New South Wales Auditor-General's Report
Performance Audit

Medical equipment management in NSW public hospitals
NSW Health

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OF NEW SOUTH WALES

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auditoffice
OF NEW SOUTH WALES

AUDITOR-GENERAL NEW SOUTH WALES

GPO Box 12
Sydney NSW 2001

The Legislative Assembly
Parliament House
Sydney NSW 2000

The Legislative Council
Parliament House
Sydney NSW 2000

In accordance with section 38E of the *Public Finance and Audit Act 1983*, I present a report titled **Medical equipment management in NSW public hospitals: NSW Health.**

Margaret Crawford
Auditor-General
25 May 2017

Contents

Executive summary

Medical equipment needs to be properly managed over its lifecycle, from planning to acquisition, operation and disposal, to ensure patient safety and quality of care.

This audit assessed how well NSW hospitals managed medical equipment to meet the needs of patients. We examined the management of:

1. Positron Emission Tomography and Computed Tomography (PET-CT) scanners, a high-value piece of equipment commonly used for diagnosing cancer
2. a small sample of lower value but critical medical equipment known as biomedical equipment.

We examined five hospitals for this audit: Lismore Base Hospital (in the Northern NSW Local Health District (LHD)), Liverpool Hospital (South Western Sydney LHD), Nepean Hospital (Nepean Blue Mountains LHD), Royal Prince Alfred Hospital (Sydney LHD) and Westmead Hospital (Western Sydney LHD).

Conclusion

Management of PET-CT scanners

PET-CT scanners were well managed, though could be enhanced by better performance reporting and replacement planning.

The PET-CT scanners we reviewed were well utilised and there was prompt reporting of scan results by specialists to referring doctors.

In 2015–16, 10 per cent of PET-CT scans were inpatient services (funded mostly by NSW Health), 60 per cent were Medicare-funded outpatient services, and the remaining 30 per cent were privately referred outpatient services not funded by Medicare. Service costs for privately referred scans not funded by Medicare were met by a range of sources, including hospitals' general purpose funds and patient out-of-pocket charges. Across the five hospitals, out-of-pocket charges varied and ranged from $250 to $950 per scan.

While responsibility for providing PET-CT services has been delegated to Local Health Districts, NSW Health could assume an enabling role in collating performance reporting to inform service planning and benchmarking.

There was little equipment replacement planning for PET-CT scanners, making it unclear when and how equipment might be replaced, including what model of funding might apply.

Management of biomedical equipment

Improvement is needed in the timeliness of testing and maintenance for biomedical equipment. Outdated and inefficient information systems used for day-to-day management of biomedical equipment need to be improved or replaced.

Only about half of the items of equipment included in our sample had testing and maintenance completed according to scheduled intervals or within 30 days of the scheduled date. These intervals were set under the Australian/New Zealand Standard 3551 'Management programs for medical equipment', which requires regular testing and maintenance of biomedical equipment to ensure it is safe and suitable for clinical use.

The information systems used to record service histories of biomedical equipment were inefficient and inadequate for effective planning, monitoring and reporting of testing and maintenance. The implementation of a state-wide asset management system, Asset and Facilities Management Online (AFM Online), which will replace existing systems, has experienced delays. In addition, hospitals did not maintain adequate oversight of testing and maintenance that was outsourced to external contractors.

Management of PET-CT scanners

PET-CT scanners were well utilised and reports were promptly sent to referring doctors

PET-CT scanners in Liverpool, Westmead and Royal Prince Alfred Hospitals were utilised to over 85 per cent of capacity. Utilisation at Nepean Hospital (around 60 per cent) was lower due to the age of the equipment and insufficient 'uptake rooms' for patients to receive radioactive injections. Lismore Base Hospital had a lower population to service and scheduled its PET-CT patients into three days a week to optimise efficiency.

PET-CT services were generally available to patients in a timely way and reports were promptly sent back to referring doctors. While clinicians we interviewed advised that there was generally no delay in patients accessing PET-CT scanners, only one hospital collected patient waiting time data to confirm this view.

Funding of PET-CT scans is complex

The funding of health services in NSW public hospitals involves a complex arrangement between the Australian and NSW Governments. In 2015–16, 10 per cent of PET-CT scans were inpatient services (funded mostly by NSW Health), 60 per cent were Medicare-funded outpatient services, and the remaining 30 per cent were privately referred outpatient services not funded by Medicare. Service costs for privately referred scans not funded by Medicare were met by a range of sources, including hospitals' general purpose funds and patient out-of-pocket charges. Across the five hospitals, out-of-pocket charges varied and ranged from $250 to $950 per scan.

Better performance reporting could enable better planning of PET-CT scanners

NSW Health has delegated the planning functions for many pieces of high-value medical equipment, including PET-CT scanners, to Local Health Districts. This is intended to ensure local decision-making that is responsive to local community needs.

While local planning and service delivery is delegated to each Local Health District, under the *Health Administration Act 1982*, the Secretary of NSW Health is responsible for planning the provision of comprehensive, balanced and co-ordinated health services throughout New South Wales.

NSW Health could enable better service delivery and planning by collating and sharing performance information about PET-CT services across Local Health Districts.

Equipment replacement planning was unclear

Planning for future replacement of PET-CT scanners at the hospitals we examined was unclear, including when equipment would be replaced and what funding model might be applied. A better practice would be to have a clear equipment replacement plan for existing scanners that would ensure clarity about when equipment will be replaced, whether the replacement scanner should be leased, purchased or shared, and possible funding sources.

Management of biomedical equipment

Equipment testing and maintenance did not always comply with intervals set under the Australian/New Zealand Standard

All hospitals we examined adopted the Australian/New Zealand Standard 3551 'Management programs for medical equipment' (the Standard) for managing medical equipment, the purpose of which is to ensure that equipment is safe and suitable for use. The Standard requires the regular testing and maintenance of biomedical equipment at predetermined intervals.

Our review of three years of service records for 50 items of biomedical equipment found that:

- nineteen (38 per cent) items of equipment were tested and maintained within the intervals determined by hospitals under the Standard

- five (ten per cent) had at least one instance where they were tested and maintained less than 30 days later than when the work was due
- thirteen (26 per cent) had at least one instance where they were tested and maintained one to six months later than when the work was due
- six (12 per cent) had at least one instance where they were tested and maintained more than six months later than when the work was due
- seven (14 per cent) were lost, removed from clinical use or unable to be unidentified.

The Standard envisages that there may be circumstances when testing and maintenance does not occur according to schedule, and sets out a procedure that should be followed when testing and maintenance is overdue. This procedure was not followed in any of the hospitals we reviewed.

Two out of five audited hospitals used risk rating to oversee equipment maintenance

Only two out of five hospitals we examined used risk rating, under which equipment is classified according to clinical risk, to prioritise equipment maintenance and to determine appropriate frequencies for equipment testing and maintenance.

Some hospitals had inadequate oversight of work performed by external contractors

There was variable oversight of outsourced service contracts for high-risk biomedical equipment. In some cases, hospitals did not maintain complete histories of testing and maintenance work performed by contractors. Some contractors had incorrectly recorded items they had tested, or had refused to provide details of testing and maintenance performed.

New peer review process may improve assurance over testing and maintenance

NSW Health has started a peer review process in a small number of hospitals. This process covers a range of performance indicators relating to equipment management practices, including the auditing of test and maintenance records for two pieces of equipment per hospital. There is opportunity to build upon this effort by including all hospitals in the peer review process, and by expanding the sample of equipment subject to records audit.

Hospitals' record keeping of testing and maintenance service histories was inefficient and inadequate

The Standard requires that adequate and traceable equipment maintenance histories be kept. We found that hospitals' record keeping of equipment service histories was inefficient and inadequate. None of the hospitals used an information system that provided the full three-levels of capability outlined below:

- storing equipment information electronically, allowing easy retrieval
- managing service requests and holding full service histories and test results
- automatically generating reports to allow risk based prioritisation of equipment maintenance, repairs and replacements.

