unavailable**

* This information was not recorded in the hospital biomedical engineering database.

Medical equipment items that had exceeded its expected life – risk

Model risk	Total number of items	No. of items that have exceeded the estimated life	Purchase cost ($) of items that have exceeded the estimated life
20 Most critical	6	0	0
19	30	3	74,400
18	136	48	619,048
17	280	143	1,354,284
16	352	251	398,653
15	1,157	180	847,918
14	302	232	652,983
13	1,288	422	947,546
12	806	145	537,679
11	908	428	1,086,012
10	54	18	218,970
9	286	112	498,357
8	311	108	193,527
7	410	250	250,669
6	91	28	264,148
5	204	123	233,050
4	140	101	291,799
3	42	35	94,006
2	3	2	94,469
1	36	32	353,677
0 Least critical	6,764	4,243	22,937,181
Total	**13,606**	**6,904**	**31,948,376**

Medical equipment items where service and repair costs have exceeded original purchase cost

	Number of items	Total original purchase cost ($)	Total service and repair cost ($)
Not within expected life	2,054	1,550,574	2,935,860
Within expected life	477	144,549	503,735
Total	**2,531**	**1,695,123**	**3,439,595**

North Metropolitan Health Service

The North Metropolitan Health Service (NMHS) administers health services for people living in Perth's north metropolitan area. With a catchment area of 3,000 square kilometres and a population of nearly 1 million it is the largest health service in the metropolitan area.

It comprises a network of 5 hospitals and offers a range of hospital and community based public health services:

- Graylands Hospital
- Joondalup Public Hospital
- King Edward Memorial Hospital
- Osborne Park Hospital
- Sir Charles Gairdner Hospital.

Other services include:

- Breast Screen WA
- PathWest
- Dental Health Service.

Sir Charles Gairdner Hospital

Sir Charles Gairdner Hospital (SCGH) is a 600 bed tertiary hospital. It provides a comprehensive range of adult clinical services including general surgical and medical services, emergency and trauma services, mental health and rehabilitation, and aged care. It is the states principal hospital for neurosurgery and liver transplant, and home to the states cancer centre.

In 2015-16, SCGH hospital managed more than 70,600 inpatient separations, more than 72,400 emergency department attendances and more than 419,500 outpatient occasions of service.

Medical equipment items at SCGH

Equipment type	No. of items	As % of all equipment	Purchase cost ($)	% by value	Estimated replacement cost ($)
Major items over $50K	203	2%	68,364,101	63%	108,380,529
Minor above $5K < $50K	2,289	25%	30,499,239	28%	46,434,722
Minor below $5K	6,865	73%	10,426,546	9%	15,998,162
Total	**9,357**	**100%**	**109,289,886**	**100%**	**170,813,413**

Medical equipment items that had exceeded its expected life - risk

Model risk*	Total number of items	No. of items that have exceeded the estimated life	Purchase cost ($) of items that have exceeded the estimated life
10 Most critical	185	70	1,297,241
9	4,123	1,268	24,377,263
8	307	161	536,694
7	1,704	503	14,224,187
6	2,656	455	1,892,268
5	0	0	0
4	0	0	0
3	0	0	0
2	0	0	0
1	0	0	0
0 Least critical	382	143	330,781
Total	**9,357**	**2,600**	**42,658,434**

*Risk rating at SCGH is based on equipment function which uses a 0 least critical – 10 most critical rating.

Medical equipment items where service and repair costs have exceeded original purchase cost

	Number of items	Total original purchase cost ($)	Total service and repair cost ($)
Not within expected life	63	250,757	395,589
Within expected life	148	462,666	713,625
Total	**211**	**713,423**	**1,109,214**

South Metropolitan Health Service

The South Metropolitan Health Service (SMHS) administers hospital and health services for people living in the south metropolitan area of Perth. It provides a full range of medical, surgical, emergency, rehabilitation and primary health services to adults and children. SMHS comprises a network of 5 hospitals and offers a range of hospital and community based public health services:

- Fiona Stanley Hospital
- Fremantle Hospital
- Murray District Hospital
- Peel Health Campus
- Rockingham General Hospital.

