Queensland Audit Office

Queensland public hospital operating theatre efficiency

Volume One

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Queensland Audit Office

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The Honourable P Wellington MP
Speaker of the Legislative Assembly
Parliament House
BRISBANE QLD 4000

Dear Mr Speaker

Report to Parliament

This report is prepared under Part 3 Division 3 of the *Auditor-General Act 2009*, and is titled Queensland public hospital operating theatre efficiency, volume one and volume two.

In accordance with s.67 of the Act, would you please arrange for the report to be tabled in the Legislative Assembly.

Yours sincerely

Andrew Greaves
Auditor-General

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Summary

In 2014–15, Queensland's public hospitals delivered elective surgery to 125 566 patients. A further 60 485 patients were admitted for emergency surgery. These surgeries were performed across 234 operating theatres in the 51 public hospitals that are managed by 16 Hospital and Health Services (HHSs) and the Mater Health Services.

Surgery waiting lists are again starting to increase, as the demands on our health system grow, particularly from an ageing population. The Department of Health (the department) reported that the number of people waiting longer than clinically recommended for elective surgery fell from a high of 7 042 patients in February 2013 to a low of 175 in June 2015. By December 2015, the number of patients waiting longer than clinically recommended had increased to 356. The total numbers waiting for elective surgery (not just long waits) had increased from 30 782 in June 2014 to 37 617 in December 2015.

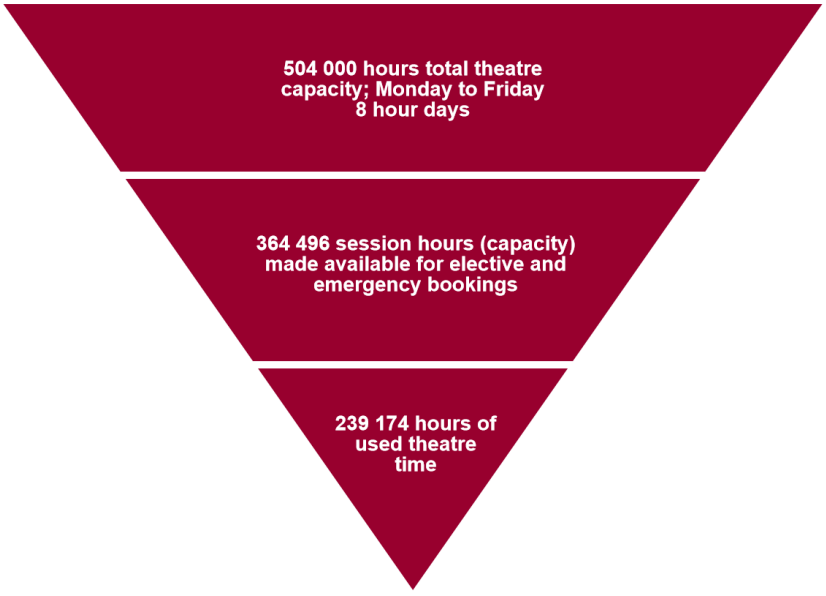
Hospitals do not use their operating theatres all day, every day. They use them in blocks of time, called sessions. Sessions are either half day — approximately four hours — or full day — approximately eight hours. Each session can involve surgery on one or more patients. Sessions also are designated as either elective — where the procedure is not critical to saving the patient's life or limb — or as emergency, where urgency is categorised on a scale to determine access priority.

The *Hospital and Health Boards Act 2011* (Qld) (the Act) makes the Board and management of each HHS responsible for delivering efficient health services. The use of their hospitals' operating theatres is one important dimension of efficiency. Each HHS determines who they make responsible for managing their theatres. Typically, they delegate this responsibility to individual hospital administrators or to theatre management committees.

Theatre capacity and throughput is subject to external constraints, outside of the direct control of theatre managers. The need for planned maintenance is the first of these, but overall demand for surgery at a particular hospital is also a constraint, as is lack of bed capacity or a limited supply of staff — particularly in rural hospitals. The need for medical training also has an impact. Queensland public hospitals are important centres for training and this remains a critical component of an effective healthcare system.

After taking account of capacity constraints, the remaining time is available for theatre sessions. Figure A is one example of how the theatre capacity is utilised in a peer group of public hospitals.

Figure A
Peer group example of theatre infrastructure utilisation



Source: Queensland Audit Office

An efficiently run theatre will maximise the use of its available time by:

- starting sessions on time
- minimising the changeover time between surgeries
- minimising the cancellation of surgeries or premature termination of sessions due to unplanned maintenance or lack of staff.