There is an urgent need to implement the state-wide asset management system for biomedical equipment

Hospitals advised that the current outdated systems will be replaced by a state-wide asset management system, Asset and Facilities Management Online, though this implementation has experienced delays.

There was good governance over equipment acquisition, replacement and disposal

All hospitals had formal processes for acquiring and replacing biomedical equipment, including management committees to oversee equipment needs. Equipment disposal processes were aligned with relevant standards and policies.

All hospitals purchased the majority of their biomedical equipment through HealthShare, the central procurement agency of NSW Health. This contributed to cost savings across the health system.

Recommendations

By June 2018

1. NSW Health should review all services provided by Local Health Districts which use high-value medical equipment (with establishment cost that exceeds $3 million), to determine whether state-level coordination, service benchmarking and equipment usage reporting is warranted.
2. NSW public hospitals offering PET-CT services should collect and use patient waiting time data (the difference between the date of referral and the actual date of the scan) as part of improving service efficiency and meeting patient needs.
3. Local Health Districts should ensure that there is a formal equipment replacement plan at the time of procuring high-value equipment, for both new and existing services. The plan should include an estimated time of replacement. The Ministry of Health should regularly review capital funding implications from these planned equipment replacements.

By June 2019

4. NSW public hospitals should review internal business rules and processes for biomedical equipment management to ensure that:
    a) equipment is accessible by service technicians for testing and maintenance work, including establishing internal processes to assist service technicians in gaining access to equipment that has missed previous testing and maintenance attempts in accordance with the Australian/New Zealand Standard 3551
    b) adequate maintenance records are kept, including descriptions of testing and maintenance work carried out in accordance with the Australian/New Zealand Standard 3551
    c) there is regular reporting to Local Health District Chief Executives on the compliance of equipment testing and maintenance, including equipment that is tested or maintained later than scheduled intervals
    d) there is specified statement of risk tolerance for late equipment testing and maintenance and mechanisms to appropriately prioritise equipment testing and maintenance.
5. The Ministry of Health should encourage that all NSW public hospitals have their biomedical equipment management practices reviewed under the new peer review process, and that the review sample from each hospital be increased to more than two pieces of equipment per hospital.
6. The Ministry of Health should complete the implementation of AFM Online for biomedical equipment management.

Introduction

Management of medical equipment in the NSW public health system

In New South Wales, responsibility for the management of public hospitals is devolved from the NSW Ministry of Health to 15 Local Health Districts and two Speciality Health Networks[1].The Secretary of NSW Health retains a function under the *Health Administration Act 1982* to plan the provision of comprehensive, balanced and co-ordinated health services throughout the State.

Every year, the Ministry of Health and Local Health Districts sign a service agreement that sets out the expected performance from Local Health Districts and the funding they will receive to provide their services. Under these arrangements, responsibility for managing medical equipment is delegated to Local Health Districts.

Medical equipment is used to diagnose, treat and manage patients. It includes items as diverse as patient beds, dialysis machines, operating tables and heart monitors. The good management of medical equipment contributes to ensuring patient care and safety, as well as keeping the cost burden on the public health system low.

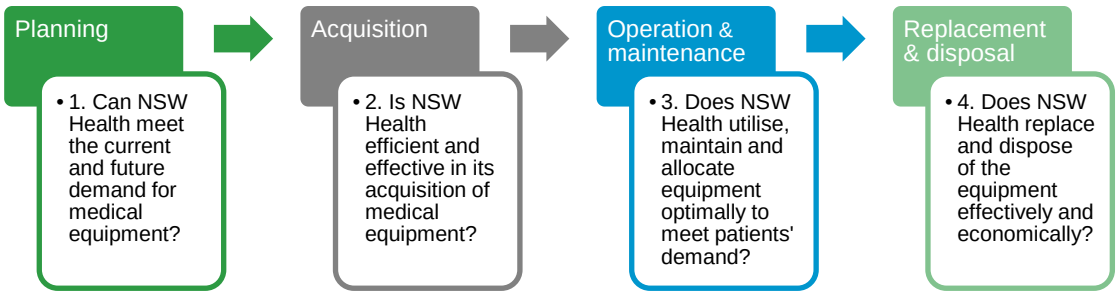
The New South Wales public health system uses a wide range of medical equipment. Most of this equipment is used in hospital settings, however, some is also used in community health centres and patients' homes. The cost of individual items ranges from less than $100 to several million dollars. In total, about $1.2 billion, or six per cent of NSW Health's total asset value, was for medical equipment.

The approach used to manage medical equipment varies between hospitals, and between expensive and less-expensive items. Different service models are also used, for example, some items may be purchased in one hospital, but leased in another.

About the audit

This audit assessed how well NSW public hospitals managed medical equipment to meet the needs of patients. We looked at the lifecycle of biomedical equipment, which comprises planning, acquisition, operation and maintenance, and then replacement and disposal. The audit questions in relation to each stage of the lifecycle are summarised in Exhibit 1.

Exhibit 1: Lifecycle management of equipment



[1] The 15 Local Health Districts serve specific geographic areas, while the two Specialty Health Networks - Sydney Children's Hospitals Network and Justice Health and Forensic Mental Health - provide care for specific groups of patients. In this report, we use the term 'Local Health Districts' to refer to both types of local bodies that are responsible for service delivery.

The audit had two parts:

- Part 1 examined the management of one item of high-value medical equipment – PET-CT scanners.
- Part 2 examined the management of biomedical equipment. This equipment is lower-value, but still clinically critical. We selected ten items of biomedical equipment at each of the five hospitals.

Given the inherent differences between specialised high-value PET-CT scanners and lower-value, higher-volume biomedical equipment, our findings focus on different audit questions to different degrees of detail.

In answering the third audit question for biomedical equipment, we have focused on testing and maintenance rather than utilisation and allocation. Because of the large volume and diversity in biomedical equipment, this type of equipment did not readily lend itself to being assessed for utilisation and allocation.

What is a PET-CT scanner?

Positron Emission Tomography (PET) is a form of medical imaging that allows a doctor to check for diseases in a patient's body. The scan uses a special dye that has radioactive tracers. These tracers are injected into a vein in the patient's arm and are then attracted to certain types of cells that are more likely to be diseased.

A Computed Tomography (CT) is an imaging procedure that provides visual information about bodily structures.

A PET-CT scanner has the combined capability of PET and CT. This allows the entire body to be scanned to detect conditions that may be missed through standard imaging methods and blood tests.

PET-CT scanners are mainly used in diagnosing cancer, planning cancer treatment and assessing the effectiveness of cancer treatment. Increasingly, doctors are using PET-CT scanners for other patient groups, including people with Alzheimer's disease and cardiology patients.

PET-CT scanners require patients to be injected with radioactive materials before being scanned. Throughout the process, there needs to be strict clinical protocols and physical barriers to limit radiation exposure. After being injected with the radioactive tracers, patients wait in an 'uptake' room to allow the radioactive material to accumulate in certain types of body tissue where tumours are more likely to be evident. These uptake rooms provide barriers to protect staff and patients from excessive doses of radiation. Accordingly, the availability of suitable uptake rooms is an important influence on a hospital's capacity to provide PET-CT scans.

The radioactive material used for PET-CT scans has a typical useful life of six hours from the time it is in the hospital. This means patients need to be scheduled efficiently to ensure the radioactive material is used to conduct as many PET-CT scans as possible within its six hour life. Only Royal Prince Alfred Hospital and Liverpool Hospital had on-site facilities to produce radioactive material. The other hospitals relied on radioactive materials being delivered each morning.

What is biomedical equipment?

Biomedical equipment is the term used in hospitals to describe all medical equipment other than specialised high-value equipment managed within clinical streams.
The biomedical equipment we reviewed as part of this audit included:

- anaesthesia monitors
- mobile x-rays
- fibroscans
- bedside monitoring systems

- vital sign monitors
- defibrillators
- ventilators
- surgical tables
- patient monitors
- haemodialysis machines.