Rockingham General Hospital

Rockingham General Hospital (RGH) is a 242 bed general hospital that provides a range of clinical health services including; general medicine and surgery, specialist medical and surgical services, sub-acute services including rehabilitation and aged care, mental health emergency, maternity and paediatric.

In 2015-16, RGH managed more than 22,400 inpatient separations, more than 54,300 emergency department attendances and more than 96,300 outpatient occasions of service.

Medical equipment items held at RGH

Equipment type	No. of items	As % of all equipment	Purchase cost ($)	% by value	Estimated replacement cost ($)
Major items over $50K	33	1%	5,295,711	34%	* unavailable
Minor above $5K < $50K	504	22%	7,694,048	50%	* unavailable
Minor below $5K	1,420	63%	2,450,817	16%	* unavailable
No purchase cost recorded	323	14%	-	-	* unavailable
Total	**2,280**	**100%**	**15,440,576**	**100%**	*** unavailable**

* This information was not recorded in the hospital biomedical engineering database.

Medical equipment items that had exceeded its expected life – risk

Model risk	Total number of Items	No. of items that have exceeded the expected life	Purchase cost ($) of items that have exceeded the expected life
20 Most critical	0	0	0
19	5	0	0
18	18	3	65,671
17	28	0	0
16	97	12	61,080
15	265	8	85,914
14	57	7	46,479
13	216	23	66,072
12	26	5	13,935
11	118	39	452,537

Model risk	Total number of Items	No. of items that have exceeded the expected life	Purchase cost ($) of items that have exceeded the expected life
10	20	0	0
9	75	12	74,654
8	73	2	3,200
7	15	2	3,976
6	7	0	0
5	50	4	5,706
4	2	0	0
3	6	2	3,100
2	2	1	1,600
1	60	22	169,101
0 Least critical	1140	139	1,229,729
Total	**2,280**	**281**	**2,282,754**

Medical equipment items where service and repair costs have exceeded original purchase cost

	Number of items	Total original purchase cost ($)	Total service and repair cost ($)
Not within expected life	137	42,576	86,866
Within expected life	20	55,398	142,814
Total	**157**	**97,974**	**229,680**

WA Country Health Service

WA Country Health Service (WACHS) administers hospital and health services for over 500,000 people living in the regional and remote areas of Western Australia. It operates 7 administrative regions supported by the central office in Perth. These regions (Kimberley, Pilbara, Midwest, Wheatbelt, Goldfields, South West and Great Southern) provide a range of clinical services including; emergency care, outpatient services, acute inpatient medical and surgical services, and residential aged care.

WACHS uses a hub and spoke model where key centres in the respective regional health service network act as the regional referral centre for diagnosis, secondary level acute and surgical service and coordination for outreach services.

Carnarvon Hospital

Carnarvon Hospital (CH) is 1 of 15 integrated district health services (IDHS) in the WACHS. The hospital has a capacity of 40 beds and operates in the Midwest administrative region. As an IDHS the hospital provides diagnostic, emergency, acute inpatient and minor procedures. It also provides coordination for acute, primary and mental health services at a district level.

In 2015-16, CH managed more than 1,300 inpatient separations, more than 8,200 emergency department attendances and more than 9,392 outpatient occasions of service.

Medical equipment at CH

Equipment type	No. of items	As % of all equipment	Purchase cost ($)	% by value	Estimated replacement cost ($)
Major items over $50K	11	4%	2,124,847	53%	* unavailable
Minor above $5K < $50K	94	37%	1,544,070	38%	* unavailable
Minor below $5K	147	59%	372,368	9%	* unavailable
Total	**252**	**100%**	**4,041,285**	**100%**	*** unavailable**

* This information was not recorded in the hospital biomedical engineering database.

Medical equipment that had exceeded its expected life

No. of items	No. of items exceeding expected life	Percentage	Purchase cost ($)
252	51	20%	1,175,720

Medical equipment that had exceeded its expected life – risk

We were unable to do this analysis as WACHS medical equipment database does not classify equipment by risk.