Efficiency, in this sense, can be tracked by computing the utilisation rate for each theatre — the percentage of time the theatre is used compared to the time it is made available for use. HHSs use a variety of measures to monitor their theatre performance, including such utilisation rates. They set their own efficiency targets and are not required to report on their theatre efficiency to the department. However, the department advocates a better practice benchmark of 85 per cent for theatre utilisation.

The heads of agreement between the Commonwealth and jurisdictions signed on 1 April 2016 at the Council of Australian Government meeting extended aspects of the National Healthcare Agreement and the National Health Reform Agreement. It reinforces the need for HHSs to increase their focus on cost efficiency, because state and territory governments will take greater responsibility for funding shortfalls. Therefore, the cost of running their operating theatres is another key measure that demands careful management and monitoring by each HHS.

In this audit we assessed how efficiently 39 of Queensland's 51 public hospitals are managing their 221 public operating theatres to deliver emergency and elective surgical services. The 39 hospitals in scope all use the same operating room management information system. The remaining hospitals are small or remote hospitals that use a different operating room management information system.

We analysed whether the systems and practices they use to manage, monitor and report on their theatre efficiency are effective. To enable comparability we standardised the definitions of key efficiency metrics and applied these consistently to hospitals. This has meant that for some hospitals our analysis differs from their own internal reports on their efficiency.

We also grouped the hospitals we examined into 'peer groups' in the body of this report to allow better like for like comparisons. Appendix E explains these Australian Institute of Health and Welfare peer groups.

Conclusions

Public hospitals can substantially improve their theatre efficiency, both by increasing utilisation and by better managing their costs of surgery. That more can be done with existing theatre infrastructure is indicative of the potential cost savings that can be realised in the system.

Improving theatre utilisation will also help to ameliorate the growing elective surgery waiting list. In terms of cost avoidance, utilising existing theatres is also a better way to deal with increasing demand for surgical services than investing in new theatre infrastructure.

Across the state, theatres were used on average only 73.7 per cent of the available time in elective sessions. This compares unfavourably to the better practice benchmark target of 85 per cent. Hospital management are not paying sufficient attention to the use of their theatres with the result that:

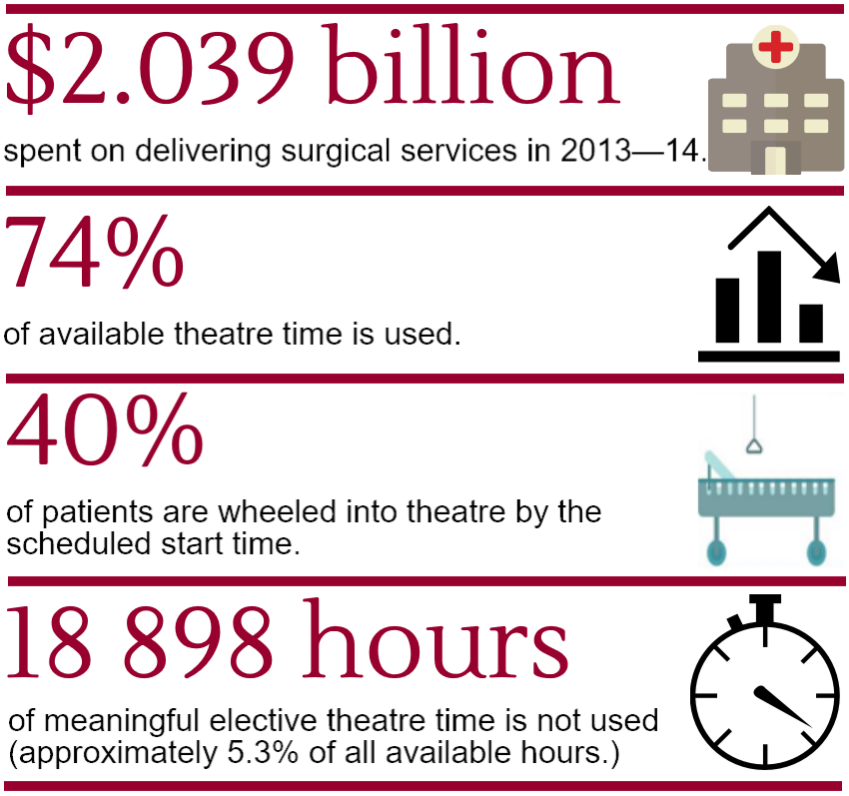
- too many sessions do not start on time
- the changeover time between many surgeries takes too long
- sessions close early and surgery cancellations are not well managed.