Each hospital we examined manages large volumes of biomedical equipment. Lismore Base Hospital manages approximately 6,000 items, Liverpool, Nepean and Royal Prince Alfred hospitals each manage approximately 8,000 items, and Westmead Hospital manages approximately 16,000 items of biomedical equipment.

There is an Australian/New Zealand Standard that applies to the management of biomedical equipment. This is discussed in detail in section 2 of the Key Findings to this report.

Key findings

1. Management of PET-CT scanners

PET-CT scanners were well managed, though could be enhanced by better performance reporting and replacement planning.

Utilisation rates for scanners were highest in Liverpool, Westmead and Royal Prince Alfred hospitals (over 85 per cent of capacity at each), though lower at Nepean Hospital and Lismore Base Hospital. PET-CT services were generally available to patients in a timely way and reports were promptly sent to referring doctors. While clinicians advised that there was generally no delay in patients accessing PET-CT scanners, only one hospital collected patient waiting time data to confirm this view.

In 2015–16, 10 per cent of PET-CT scans were inpatient services (funded mostly by NSW Health), 60 per cent were Medicare-funded outpatient services, and the remaining 30 per cent were privately referred outpatient services not funded by Medicare. Service costs for privately referred scans not funded by Medicare were met by a range of sources, including hospitals' general purpose funds and patient out-of-pocket charges. Across the five hospitals, out-of-pocket charges varied and ranged from $250 to $950 per scan.

Performance reporting is frequently used in the health system to improve system planning and service delivery. This can be done through aggregate state-level data on system performance, or at the level of individual hospitals to allow service benchmarking. While responsibility for providing PET-CT services has been delegated to Local Health Districts, NSW Health could assume an active and enabling role in collating and sharing this performance information.

In most cases, planning for future replacement of PET-CT scanners was uncertain in terms of the timing of equipment replacement and funding sources. A better practice would be to have a clear equipment replacement plan for existing scanners, which would ensure clarity about when equipment will be replaced, whether the replacement scanner should be leased, purchased or shared, and possible funding sources.

Recommendations

By June 2018

1. NSW Health should review all services provided by Local Health Districts which use high-value medical equipment (with establishment cost that exceeds $3 million), to determine whether state-level coordination, service benchmarking and equipment usage reporting is warranted.
2. NSW public hospitals offering PET-CT services should collect and use patient waiting time data (the difference between the date of referral and the actual date of the scan) as part of improving service efficiency and meeting patient needs.
3. Local Health Districts should ensure that there is a formal equipment replacement plan at the time of procuring high-value equipment, for both new and existing services. The plan should include an estimated time of replacement. The Ministry of Health should regularly review capital funding implications from these planned equipment replacements.

1.1 Scanners were operated and maintained effectively

PET-CT scanners were well utilised

Of the hospitals included in the audit:

- Liverpool, Royal Prince Alfred and Westmead Hospitals utilised their scanners at over 85 per cent of potential capacity

- Nepean Hospital had a moderate utilisation of 61 per cent, due to older equipment and insufficient 'uptake' rooms for patients to receive radioactive injections
- Lismore Base Hospital's utilisation was only 32 per cent, due to lower demand than the metropolitan hospitals, which in turn meant that it only provided PET-CT services for three days per week.

Exhibit 2 shows our calculation of PET-CT utilisation based on data provided by each hospital.

Exhibit 2: Scans per PET-CT scanner per day, 2015–16

Hospital	Total scans*	Number of scanners	Average number of scans per day per scanner	Potential capacity**	Current utilisation (total scans divided by potential capacity) %
Lismore	1,100	1	6.4	3,430	32
Liverpool	3,243	1	13.1	3,430	95
Nepean	2,101	1	8.5	3,430	61
RPAH	5,890	2	11.5	6,860	86
Westmead ***	2,429	1	11.7	2,744	89

Note:

* The numbers in Exhibit 2 do not include standalone CT scans that were performed on PET-CT scanners by Lismore Base and Nepean Hospitals.

** Hospitals advised that their PET-CT scanner was unavailable on average five days per annum for routine maintenance. In calculating potential capacity, we assumed that equipment should be available 245 days in a year and each PET-CT scanner can service 14 patients per day. All hospitals we examined confirmed that this is a realistic reflection of their operating capacity.

*** Westmead's number is pro-rated to reflect one day per week allocated to the Children's Hospital Westmead.

Source: Audit Office analysis of data provided by hospitals.

There was limited data on patient wait times for PET-CT scans

Clinicians we interviewed during the audit advised that there was generally no delay in patients accessing PET-CT scanners. However, most hospitals did not collect patient wait time data to confirm this view.

Only Royal Prince Alfred Hospital collected data on the time patients waited for PET-CT scans, which is the difference between the date of scan that referring doctors requested and the actual date scanning takes place. This allowed the hospital to monitor its performance. The data show that in 2015–16, 54 per cent of scans at Royal Prince Alfred Hospital were undertaken on the date requested by the referring doctor, while 99 per cent of scans were undertaken within five days.

The consistent use of patient wait time data across hospitals would offer greater assurance that services are being provided in a timely way, as well as allow hospitals to benchmark their performance against like services.

Most scans were reported promptly and in line with clinical standards

Clinical standards[2] require that completed scans should generally be reported to referring doctors within 24 hours of the scan being completed. Exhibit 3 shows that across the hospitals we examined, 90 per cent of results were reported within 24 hours of the scan being taken. Only Royal Prince Alfred Hospital achieved 100 per cent completion of scan reports within 24 hours of the scan being taken.

Exhibit 3: Time from completion of scan to reporting by specialist, 2015–16

Performance indicator	Lismore	Liverpool	Nepean	RPAH	Westmead	Total
Percentage reported within 24 hours	81	98	73	100	89	90
Average time to report for those that are not reported within 24 hours (days)	2	4	3	N/A	3	3

Source: Audit Office analysis of data provided by hospitals.

[2] Issued by the Royal Australian and New Zealand College of Radiologists.

There was good oversight of PET-CT scanner maintenance and repair

Hospitals we examined had service contracts with equipment manufacturers or distributors for routine servicing and repair of scanners. Clinical staff responsible for administering PET-CT scans were also directly responsible for overseeing service contractors' work.

Based on service reports we inspected, there was good oversight of equipment maintenance and repair. There were about five days each year during which each PET-CT scanner was not used due to routine maintenance.

Hospitals monitored radiation exposure consistent with safety standards

All hospitals operating PET-CT scanners must meet Australian Department of Health accreditation standards, including those relating to radiation safety.

On our hospital site inspections, we observed that hospitals placed great emphasis on limiting radiation exposure for staff and patients around PET-CT services. Practices we observed included:

- personal radiation monitoring equipment, and mechanisms to review and limit exposure, such as rostering of staff
- services having dedicated radiation limiting dosage rooms. Some services also had capacity to remotely administer radioactive injections, special purpose waiting bays, and CCTV monitoring of patients during examination
- post-scan arrangements to limit public exposure to radiation, including extended waiting times post-scan for patients who intended to catch public transport.

1.2 Funding of PET-CT scans is complex

The funding of health services in NSW public hospitals involves a complex arrangement between the Australian and NSW Governments. In practice, this means:

- Services delivered to patients who present at Emergency Departments and / or are admitted as public patients are funded by NSW Health. For some patients who are admitted but consented to being admitted as private patients, service costs are partly recoverable from their Private Health Insurance.
- Services delivered to patients who are privately referred to a public hospital's outpatient clinic (where patients attend for diagnosis or treatment, but are not admitted to the hospital) are funded by Medicare[3], and if applicable, other sources such as Workers Compensation or patient out-of-pocket charges.