Medical equipment items where service and repair costs have exceeded original purchase cost

WACHS Biomedical Engineering operates a cost recovery model and invoices hospitals for medical equipment repair and maintenance costs. The total repair and maintenance costs for medical equipment held by CH was $501,311 (over the life of the equipment held).

Esperance Hospital

Esperance Hospital (EH) is 1 of 15 integrated district health services (IDHS) in the WACHS. The hospital has a capacity of 35 beds and operates as part of the Goldfields administrative region. As an IDHS the hospital provides diagnostic, emergency, acute inpatient and minor procedures. It also provides coordination for acute, primary and mental health services at a district level.

In 2015-16, EH managed more than 2,400 inpatient separations, more than 11,900 emergency department attendances and more than 6,200 outpatient occasions of service.

Medical equipment at EH

Equipment type	No. of items	As % of all equipment	Purchase cost ($)	% by value	Estimated replacement cost ($)
Major items over $50K	11	3%	$2,153,222	46%	* unavailable
Minor above $5K < $50K	143	42%	$2,057,880	44%	* unavailable
Minor below $5K	184	55%	$470,249	10%	* unavailable
Total	**338**	**100%**	**$4,681,351**	**100%**	*** unavailable**

* This information was not recorded in the hospital biomedical engineering database.

Medical equipment that had exceeded its expected life

No. of items	No. of items exceeding expected life	Percentage	Purchase cost ($)
338	50	15%	582,913

Medical equipment that had exceeded its expected life – risk

We were unable to do this analysis as WACHS medical equipment database does not classify equipment by risk.

Medical equipment items where service and repair costs have exceeded original purchase cost

WACHS Biomedical Engineering operates a cost recovery model and invoices hospitals for medical equipment repair and maintenance costs. The total repair and maintenance costs for medical equipment held by EH was $595,260 (over the life of the equipment held).

Geraldton Regional Hospital

Geraldton Regional Hospital (GRH) is 1 of 6 Regional Resource Centres (RRC) in WACHS. The hospital has a capacity of 100 beds and operates as the main RRC for the Midwest administrative region. As an RRC the hospital acts as the regional referral centre for diagnosis, secondary-level acute and surgical services, and emergency and specialist services.

In 2015-16, GRH managed more than 15,400 inpatient separations, more than 28,500 emergency department attendances and more than 47,000 outpatient occasions of service.

Medical equipment at GRH

Equipment type	No. of items	As % of all equipment	Purchase cost ($)	% by value	Estimated replacement cost ($)
Major items over $50K	14	2%	$2,518,990	34%	* unavailable
Minor above $5K < $50K	233	30%	$3,584,566	48%	* unavailable
Minor below $5K	518	68%	$1,377,154	18%	* unavailable
Total	**765**	**100%**	**$7,480,710**	**100%**	*** unavailable**

* This information was not recorded in the hospital biomedical engineering database.

Medical equipment that had exceeded its expected life

No. of items	No. of items exceeding expected life	Percentage	Purchase cost ($)
765	132	17%	1,695,750

Medical equipment that had exceeded its expected life – risk

We were unable to do this analysis as WACHS medical equipment database does not classify equipment by risk.

Medical equipment items where service and repair costs have exceeded original purchase cost

WACHS Biomedical Engineering operates a cost recovery model and invoices hospitals for medical equipment repair and maintenance costs. The total repair and maintenance costs for medical equipment held by GRH was $1,699,461 (over the life of the equipment held).

Kalgoorlie Regional Hospital

Kalgoorlie Regional Hospital (KRH) is 1 of 6 regional resource centres in WACHS. The hospital has a capacity of approximately 110 beds and operates as part of the Goldfields administrative region. As an RRC the hospital acts as the regional referral centre for diagnosis, secondary-level acute and surgical services, and emergency and specialist services.

In 2015-16, KRH managed more than 12,000 inpatient separations, more than 23,300 emergency department attendances and more than 25,500 outpatient occasions of service.