In addition, not all HHSs are actively seeking to minimise their surgery costs. This is largely because decision-makers do not have access to the timely, accurate costing information they require to better allocate resources. They are hampered by unreliable data in their internal activity-based cost reports.

The lack of agreement on a consistent suite of theatre activity measures, targets and standardised definitions also limits opportunities for intrastate and interstate benchmarking. Benchmarking, done well, can highlight where HHSs can improve their theatre performance, and would allow them to better target their improvement strategies.

Operating theatre cost-efficiency

Figure B
Queensland's public hospital operating theatres
July 2014 to December 2015



Source: Queensland Audit Office

The hours that theatres are available are not always within the direct control of a HHS. For example, smaller rural and remote hospitals close theatres because they provide fewer services and lack the demand to justify providing more surgical time.

Larger hospitals have greater demand for services, access to more staff and more inpatient beds for surgical patients to recover, and so should be able to better manage such externalities. However, during the 18 months to December 2015, the larger regional and metropolitan hospital theatres were idle at times because their theatre staff were not available, they had not allocated funding to run the sessions, maintenance was being carried out or low patient demand. This idle theatre time totalled 33 310 hours, which equates to a 17 theatre hospital operating for a year.

Across the state, theatres were used only 73.7 per cent of their available elective session times. Actual utilisation rates varied between 41.9 per cent in the worst performing hospital to 82.2 per cent at the best performing

In comparison, the better practice target of 85 per cent utilisation already makes allowance for changeover between patients but it assumes minimal down time, such as sessions starting late or finishing early. The gap between actual performance and this target shows clearly that scope remains for all hospitals to improve their productivity.

For the 18 month period to 31 December 2015, we estimate that 18 900 hours of available theatre time was unused across the 39 in-scope hospitals. This is a conservative estimate, as we computed this by considering only sessions that were not fully used for at least two hours — the two hour metric being approximately the average length of all surgeries performed over July 2014 to December 2015.

This is the equivalent of 7 874 elective operations of the average 129 minutes, including adding time to change over the theatre for the next patient. As at 31 December, 37 617 people were waiting for elective surgery.

Hospitals are only able to use this time if there is sufficient demand for surgery in the specialty allocated to the session and bed capacity in the hospital. After excluding these constraining factors, the relatively lower rates of theatre utilisation experienced arose from one or a combination of the following:

- late starts — only 40.4 per cent of hospitals wheeled their first patient (first session) into the operating theatre by the scheduled start time, and only 7.1 per cent started the first procedure by the scheduled start time.
- changeover taking longer than the 15 minutes scheduled between sessions — the average time taken for elective surgery changeovers was 18.5 minutes, and 25.9 minutes for emergency surgery.
- finishing the session early — 16.9 per cent finished more than one hour earlier than scheduled, mainly because of patient or hospital initiated cancellations.

These three factors are much more within the control of each HHS and can be better managed. Volume 2 of this report sets out the results for each of these factors by HHS.

Late starts

Although HHSs interpret start time differently, for consistency in analysis we measured the start time as the time staff wheel patients into the operating theatre. It is at this time that the theatre becomes occupied and unavailable to another patient. Our approach results in some hospitals appearing more or less efficient than their own internal reporting indicates.

Queensland has the lowest percentage of on time starts when compared with public hospitals from New South Wales and Western Australia, the only two jurisdictions with publically available information. Between July 2014 and December 2015, only 40.4 per cent of hospitals wheeled the first patient (first session) into the operating theatre by the scheduled start time, and only 7.1 per cent started the first procedure by the scheduled start time.

Late starts by an hour or more contributed to 2 835 sessions running over by more than an hour. Sessions running over can incur time off in lieu or overtime payments to theatre staff.

Starting late also has a significant downstream effect on subsequent surgeries. Regardless of whether the patient or hospital contributed to the delay, one and a half times as many subsequent surgeries were cancelled than when the first session started on time.

Longer changeover between patients

Changing over the theatre between patients is necessary. The theatre is cleaned, unsterilised equipment is removed and clean equipment is brought in. An efficient changeover time is within the control of the hospital and relies upon staff being available, the next set of equipment being ready and the following patient being appropriately prepared for surgery.