Exhibit 4 shows the number of PET-CT scans provided by hospitals we examined over three financial years for different patient types. PET-CT scans that were provided in outpatient clinics and were not eligible for Medicare rebate accounted for 25 per cent of total scans in 2013–14, and had increased to 30 per cent of total scans in 2015–16. The costs for a small number of these scans were recoverable from other sources such as Workers Compensation, while for the majority the costs were met by a range of sources, including hospitals' general purpose funds and patient out-of-pocket charges. Across the five hospitals, out-of-pocket charges varied and ranged from $250 to $950 per scan.

[3] For Australian residents with a valid Medicare card, who access services listed in the Medicare Benefit Schedule.

Exhibit 4: PET-CT scans provided to different patient types, across five hospitals

Patient types	2013-14	2014-15	2015-16
Emergency Department	3	4	3
Inpatient	1,168	1,353	1,440
Outpatient services eligible for Medicare	8,021	8,474	8,837
Outpatient services not eligible for Medicare	3,044	3,602	4,483
Grand total	**12,236**	**13,433**	**14,763**
Proportion of scans: Emergency Department and Inpatient (%)	10	10	10
Proportion of scans: Outpatient services eligible for Medicare (%)	66	63	60
Proportion of scans: Outpatient services not eligible for Medicare (%)	25	27	30

Source: Audit Office analysis of data provided by hospitals.

1.3 Services are planned locally, with minimal state-level coordination

Local Health Districts are responsible for planning local PET-CT services

In New South Wales, responsibility for delivering health services has been devolved from the Ministry of Health to Local Health Districts. This approach is intended to ensure that local decision-making is responsive to local community needs.

However, Local Health Districts do not have unfettered discretion in how they plan their local delivery of PET-CT services. To be eligible for funding under Medicare, the Australian Government Department of Health requires that PET-CT services must comply with a range of requirements, including that the service must be performed:

- by an appropriately qualified person
- in a comprehensive facility that can provide a full range of diagnostic imaging services and cancer treatment services
- using equipment that meets certain requirements
- only following a referral from a recognised physician or specialist consultant.[4]

Local Health Districts are also required to comply with NSW Health's Guide to the Role Delineation of Clinical Services ('the Guide'). The Guide describes the minimum support services, workforce and other requirements that must be provided to ensure the safe delivery of clinical services.[5] The Guide describes seven types of clinical services that require access to PET-CT scanners.[6]

These requirements of the Australian Government and NSW Health set the broad parameters within which Local Health District's plan and provide PET-CT services.

Demand for PET-CT scans grew from 2013–14 to 2015–16

Ensuring adequate supply of PET-CT services requires accurate measurement of current and future demand.

From 2013–14 to 2015–16, the demand for PET-CT scans increased in each of the hospitals we visited. As shown in Exhibit 5, the increase in the number of scans performed was:

- largest at Nepean Hospital (increasing 47 per over three years)
- followed by Lismore Base Hospital (29 per cent), Westmead Hospital (25 per cent) and Royal Prince Alfred Hospital (16 per cent)
- smallest at Liverpool Hospital (10 per cent).

[4] http://www.health.gov.au/internet/main/publishing.nsf/Content/pet-nuclear-medicine-imaging
[5] http://www.health.nsw.gov.au/services/pages/role-delineation-of-clinical-services.aspx
[6] These are: Nuclear Medicine, Haematology, Neurology, Medical Oncology, Radiation Oncology, Rheumatology, and General Surgery.

Exhibit 5: PET-CT scans provided, 2013–14 to 2015–16

Hospital	2013-14	2014-15	2015-16	Change (%)
Nepean	1,426	1,761	2,101	47
Lismore	856	1,104	1,100	29
Westmead	1,936	2,136	2,429	25
RPAH	5,064	5,335	5,890	16
Liverpool	2954	3,097	3,243	10

Source: Audit Office analysis of data provided by hospitals.

Demand for PET-CT scans is likely to continue to increase

Across the five hospitals we examined, 73 per cent of PET-CT scans were provided to patients aged 55 years and older. Almost one in three scans were provided to patients aged between 65 and 74 years.

The main recipients of PET-CT scans were cancer patients, though the technology is also increasingly used for Alzheimer's disease and in cardiology. The prevalence of cancer, Alzheimer's disease and heart disease all increase with age.

As the population of New South Wales ages, demand for PET-CT services is likely to increase. Local Health Districts will need to plan to meet this increased demand.

Performance reporting could inform planning and benchmark service delivery

In addition to information about current and future demand, planning needs to take into account how well existing performance meets service expectations.

Performance reporting is frequently used in the health system to inform system planning, as well as to improve service delivery. It provides a mechanism to evaluate the quality and efficiency of services. This can be done through aggregate state-level data on system performance, or at the level of individual Local Health Districts or hospitals.

Performance measurement also allows benchmarking between comparable hospitals. Different outcomes in performance can highlight good practice that can then be shared between services.

Our audit found no standardised performance reporting on PET-CT services. There was some sharing of good practice and experiences between Local Health Districts, though this was ad hoc, informal, and highly dependent on personal relationships between staff.

Some examples of performance measures that might be useful include rates of equipment utilisation, cost per scan, staffing per machine, and equipment age. Clinical outcomes data and measures of patient experience could also contribute to this reporting regime.

NSW Health could play an enabling role by facilitating more routine and standardised performance reporting across PET-CT services. This would be consistent with the role of the Secretary of NSW Health under the *Health Administration Act 1982 t*o plan the provision of comprehensive, balanced and co-ordinated health services throughout New South Wales.

1.4 Procurement processes were in place

NSW Health was effective at combining its purchasing power by mandating that Local Health Districts purchase new PET-CT scanners through NSW Health's state contracts with equipment manufacturers. Before a purchase were made, Local Health Districts were required to submit project documentation to the Ministry of Health for approval. This documentation included value-for-money assessments, such as:

- the anticipated benefits and service need from purchasing equipment
- a short list of different options for operating the equipment
- analysis of different options and the preferred options.

1.5 Equipment replacement planning was inconsistent and uncertain

Generally, there is a community expectation that once a type of health service is established, it will be maintained. Equipment replacement plans that set out when PET-CT equipment will be replaced, whether the replacement scanner should be leased, purchased or shared, and possible funding sources, would assist in promoting value for money in the continuity of service.

We found planning for the future replacement of PET-CT scanners was inconsistent and uncertain. For example, we found that Local Health Districts did limited planning to identify funding for the replacement of their PET-CT scanners.

Some Local Health Districts could clearly articulate how equipment replacement planning fitted within their local governance and budget processes. However, other Local Health Districts were far less clear, conveying a sense that equipment replacement was a matter that can be deferred to the future, at which time a solution might be found through political will, community support, and other ad hoc mechanisms.

Some clinicians were concerned by this lack of certainty around how crucial clinical equipment would be replaced. Clear planning for equipment replacement would offer greater assurance of future continuity of service in a value-for-money way.

2. Management of biomedical equipment

Improvement is needed in the timeliness of testing and maintenance for biomedical equipment. Outdated and inefficient information systems used for day-to-day management of biomedical equipment need to be improved or replaced.

Only about half of the items of equipment included in our sample had testing and maintenance completed according to scheduled intervals or within 30 days of the scheduled date. These intervals were set under Australian/New Zealand Standard 3551 'Management programs for medical equipment', which requires regular testing and maintenance of biomedical equipment to ensure it is safe and suitable for clinical use.

In addition, hospitals did not maintain adequate oversight of testing and maintenance that was outsourced to external contractors. Greater oversight is required of contractors responsible for managing high-risk equipment to ensure that testing and maintenance is performed and accurately recorded.

NSW Health recently started a peer review process in a small number of hospitals, covering a range of performance indicators relating to equipment management practices, including the auditing of test and maintenance records for two pieces of equipment per hospital. There is opportunity to build upon this effort by including all hospitals in this process, and by expanding the sample of equipment subject to records audit.