Medical equipment items at KRH

Equipment type	No. of items	As % of all equipment	Purchase cost ($)	% by value	Estimated replacement cost ($)
Major items over $50K	16	2%	$2,911,667	36%	* unavailable
Minor above $5K < $50K	257	36%	$3,939,096	49%	* unavailable
Minor below $5K	449	62%	$1,175,130	15%	* unavailable
Total	**722**	**100%**	**$8,025,893**	**100%**	*** unavailable**

* This information was not recorded in the hospital biomedical engineering database.

Medical equipment that had exceeded its expected life

No. of items	No. of items exceeding expected life	Percentage	Purchase cost ($)
722	170	24%	2,329,118

Medical equipment that had exceeded its expected life – risk

We were unable to do this analysis as WACHS medical equipment database does not classify equipment by risk.

Medical equipment items where service and repair costs have exceeded original purchase cost

WACHS Biomedical Engineering operates a cost recovery model and invoices hospitals for medical equipment repair and maintenance costs. The total repair and maintenance costs for medical equipment held by KRH was $595,261 (over the life of the equipment held).

Appendix 2: Detailed agency responses

Department of Health

The Department of Health notes the Office of the Auditor General's findings in respect of the management of medical equipment, and accepts and supports its recommendations and timeframes.

Managing the WA health and hospital system for all Western Australians is a huge and complex undertaking. With a team of over 40,000 staff, we responded to more than 1,000,000 Emergency Department presentations and 562,000 inpatient separations, over a vast area spanning 2.5 million kilometres. In these circumstances, and notwithstanding the best planning and processes that take place at all levels of the system, there will always be room for improvement.

Since late 2015, the Department has been aware that strong reform is needed in the management of medical equipment to ensure that hospitals, patients and the community receive the best return on their investment. A subsequent internal review identified many of the issues that appear in this report, and much work has already been done to reform this area of health.

The first reform is governance: the *Health Services Act 2016* requires the Health Service Providers (HSPs) to be legally accountable for the budget, performance and operations of the sites that fall within their jurisdictions. To support this reform further, the Department will work with the HSPs to steward the reform by drawing on the Auditor General's findings and developing the policies to strengthen the management of medical equipment for the whole system.

The second reform is information technology: with better technology, we are improving the way we manage and track our medical equipment, and note that our new site such as the Perth Children's Hospital, is fitted with state-of-the-art technology to record, track and manage all of the equipment at their respective locations. We will also work with the HSPs to assist them with asset planning and management processes.

And finally, our procurement division has been working closely with the Department of Finance and the HSPs to introduce reforms which include promoting aggregated procurement to achieve value for money. We have also established a Health Supply Council comprising senior executives from the Department and HSPs to review all procurement plans and procurement evaluations reports in excess of $5 million in value to ensure proper processes are followed and that aggregation opportunities are not missed. Procurements valued between $250,000 and $5 million are reviewed by the Health Supply Contracts Committee. Improvements in aggregate purchasing are already evident with a number of procurement activities for medical equipment – the most recent being for CT Scanners.

The Department will continue to roll out these significant system-wide reforms, including embedding strategic asset planning and management into the WA health system, to ensure that we can continue to deliver high quality care to all Western Australians.

South Metropolitan Health Service

South Metropolitan Health Service (SMHS) recognises and welcomes the opportunity for further improvement. SMHS will seek to address the audit concerns, improve strategic management and oversight of medical equipment, and address the historical deficiencies.

In recent years, WA Health has undergone major changes in the development of facilities and business reconfiguration. For SMHS this has occurred through the opening of the Fiona Stanley Hospital, the redevelopment of the Rockingham General Hospital and the downsizing of Fremantle Hospital to a specialist hospital facility. These major changes have resulted in equipment upgrades that have significantly reduced the risks associated with the issues raised by the OAG. To mitigate risks into the future, a program of improvement will be

developed. SMHS accepts the following recommendations and will take action to address them within the timeframe set out by the OAG of 30 June 2018, subject to the identification of appropriate resources:

- Allocate clear responsibilities for the management of medical equipment and ensure that the Board receives information to monitor performance and overall management of medical equipment.
- Ensure that all equipment related incidents are reported to the appropriate authorities, investigated and corrective action taken.
- Investigate all items of equipment listed as missing, confirm its location, and where necessary take disposal action for equipment that is no longer held or required.