Longer changeovers put pressure on the team to finish their surgery list by the session finish time to avoid either overtime or cancellations.

Approximately 85.3 per cent of changeover times are booked for the benchmark average time of 15 minutes, and 9.4 per cent of changeovers were booked for 10 minutes. But actual experience did not reflect these targets. The average time taken for elective surgery changeovers was 18.5 minutes, and 25.9 minutes for emergency surgery.

The changeover time between emergency operations is about 50 per cent longer than elective surgery. Hospitals can actively reduce this by preparing consumables and locating surgical tools and theatre staff as soon as they become aware of the next planned emergency surgery.

Early finishes

Sessions also finished at least an hour early 16.9 per cent of the time. Generally, hospitals finish surgery early because of cancellations — not because of low patient demand or under-scheduling. Hospitals cancel surgeries because the theatre team determine there is not enough time to undertake the next operation or an emergency operation requires the theatre resources, such as the surgeon.

Emergency surgery is one of the most common reasons hospitals cancel elective surgery. Such hospital initiated cancellations can be reduced through improved staff scheduling approaches. Few hospitals roster sufficient staff later into the afternoon or early evening to allow for unplanned overruns. Such approaches may require budget or human resource reallocations.

Managing performance

Administrators are not always providing useful performance information to their theatre teams, or actively managing theatre under-utilisation. Most theatre management committees have access to theatre performance information, but it is used inconsistently and rarely for driving change. Hospitals that did give relevant information to their theatre staff observed improvements in their theatre use, which reinforces the importance of sharing information in driving better performance.

Hospitals also are not actively managing the root causes of late starts or excessive changeover times. Fifteen of the 29 hospital staff we spoke with stated that their hospitals did not manage underperformance well. They reported that late starts have become common practice and the culture is not conducive to starting on time.

In addition, Queensland public hospitals complicate performance comparisons across the state by interpreting definitions and measures differently, such as the definition for starting on time. This precludes the use of benchmarking across the state.

Understanding the cost of surgical services

Queensland hospitals are not always accurately recording the information about the surgical services patients receive. The Australian Government has defined nationally consistent standards — called Diagnostic Related Groups (DRGs) — for coding patient records in a clinically meaningful way.

Accurate costing and coding of patient episodes of care is required for hospitals and HHSs to:

- get paid accurately for the services they deliver
- understand their type and mix of patients treated (casemix)
- plan for expected demand
- support medical research and accurate statistical analysis.

Coding teams have not implemented robust audit and educational programs because of the limited staff numbers applied to this and subsequent time pressures. This is contributing to errors in the coding of surgical services that misrepresent the level of care provided and hamper the ability for administrators to effectively plan for, and understand, their casemix. The errors we noted are primarily for patients with multiple and complex conditions.

The costing of surgical services and reporting on this to theatre managers are not done well, and at times the results are misleading. Hospitals are not producing cost reports in a timely manner due to delays in obtaining patient-level clinical system information. The time taken by hospitals to validate patient data is protracted because there is often insufficient information to accurately attribute actual costs to a patient. Because the clinical systems and cost models used are not always giving accurate cost results, little reliance is placed on this information for monitoring or managing costs.

Financial incentives to drive efficiency

The health reforms introduced in 2012 funded hospitals on an activity basis, rather than a population based formula. The intent of the reform was that if a HHS delivers the service at a cost less than the price they are paid, they get to reinvest and accumulate those funds. If they are unable to deliver surgery for the price they are paid, they will incur a loss and must subsidise the cost from more cost-efficient services.

Activity based funding has not yet driven the cost efficiencies expected. Some HHSs are paid less than the fixed price set by the department — Queensland Efficient Price (QEP) — because historically they have proven their ability to deliver more efficiently. Less efficient HHSs get paid more than the QEP. Based on the 2013–14 surgical costing data, only five of 16 HHSs provided their surgical services at or below QEP.

Recommendations

Theatre performance

We recommend that all HHSs:

1. facilitated by the Department of Health, develop and implement a single suite of agreed upon definitions, performance measures and targets to support HHSs and hospitals to manage, benchmark and improve theatre performance
2. require their theatre management committees (or equivalent) to monitor the efficient use of theatres and to provide regular easy to read and relevant performance reports to their theatre staff. Reports should include upstream and downstream pressure points, such as delays in preparing the patient for the anaesthetic team and a lack of Intensive Care Unit beds
3. clarify and formally communicate roles, responsibilities and accountability for delivering efficient surgical services, both operationally and strategically.