The information systems used to record service histories of biomedical equipment were inefficient and inadequate for effective planning, monitoring and reporting of testing and maintenance. The implementation of a state-wide asset management system, Asset and Facilities Management Online (AFM Online), which will replace existing systems, has experienced delays.

Recommendations

By June 2019

4. NSW public hospitals should review internal business rules and processes for biomedical equipment management to ensure that:
    a) equipment is accessible by service technicians for testing and maintenance work, including establishing internal processes to assist service technicians in gaining access to equipment that has missed previous testing and maintenance attempts in accordance with the Australian/New Zealand Standard 3551
    b) adequate maintenance records are kept, including descriptions of testing and maintenance work carried out in accordance with the Australian/New Zealand Standard 3551
    c) there is regular reporting to Local Health District Chief Executives on the compliance of equipment testing and maintenance, including equipment that is tested or maintained later than scheduled intervals
    d) there is specified statement of risk tolerance for late equipment testing and maintenance and mechanism to appropriately prioritise equipment testing and maintenance.
5. The Ministry of Health should encourage that all NSW public hospitals have their biomedical equipment management practices reviewed under the new peer review process, and that the review sample from each hospital be increased to more than two pieces of equipment per hospital.
6. The Ministry of Health should complete the implementation of AFM Online for biomedical equipment management.

2.1 Testing and maintenance was not always done within set intervals

We examined the maintenance histories of 50 items of biomedical equipment sampled from NSW Health's fixed asset register and hospitals' information systems. Ten were selected from each hospital. This sample was intended to be illustrative, rather than statistically significant.

While this section focuses on the scheduling and timeliness of testing and maintenance, it is important to acknowledge that there were a range of other factors that contributed to the management of biomedical equipment. These included incident management, acceptance testing, user training, professional training of biomedical engineers, systems and processes for alerts and notification, as well as biomedical governance.

Hospitals adopted the Australian/New Zealand Standard on biomedical equipment management

All hospitals had committed to comply with the Australian/New Zealand Standard 3551 'Management programs for medical equipment'[7] (the Standard). The Standard states:

> …throughout the lifetime of medical equipment in clinical use, there is a need for regular assessment and testing of the medical equipment to ensure it is safe, and continues to be safe, for its intended clinical application.

In addition to contributing to the safety and quality of healthcare, regular testing and maintenance also assists in minimising the whole-of-life costs associated with equipment, by prolonging the life of equipment and reducing repair costs.

Intervals for testing and maintenance were determined under the Standard

The Standard requires that, at the time of accepting biomedical medical equipment, hospitals should establish how regularly equipment testing[8] and maintenance[9] will be performed. This process is referred to as determining 'intervals' for equipment testing and maintenance.

The Standard requires hospitals to follow the intervals recommended by manufacturers. Where hospitals decide to deviate from a manufacturer's recommendation, the determined intervals must be supported by a rigorous and documented risk management process that is regularly reviewed.

The hospitals in this audit followed manufacturers' recommendations for equipment testing and maintenance. In most cases, this meant that hospitals committed to perform this work at 12-month intervals. For certain higher risk equipment, hospitals applied a six-month interval. For some lower risk equipment, a two-year interval was adopted.

Equipment testing and maintenance did not always meet intervals determined under the Standard

Our review found that only about half of the equipment items in our sample had their testing and maintenance completed in accordance with scheduled intervals or within 30 days of it being due. This is detailed in Exhibit 6 below.

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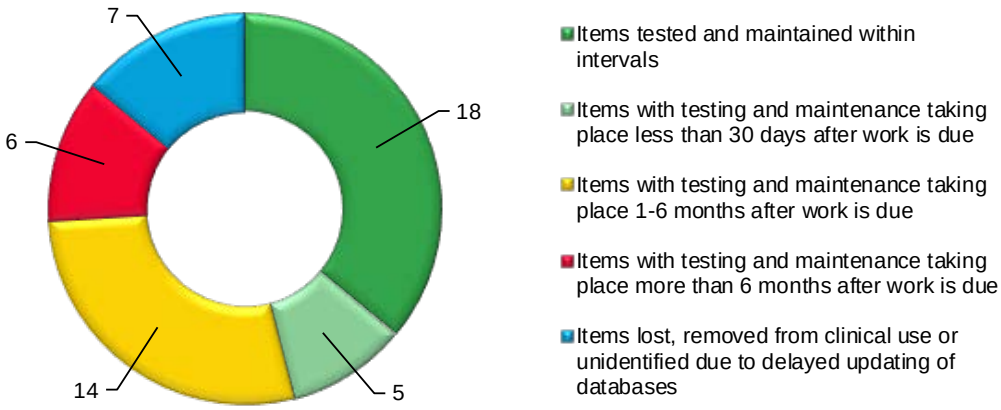
[7] AS/NZS 3551 is not referenced in legislation and does not have legal status. AS/NZS 3551 is a joint Australian/New Zealand Standard published by Standards Australia and Standards New Zealand, prepared by Joint Technical Committee HE-003, Medical Electrical Equipment. The committee contains representatives from a range of professional associations including the College of Biomedical Engineering Engineers Australia.

[8] 'Performance verification' as defined in AS/NZS 3551, which is testing of essential performance parameters of the medical equipment. This requires a range of physical, functional and electrical tests to confirm it is capable of performing safely and as intended by the manufacturer.

[9] 'Preventative maintenance' as defined in AS/NZS 3551, which is maintenance carried out at predetermined intervals, or according to prescribed criteria, intended to reduce the probability of failure or the degradation of the functioning of an item.

Exhibit 6: Equipment service history showing gaps in testing and maintenance intervals



Note: This result comprises of service history of 50 pieces of biomedical equipment over a three-year period (July 2013 to July 2016).
Source: Audit Office analysis of data provided by hospitals.

Hospital staff did not follow the correct procedure for overdue testing and maintenance

Biomedical engineers offered a range of reasons for late testing and maintenance. These included:

- **Difficulty in accessing or locating equipment:** This was usually because equipment was in use, was being transferred internally without notification to the biomedical engineering department, or was misplaced.
- **Biomedical equipment information systems were inadequate:** For example, where an information system did not efficiently track and report on testing and maintenance, thereby requiring biomedical engineering staff to be devoted to administrative tasks.
- **Insufficient human resources:** Some biomedical engineers expressed the view that complying with every test and maintenance interval for every item of equipment was impossible given the limited resources available to biomedical engineering departments.

The Standard recognises that there may be circumstances where equipment testing and maintenance is late, such as those outlined above. The Standard sets out a procedure that should be followed in these circumstances:

- the hospital is informed that testing and maintenance is late
- biomedical engineers agree with the clinical user of equipment on a mutually acceptable time for the overdue testing and maintenance to be performed.

Hospitals we examined did not follow this procedure. An alternative process was followed whereby technicians would make two attempts to attend to the equipment, without seeking assurance that it would be available on either attempt. If equipment remained inaccessible after these follow-up attempts, hospitals' policies placed responsibility on the clinical user for ensuring the biomedical engineering team was alerted to the availability of the equipment as soon as practicable.

Our interviews with hospitals' staff indicated that clinical users were not always aware of their responsibility and did not always meet it. The effectiveness of the existing follow up system varied depending on the utilisation of the equipment and the level of engagement between clinical users of equipment and biomedical engineers.

Hospital accreditation can supplement, but is not a substitute for, regular reviews or performance reporting

The safe application of medical equipment depends on a variety of factors including procurement and commissioning processes, user training and user verification procedures

prior to equipment use. The issues identified in our analysis demonstrate that, in addition to the existing safeguards, hospitals will benefit from having their equipment management practices reviewed regularly.