SMHS accepts in principle the recommendation to establish a single register of all medical equipment that includes all relevant information and ensure that it is accessible to key users within hospitals. However, at this time, a separate register will be maintained for Fiona Stanley Hospital as the contractual requirements of the non-clinical services contract necessitate a differentiation of process. Should whole-of-health system improvements in the future facilitate a single register from an operational perspective this will be pursued.

SMHS accepts in principle the remaining 4 recommendations and commits to the development of a framework for the management of medical equipment by 30 June 2019. This framework will help to address the disparate practices of managing medical equipment across SMHS hospital sites and establish an implementation timeframe that will address the remaining recommendations. It will also address improvements to the SMHS-wide medical equipment register.

WA Country Health Service

WA Country Health Service (WACHS) welcomes the findings and recommendations of the Office of the Auditor General's audit and is committed to addressing those recommendations accepted by the organisation. WACHS notes that medical equipment management is more than the management of contracts and this audit highlights the need for dedicated expertise and software systems to monitor and manage procurement, routine maintenance and replacement (through damage or part failures).

WACHS will ensure the clear allocation of responsibility for the management of medical equipment and develop a process to ensure that the Medical Equipment Committee, WACHS Chief Executive and Board Chair receive information in a manner to enable performance monitoring and assessment of the overall management of medical equipment.

WACHS through the infrastructure unit, will reassess the medical equipment including types of assets which will be subject to periodic review to ensure that they meet agreed service requirements and demand; this will require a change in biomedical engineering (BME) roles.

Unlike metropolitan BME, WACHS BME is not local to hospitals therefore surplus equipment needs to be considered as a benefit, it provides a suitable buffer of equipment for breakdowns. Equipment failures of less than 1% (or >99% uptime) could be viewed as an overall good result.

WACHS has already commenced a casting of 5-year forecasts for equipment replacement needs via its Medical Equipment Committee to commence forecasting of funding requirements.

The establishment of a single register of all medical equipment will be difficult to maintain as not all equipment is purchased by MERP e.g.donations. WACHS will explore the possibility of a single equipment database, through the integration of BME's database with WACHS Agility within 12 months.

The development of consistent guidelines and assessment of the life expectancy of medical equipment is supported and will be developed to align with the overarching policy recommended for development by the Department of Health. This is a noble target however equipment age alone is only a rough guide and WACHS will determine how it can assist this being developed centrally. The diversity of WACHS sites means we can relocate equipment within WACHS to extract as much value as possible.

WACHS will commence discussions with infrastructure / BME to develop a reporting mechanism to the Medical Equipment Committee, WACHS Chief Executive and the WACHS Board about the ongoing performance and condition of medical equipment.

All equipment related incidents will be reported via the Clinical Incident Monitoring System and added to the WACHS Safety and Quality Reporting dashboard.

A process of managing equipment listed as missing will be developed and correct disposal of equipment no longer required is currently undertaken by BME. Equipment disposed through BME is used as a valuable resource of spare parts to maintain fleet WACHS wide. We also support overseas charities with equipment redundant for WACHS but still in reasonable working order.

Auditor General's Reports

Report number	2017 Reports	Date tabled
7	Audit Results Report – Annual 2016 Financial Audits – Universities and TAFEs – Other audits completed since 1 November 2016	11 May 2017
6	Opinions on Ministerial Notifications	13 April 2017
5	Accuracy of WA Health's Activity Based Funding Data	11 April 2017
4	Controls Over Purchasing Cards	11 April 2017
3	Tender Processes and Contract Extensions	11 April 2017
2	Opinion on Ministerial Notification	6 April 2017
1	Opinion on Ministerial Notification	30 March 2017

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