We recommend that the Department of Health:

4. issue the definitions, performance measures and targets that the HHSs agree upon as guidance to hospitals and provide education and implementation support to help hospitals improve their theatre efficiency.

Theatre planning

We recommend that all HHSs:

5. require their hospitals to regularly review their theatre schedules to ensure supply of specialty theatre sessions best matches their demand for services
6. revise surgery staff rosters to minimise late starts, early finishes and hospital initiated cancellations on the day of surgery.

Theatre data quality

We recommend that all HHSs:

7. undertake rigorous data quality audits and train staff to ensure they enter data consistently and accurately.

Medical coding

We recommend that all HHSs:

8. improve the framework supporting coding in hospitals by:
    - ensuring their hospitals develop a comprehensive internal coding audit program, in conjunction with the HHS's internal audit function, that focuses on quality and standardisation
    - undertaking a formalised and structured peer reviewing program.

Costing/funding

We recommend that all HHSs:

9. improve the accuracy and timeliness of patient-level costing of hospital services and provide meaningful reports to directors and to the theatre management committee.

We recommend that the Department of Health:

10. reviews the purchasing incentives to encourage efficiency and reward better performing HHSs.

Reference to comments

In accordance with s.64 of the *Auditor-General Act 2009*, a copy of this report was provided to all HHS Chief Executives, the Chief Executive of the Mater Hospital and the Director–General for the Department of Health with a request for comments.

Their views have been considered in reaching our audit conclusions and are represented to the extent relevant and warranted in preparing this report.

The comments received are included in Appendix A of this report.

1. Context

Queensland's Hospital and Health Services (HHSs) provide surgical services to the public. The audit focused on publicly funded emergency and elective (scheduled) surgical services provided through 39 public hospitals across the state. The number of patients admitted for surgical services in these 39 hospitals in 2014–15 represents approximately 93 per cent of all public patients admitted for surgery in Queensland.

Public hospitals

Of Queensland's 169 public hospitals, 51 have operating theatres. Statewide, there are 234 public hospital operating theatres. Hospitals vary in size, capacity and the clinical services they provide. The Australian Institute of Health and Welfare categorises hospitals into peer groups based on shared characteristics, such as the 'types of services provided'. These categorisations enable valid comparisons between Queensland's public hospitals based on their purpose, resources and role. Appendix E describes these characteristics and outlines which peer groups the 39 Queensland public hospitals selected for our analysis fall into.

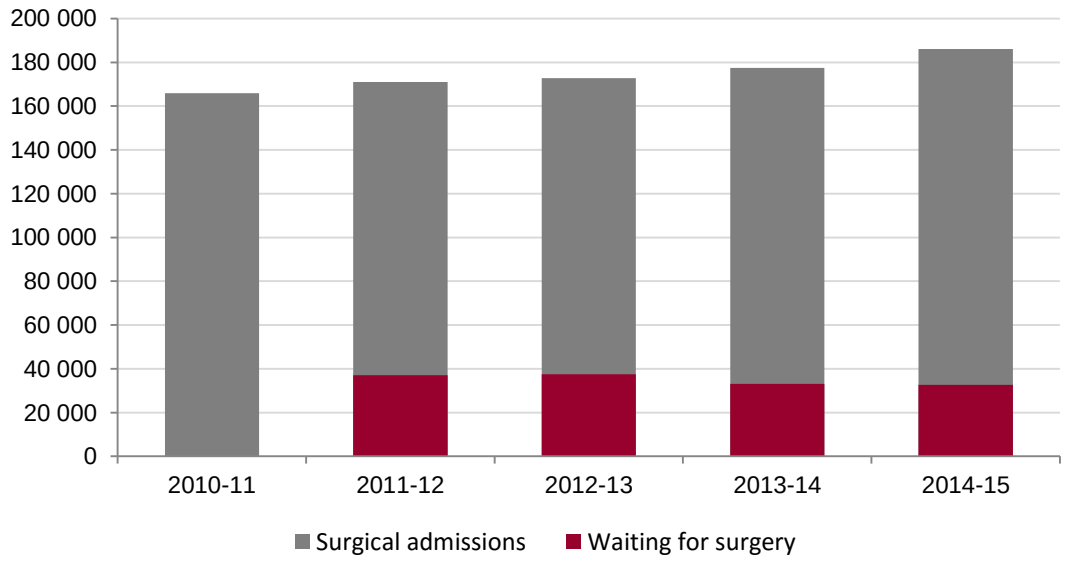
Increasing demand for public hospital services

The Australian Medical Association's 2015 public hospital report card found that public hospital capacity is not increasing with demand from population growth and the associated demand for services.