NSW Health advised that the Australian Council on Healthcare Standards, an accreditation agency of hospitals, has developed supplementary standards which include medical equipment management. The supplementary standards were not compulsory for hospital accreditation. At the time of this audit, two out of the five hospitals we examined had their medical equipment management assessed and accredited under these supplementary standards and one hospital had commenced accreditation. The remaining two hospitals advised that they were scheduled to be accredited under these supplementary standards in their next accreditation cycle, which is in approximately two to three years.

While we recognised the hospital accreditation process, in particular the supplementary standards, can support review of medical equipment practices, it is not a substitute for regular reviews, or performance reporting, as:

- Hospital accreditation reviews typically follow a four-yearly cycle. A four-yearly review of testing and maintenance of medical equipment may be insufficient, as most equipment is scheduled to be tested and maintained every 12 months.
- Out of the two hospitals that were accredited under the supplementary standards, the Local Health District Chief Executive for one hospital advised that accreditation reports tend to be short and in summary form; the Local Health District Chief Executive for the other hospital advised that the accreditation process focused on systems, processes and policy, rather than the detail that this audit went into.

NSW Health advised that the hospital accreditation process was embedded in internal processes and that hospitals were required to provide high level summaries of activities underway to improve biomedical equipment management.

New model of peer review may improve assurance about testing and maintenance

During our audit, NSW Health advised that it had recently introduced a peer review process to a limited selection of hospitals. This process covers a range of performance indicators relating to equipment management practices, including equipment testing and maintenance. In addition to auditing the testing and maintenance records of two pieces of equipment, the scope includes the following matters:

- whether these is a documented, planned and coordinated equipment testing and maintenance program
- whether equipment testing and maintenance had been carried out in accordance with this plan
- whether the deferred maintenance liability had been documented and evaluated.

There is opportunity to build upon this effort by including all hospitals in the peer review process, and by expanding the sample of equipment records that are audited.

2.2 Risk management and monitoring was inadequate

Only two hospitals used risk rating to oversee equipment maintenance

Only two of the five hospitals implemented risk ratings in the management of biomedical equipment, under which equipment was classified according to clinical risk. A third hospital had documentation about risk rating, but there was no evidence that it had been implemented. The two remaining hospitals advised that their existing equipment information systems did not support equipment risk rating.

In the context of biomedical equipment testing and maintenance, there are two primary uses of equipment risk rating:

- **The first was to guide a biomedical engineering department in prioritising testing and maintenance of high risk equipment on a day to day basis.** An effective risk rating process assists biomedical engineering departments to determine and track their

priorities in a way that minimises risks to patients associated with delayed testing and maintenance.

- **The second was to allow a biomedical engineering department to determine testing and maintenance intervals that deviate from equipment manufacturer's recommendations.** The Standard states that hospitals may extend the intervals they apply beyond a manufacturer's recommendation if the decision is supported by an assessment of risk. Hospitals may decide to extend testing and maintenance intervals for some equipment, to lower costs or allow their biomedical engineering team to focus on higher priority tasks.

The Ministry of Health advised that equipment risk rating would be incorporated into the Asset and Facilities Management Online (AFM Online), a state-wide asset management system that NSW Health had developed and was implementing. The risk rating to be used state-wide will be based on the risk rating used by the Children's Hospital at Westmead.

AFM Online is further discussed in section 2.4.

2.3 Oversight of external contractors' work was often poor

Some hospitals had inadequate oversight of work performed by external contractors

Some biomedical equipment in our sample was managed using service contracts with external contractors (often the manufacturer or distributor) who tested, maintained and repaired the equipment. The Standard recognises that service contracts may be used by hospitals to manage high-risk biomedical equipment and as a way of dealing with limited internal biomedical engineering resources. There is an expectation that service contracts are likely to become more common as biomedical equipment becomes more sophisticated and complex.

The use of external contractors can be appropriate, provided that the work is subject to oversight by hospitals and detailed records are kept. As one senior executive explained '…a service contract can be great, however, you need someone with expertise to oversee it.'

Some hospitals relied on external contractors to keep service histories of their equipment. The Standard requires health services to maintain their own complete service histories regardless of whether equipment was maintained in-house or by external contractors. The failure of hospitals to maintain these records means they may not be aware of the condition of equipment that was serviced by contractors. This may expose patients to clinical risks and poor health outcomes, particularly as service contracts are frequently used to maintain high risk equipment.

Some biomedical engineering department staff reported poor practices by external contractors, including instances in which providers had incorrectly recorded items they had tested, or had refused to provide details of testing and maintenance performed. This reinforces the need for hospitals to actively manage and monitor work performed under service contracts.

2.4 Record keeping processes and systems were inadequate

The Standard requires hospitals to keep records of testing and maintenance activities[10]. Without accurate and accessible records, it is difficult for biomedical engineers to

- efficiently schedule and prioritise their work
- self-audit and quality assure their work
- offer assurance that equipment is being tested and maintained to ensure it is safe and suitable for its intended clinical use.

As we found during this audit, without good recordkeeping, it is also difficult for third-parties to review and assure testing and maintenance processes for biomedical equipment. Despite our sample being limited to just ten items from each hospitals, we found that some hospitals were

[10] Section 2.5.3 of AS/NZS 3551:2012.

unable to provide service histories in a timely way. In some cases, it took months for complete information about service histories to be provided.

Some hospitals did not keep complete and accurate service histories

The records provided to us by some hospitals did not clearly and consistently identify the activities performed on items of equipment. For example, several biomedical engineers told us they assumed testing and maintenance had been performed in relation to a number of 'repair' database entries, even though there was no mention of these activities in the database. Testing and maintenance activities were often recorded inconsistently between equipment items and even within the records for the same equipment item.

Biomedical equipment information systems were inefficient and outdated

At Nepean and Westmead Hospitals, records were maintained using a combination of a paper based filing system and an unsupported information system developed in the early 1990s. Lismore Base Hospital used an unsupported version of the same system, also in combination with a paper based filing system.

At Liverpool Hospital, maintenance records for several items were not tracked on a biomedical engineering information system at all, with service records consisting only of scanned service reports saved to a network drive. Royal Prince Alfred Hospital used the same system as Liverpool Hospital, although it had developed and customised the system to allow for tracking and reporting on testing and maintenance, and electronic entry of testing and maintenance reports.

Exhibit 7 depicts three capability levels of information systems to support biomedical equipment management, and shows the level of capability of information systems in each hospital. None of the hospitals used an information system that provided the full three-levels of capability outlined below.

Exhibit 7: Current capability of equipment information systems

Hospital	Level 1	Level 2	Level 3
	System stores basic information on equipment, including serial number and other identifiers, and installation date	System is used to make and respond to service requests System contains full maintenance history and test results	System provides framework for risk-based prioritisation of maintenance or repairs System provides framework for risk-based prioritisation of equipment replacement
Lismore	✓	O	X
Liverpool	✓	O	X
Nepean	✓	O	O
RPAH	✓	✓	O
Westmead	✓	O	X

Note: ✓means there is current capability, O means there is some capability, X means there is no capability.

Source: Audit office research and findings based on hospital visits.

There had been slow progress toward a state-wide asset management system

Since 2009, NSW Health had been developing the AFM Online asset management system. This was intended to be a state-wide 'one-stop-shop' for all asset management at both the state (Ministry of Health) and local (hospital) level. It included a module for managing biomedical equipment.

Local Health Districts and hospitals recognised that their existing biomedical equipment management systems were inefficient and outdated. However, they had delayed upgrading

these existing information systems in anticipation of AFM Online being implemented for biomedical equipment management.

AFM Online was made available to Local Health Districts in 2014–15, but none of the hospitals we examined had implemented it to manage biomedical equipment. We were told that there were significant challenges, including a lack of resources, in aligning the AFM Online software with local processes for biomedical equipment management.

2.5 Acquisition, disposal and replacement processes were sound

Centralised procurement of biomedical equipment saved money

All hospitals we examined used HealthShare, NSW Health's centralised shared services organisation, to purchase in bulk the majority of their biomedical equipment. HealthShare purchases were made based on NSW Health's 'state contracts' with equipment manufacturers.