In Queensland, over the last four years, the average number of patients waiting for surgery has risen from 36 626 to 37 617, as at December 2015. The department did not collect patient-level waitlist data before 2012. The summary level data held by the department has been excluded because of the significant caveats and the department's concerns over its accuracy.

Figure 1A shows the number of surgeries performed has increased from 165 860 to 186 051 (12.17 per cent) over the last five years.

Figure 1A
Statewide patients admitted to hospital vs waiting for surgery over five years



Notes: This data excludes unqualified newborns, posthumous organ procurements and hospital boarders. Waitlist data is not available for 2010–11. This data includes all public hospital patients in Queensland from reportable hospitals. Reportable hospitals have fluctuated over time.

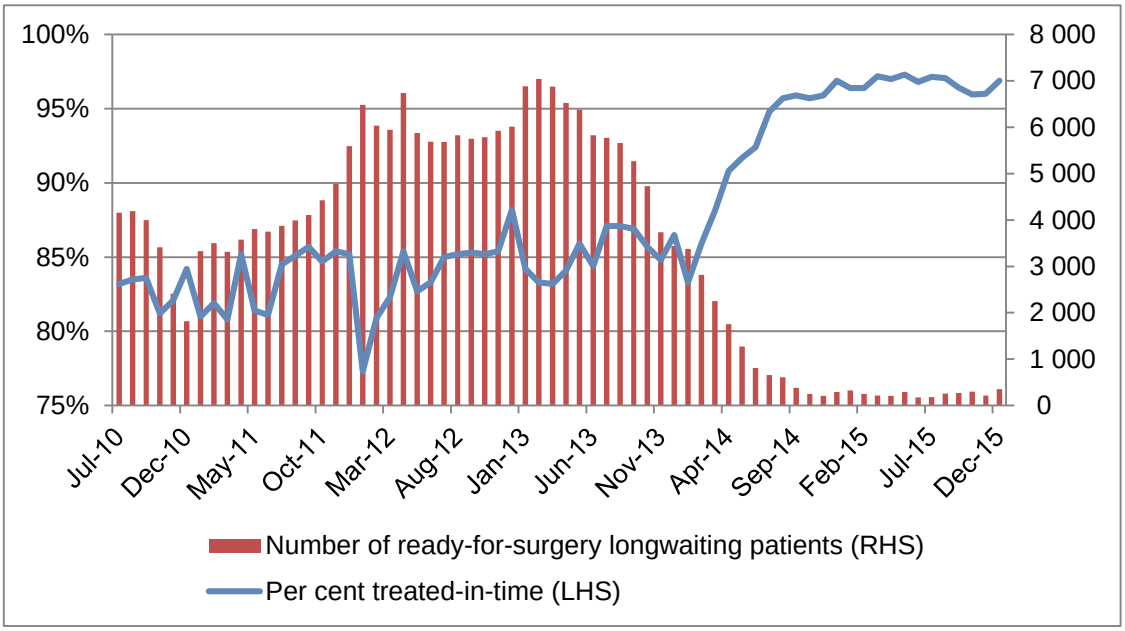
Source: Queensland Audit Office from Department of Health

Despite this growth in demand, the public hospital system has reduced the number of people waiting longer than the clinically recommended time to receive their surgery. Figure 1B shows the number of patients ready for care who were waiting longer than clinically recommended has reduced from a peak of 7 042 in February 2013 to 356 as at 31 December 2015. While near to their lowest point in the last five years, the numbers are growing and it demonstrates there is still a high level of demand for surgical services. The renewed rises in long-waiting patients was driven by one hospital adding a new surgical service and another hospital reducing patient throughput while transitioning to becoming a digital hospital.

Hospitals reported they reduced the long waitlist through combinations of:

- increasing the number of available sessions during the day and outside standard working hours
- conducting more overtime instead of cancelling elective patients
- outsourcing to the private sector
- better waitlist auditing to ensure patients were ready for care and hadn't received surgery elsewhere
- improved categorisation against national benchmarks, ensuring more accurate reflection of clinical urgency.