The use of state contracts resulted in savings from bulk purchases, as all Local Health Districts consolidated their purchasing power to improve their bargaining position with equipment manufacturers. For example, financial data for the purpose of electromedical equipment under state contract 956 showed savings of $1.38 million, or 26 per cent, compared to the maximum price of the equipment before the contract. This contract was one of 88 such state contracts managed by HealthShare.

HealthShare advised that there were further benefits from the use of state contracts beyond monetary savings, such as reduced task duplication, and the consolidation of logistical and storage requirements associated with equipment purchases.

There was good governance of equipment acquisition and disposal

The hospitals we examined had formal processes governing biomedical equipment acquisition and disposal.

Equipment that needed to be replaced was identified by a hospital's biomedical engineering department, on the basis of one or more of the following considerations:

- an item's projected replacement date
- an item's repair history, which could indicate whether it would be more cost effective to replace than to maintain
- a manufacturer's end of support notification (stating that the manufacturer will not maintain the item or provide spare parts beyond a certain date)
- a notification from a nursing unit manager, subsequently affirmed by a technician, that the equipment required replacement.

Hospitals' processes for approving the replacement of equipment were tailored and proportionate to the value of the equipment. Replacement of low value equipment (valued at under $10,000) was generally processed by the biomedical engineering department. A procurement and asset management committee was responsible for approving the replacement of medium-value equipment (valued between $10,000 and $250,000 in most hospitals we examined), while high value equipment (over $250,000 in most hospitals we examined) replacement requests were escalated to a more senior committee with broader planning responsibilities.

If equipment was new to a hospital, a procurement or planning committee must approve the purchase. In deciding whether to give approval, the committee considered whether the equipment would generate sufficient revenue to justify the purchase, or whether there was a clinical, research or other justification. A trial process was followed before a vendor was selected, with equipment being tested on-site and results logged on a state-wide database. At the hospitals we examined, equipment disposal processes were aligned with Australian Standards, NSW Health's Goods and Services Procurement Policy, and the NSW Environment Protection Authority's hazardous equipment guidelines.

Inefficient data system limited hospitals' ability to plan for equipment replacement

Due to the large number of biomedical equipment items, planning for such equipment is considered as part of each hospital's annual asset strategy.

There was a large amount of data available on the service history of biomedical equipment, but this data could not be efficiently queried and used for planning purposes. Given that planning for biomedical equipment replacement was partly based on service history, it was difficult for hospitals to identify equipment that should be replaced rather than repaired.

Identifying this equipment requires hospitals to have systems and processes in place that identify equipment with a high rate of failure. These systems and processes did not exist in the hospitals we examined. A more efficient data system and automated reporting will enable improved planning.

Appendices

Appendix 1: Response from NSW Health

NSW GOVERNMENT Health

Margaret Crawford
Auditor-General of NSW
NSW Audit Office
GPO Box 12
SYDNEY NSW 2001

Your ref PA6586
Our ref S17/233

Dear Ms Crawford Margaret

Final Performance Audit Report on Management of Medical Equipment

I am writing in regard to your letter of 26 April 2017 providing a copy of the final performance audit report on *Management of Medical Equipment in NSW Public Hospitals*.

This performance audit confirms the priority being placed on improving asset management in NSW Health. Health supports the report's recommendations as they align with our existing asset management initiatives including the reporting on medical equipment maintenance within the Asset and Facilities Management (AFM) Online information system. This system is currently being implemented across all our hospitals to improve the oversight and management of medical equipment assets.

I would also like to clarify that all public patients who access PET-CT services as part of their inpatient services are treated free of charge in NSW public hospitals. Where out-of pocket charges for privately referred non-inpatients occur, they relate to instances where the scan does not meet the Commonwealth Medicare rebate requirements. In these situations the treating doctor will bill the privately referred non-inpatient directly for the cost of providing the scan.

Attached to this letter is a table outlining NSW Health's response to the individual report recommendations. I note that this letter and the attached table will be incorporated into the published report, which will be tabled in Parliament on 25 May 2017.

I would like to thank you and your team for working with NSW Health over the course of the audit program.

Yours sincerely

Elizabeth Koff
Secretary, NSW Health
24/5/17.

NSW Ministry of Health
ABN 92 697 899 630
73 Miller St North Sydney NSW 2060
Locked Mail Bag 961 North Sydney NSW 2059
Tel. (02) 9391 9000 Fax. (02) 9391 9101
Website. www.health.nsw.gov.au

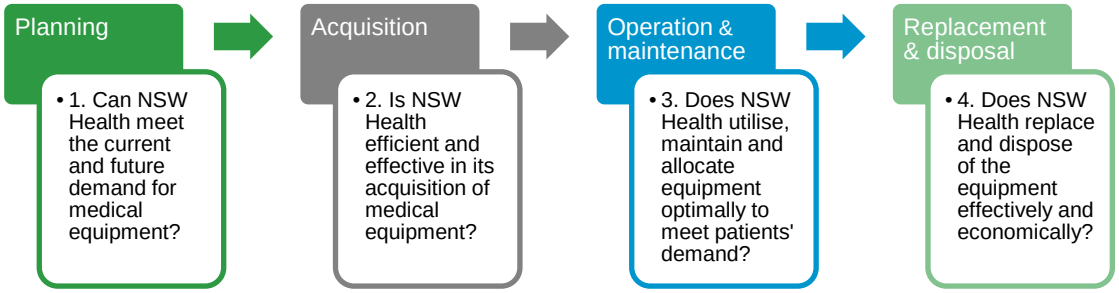
Audit Office Recommendation	NSW Health Response	
By June 2018		
1. NSW Health should review all services provided by Local Health Districts which use high-value medical equipment (with establishment cost that exceeds $3 million), to determine whether state-level coordination, service benchmarking and equipment usage reporting is warranted.	**Supported with qualification**	Health will review services where warranted. Guidance for clinical service planning is provided in the NSW Health Guide to the Role Delineation of Clinical Services. The NSW Framework for New Health Technologies and Specialised Services (GL2017_004) has clear criteria and processes on services/technologies that require state-wide consideration.
2. NSW public hospitals offering PET-CT services should collect and use patient waiting time data (the difference between the date of referral and the actual date of the scan) as part of improving service efficiency and meeting patient needs.	**Supported with qualification**	Health is ensuring that there is timely access to services based on clinical need. There is no clear evidence that patient access is an issue for PET-CT services. The improvement of patient scheduling systems to support efficient business processes should be encouraged and this will need further consideration in relation to other clinical and corporate IT systems being rolled out.
3. Local Health Districts should ensure that there is a formal equipment replacement plan at the time of procuring high-value equipment, for both new and existing services. The plan should include an estimated time of replacement. The Ministry of Health should regularly review capital funding implications from these planned equipment replacements.	**Supported**	The requirement to submit a formal equipment replacement plan is already in place as part of the NSW Health Process of Facility Planning (POFP) policy. LHDs submit the plan to the Ministry of Health as part of either the annual submission process for Locally Funded Initiatives or Asset Strategic Plans.
By June 2019		
4. NSW public hospitals should review internal business rules and processes for biomedical equipment management to ensure that:	**Supported**	NSW Health has commenced the review of business rules and processes for biomedical equipment management in line with the ongoing implementation of the Asset and Facilities Management (AFM) Online system. Health's new State-wide Asset Management Unit will support this review and the system implementation.
a. equipment is accessible by service technicians for testing and maintenance work, including establishing internal processes to assist service technicians in gaining access to equipment that has missed previous testing and maintenance attempts in accordance with the Australian/New Zealand Standard 3551	**Supported**	AFM Online will support the process of accessing equipment for regular testing and maintenance. Technicians and nursing staff carefully balance the risk to patients arising from unavailability of equipment.