Figure 1B
Number of long-waiting patients July 2010–December 2015

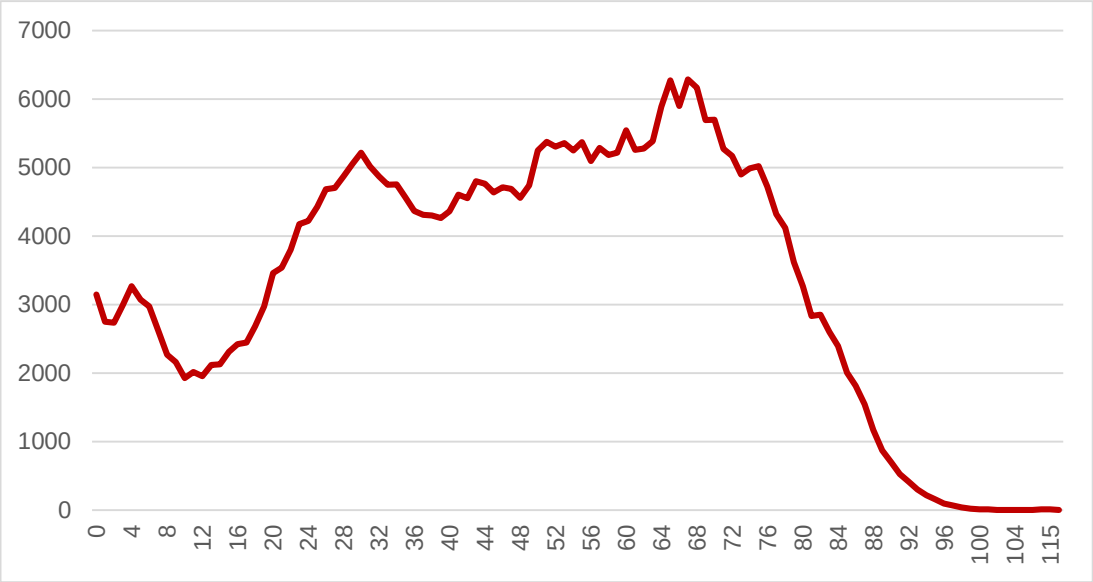


Source: Healthcare Improvement Unit, Department of Health

Australia's ageing population is also contributing to the increase in demand for public health services. Figure 1C shows the age distribution of Queensland's surgical patients initially spikes between 20 and 36 years of age and then starts to significantly rise after 52 years of age, spiking at 64 to 68 years before declining. The first spike is driven by females, the second spike is led slightly by males.

The Australian Bureau of Statistics August 2015 population summary estimated that 14 per cent of the Queensland population (659 799 people) were aged 65 and over. In 2014, the Australian Institute of Health and Welfare estimated that by 2053, 21 per cent of the population will be aged 65 and over. This population projection is expected to place added strain on the ability of hospitals to meet the rising demand for services. Figure 1C shows that 27.7 per cent (6 276 patients) of Queensland's surgical patients were aged over 65.

Figure 1C
Age of surgical patients across 39 in-scope hospitals July 2014–December 2015



Notes: The spike 24–36 years of age represents female patients receiving obstetrics or gynaecological surgery