Audit Office Recommendation	NSW Health Response	
b. adequate maintenance records are kept, including descriptions of testing and maintenance work carried out in accordance with the Australian/New Zealand Standard 3551	**Supported**	The AFM Online system is supporting this ongoing improvement process.
c. there is regular reporting to Local Health District Chief Executives on the compliance of equipment testing and maintenance, including equipment that is tested or maintained later than scheduled intervals	**Supported**	Health is implementing performance reporting for biomedical equipment management through the AFM Online system.
d. there is specified statement of risk tolerance for late equipment testing and maintenance and mechanisms to appropriately prioritise equipment testing and maintenance.	**Supported**	Health will further develop its existing standards for risk tolerance. Health is already prioritising equipment testing and maintenance and the AFM Online system has been configured to provide advanced capability this area.
5. The Ministry of Health should encourage that all NSW public hospitals have their biomedical equipment management practices reviewed under the new peer review process, and that the review sample from each hospital be increased to more than two pieces of equipment per hospital.	**Supported**	Every four years, all NSW public hospitals undergo an independent accreditation process. All five audited hospitals have been or are scheduled to be accredited through a process that includes a review of medical equipment management, which includes the ongoing cycle of maintenance. To complement the independent hospital accreditation process, the new State-wide Health Asset Management Unit will support internal reviews under inclusion of a peer review process.
6. The Ministry of Health should complete the implementation of AFM Online for biomedical equipment management.	**Supported**	The AFM Online implementation for biomedical equipment is progressing and is planned to be completed by June 2019.

Appendix 2: About the Audit

Objective and focus

This audit assessed how well NSW public hospitals manage medical equipment to meet patients' demand. The audit criteria are based on an asset life-cycle model, as shown below.



This audit has two parts:

- The first part of the audit covers the various stages of asset life cycle for one type of high-value equipment, the Positron Emission Tomography and Computed Tomography (PET-CT) scanners.
- The second part of the audit was a data-based audit of a sample of commonly used biomedical equipment. The audit sample was selected using NSW Health's Fixed Asset Register and hospitals' legacy information systems. The approximate original value of the audit sample for each hospital is $500,000.

We examined the following five public hospitals:

- Lismore Base Hospital – Northern NSW LHD
- Liverpool Hospital – South Western Sydney LHD
- Nepean Hospital – Nepean Blue Mountains LHD
- Royal Prince Alfred Hospital – Sydney LHD
- Westmead Hospital – Western Sydney LHD.

We chose these hospitals to reflect a cross-section of inner-metropolitan, suburban, and regional populations. They are all large hospitals (Royal Prince Alfred, Westmead, Liverpool and Nepean Hospitals are 'principal referral hospitals', which are the largest type of hospital). Lismore Base Hospital is the only hospital outside the Newcastle-Sydney-Wollongong region to have a PET-CT scanner.

Audit exclusions

The audit did not examine:

- clinical reasons for using or not using medical equipment
- clinical outcomes as a result of using medical equipment
- the merits of Government policy objectives.

Audit methodology and approach

Our performance audit methodology is designed to satisfy Australian Audit Standards ASAE 3500 on performance auditing. The Standard requires the audit team to comply with relevant ethical requirements and plan and perform the audit to obtain reasonable assurance and draw a conclusion on the audit objective. Our processes have also been designed to comply with the auditing requirements specified in the *Public Finance and Audit Act 1983*.

Our audit approach included:

- Review and analysis of data and documents, policies and procedures
- Site visits of the Nuclear Medicine or Medical Imaging Department and the Biomedical Engineering Department of each hospital

- Interviews with key NSW Health personnel
- Advice from an external expert consultant.

Acknowledgements

We gratefully acknowledge the cooperation and assistance provided by the various agencies that are part of NSW Health:

- NSW Ministry of Health
- Lismore Base Hospital – Northern NSW LHD
- Liverpool Hospital – South Western Sydney LHD
- Nepean Hospital – Nepean Blue Mountains LHD
- Royal Prince Alfred Hospital – Sydney LHD
- Westmead Hospital – Western Sydney LHD.
- HealthShare
- NSW Biomedical Engineering Group (BMEG)
- eHealth.

Audit team

Xin Yin Ooi and Matthew Blunt conducted this performance audit. Michael Thistlethwaite, Andrew Hayne and Kathrina Lo provided oversight and quality assurance. The Audit Office engaged Shane Rendalls from Synergy Health & Business Collaborative to provide subject matter support for the PET-CT component of the audit.

Audit cost

Including staff costs, consultancy, travel and overheads, the estimated cost of the audit is $352,000.

Performance auditing

What are performance audits?

Performance audits determine whether an agency is carrying out its activities effectively, and doing so economically and efficiently and in compliance with all relevant laws.

The activities examined by a performance audit may include a government program, all or part of a government agency or consider particular issues which affect the whole public sector. They cannot question the merits of government policy objectives.

The Auditor-General's mandate to undertake performance audits is set out in the *Public Finance and Audit Act 1983*.

Why do we conduct performance audits?

Performance audits provide independent assurance to parliament and the public.

Through their recommendations, performance audits seek to improve the efficiency and effectiveness of government agencies so that the community receives value for money from government services.

Performance audits also focus on assisting accountability processes by holding managers to account for agency performance.

Performance audits are selected at the discretion of the Auditor-General who seeks input from parliamentarians, the public, agencies and Audit Office research.

What happens during the phases of a performance audit?

Performance audits have three key phases: planning, fieldwork and report writing. They can take up to nine months to complete, depending on the audit's scope.

During the planning phase the audit team develops an understanding of agency activities and defines the objective and scope of the audit.

The planning phase also identifies the audit criteria. These are standards of performance against which the agency or program activities are assessed. Criteria may be based on best practice, government targets, benchmarks or published guidelines.

At the completion of fieldwork the audit team meets with agency management to discuss all significant matters arising out of the audit. Following this, a draft performance audit report is prepared.

The audit team then meets with agency management to check that facts presented in the draft report are accurate and that recommendations are practical and appropriate.

A final report is then provided to the CEO for comment. The relevant minister and the Treasurer are also provided with a copy of the final report. The report tabled in parliament includes a response from the CEO on the report's conclusion and recommendations. In multiple agency performance audits there may be responses from more than one agency or from a nominated coordinating agency.

Do we check to see if recommendations have been implemented?

Following the tabling of the report in parliament, agencies are requested to advise the Audit Office on action taken, or proposed, against each of the report's recommendations. It is usual for agency audit committees to monitor progress with the implementation of recommendations.

In addition, it is the practice of Parliament's Public Accounts Committee (PAC) to conduct reviews or hold inquiries into matters raised in performance audit reports. The reviews and inquiries are usually held 12 months after the report is tabled. These reports are available on the parliamentary website.

Who audits the auditors?

Our performance audits are subject to internal and external quality reviews against relevant Australian and international standards.

Internal quality control review of each audit ensures compliance with Australian assurance standards. Periodic review by other Audit Offices tests our activities against best practice.

The PAC is also responsible for overseeing the performance of the Audit Office and conducts a review of our operations every four years. The review's report is tabled in parliament and available on its website.

Who pays for performance audits?

No fee is charged for performance audits. Our performance audit services are funded by the NSW Parliament.

Further information and copies of reports

For further information, including copies of performance audit reports and a list of audits currently in progress, please see our website www.audit.nsw.gov.au or contact us on 9275 7100.

audit office
OF NEW SOUTH WALES

Our vision

Making a difference through audit excellence.

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To help parliament hold government accountable for its use of public resources.

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Purpose – we have an impact, are accountable, and work as a team.

People – we trust and respect others and have a balanced approach to work.

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Level 15, 1 Margaret Street
Sydney NSW 2000 Australia

t +61 2 9275 7100
f +61 2 9275 7200
e mail@audit.nsw.gov.au
office hours 8.30 am–5.00 pm

audit.nsw.gov.au

audit office
OF NEW SOUTH WALES