Source: Queensland Audit Office from ORMIS data July 2014 to December 2015

Healthcare roles and responsibilities

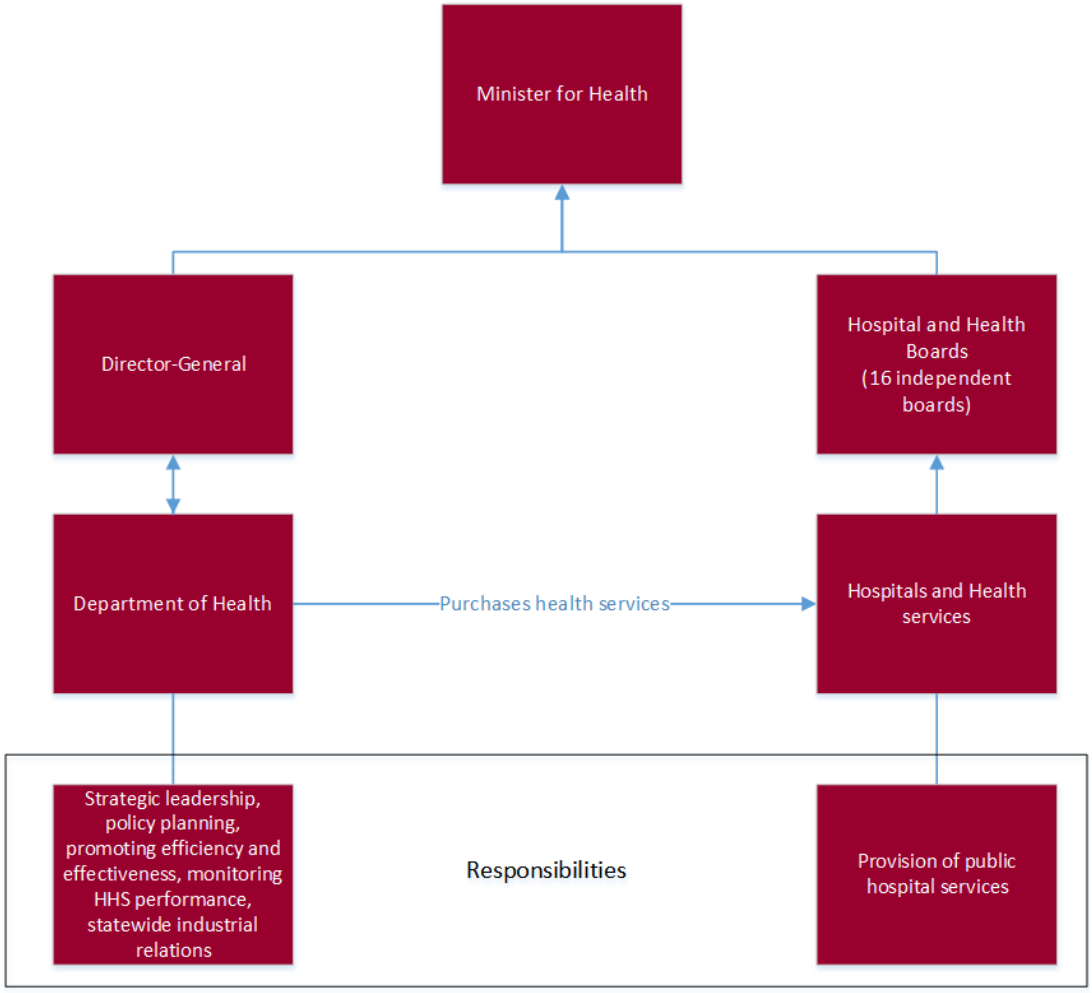
The state government is accountable for the delivery of hospital services in Queensland and funded approximately 61 per cent of services in 2014–15. The Australian Government funded approximately 28 per cent, with the balance from user charges and other revenue.

The *Hospital and Health Boards Act 2011* (Qld) established the HHSs as statutory bodies from 1 July 2012 and assigned responsibility for:

- the efficient, effective and economical delivery of health services to the 16 independent Hospital and Health Boards (HHBs), who in turn administer their HHSs
- overall management for the public sector health system, including promoting the effective and efficient delivery of health services, to the Department of Health.

Figure 1D shows the allocation of health responsibilities in Queensland.

Figure 1D
Queensland's health structure and responsibilities



Source: Queensland Audit Office

The department purchases health services from each HHS based on a service agreement. The department holds each HHS accountable for performance against the standards and measures in the service agreement.

The Hospital and Health Service Performance Management Framework sets out the systems and processes that the department employs to fulfil its responsibility as the system manager. These processes include, but are not limited to, assessing and monitoring HHS performance and intervening to manage identified performance issues.

The department's responsibilities include the:

- provision of statewide health system management
- planning, coordination and standard setting.

Responsibility for theatre usage

HHSs are responsible for delivering efficient, effective and economical health services. This includes ensuring hospitals manage and use theatres efficiently and effectively. HHSs establish and monitor their own theatre efficiency targets, but are not required to report their theatre efficiency to the department.

HHSs determine who is responsible for managing theatres, including usage, and can delegate this responsibility to individual hospital administrators or theatre management committees. Theatre management committees generally meet on a monthly basis and consist of the director of surgery, nursing director, anaesthetic director, nurse unit manager/s, clinical nurse consultant, elective surgery coordinator, data manager/administrator and other relevant staff.

The department, as the overall health system manager, is responsible for monitoring the service performance of HHSs. The department monitors HHSs' surgical output activity and their cost of care — it does not monitor or report the efficiency of public hospitals' theatres.

The department sponsors a number of statewide clinical networks including the Statewide Surgical Advisory Committee (SAC) and the Statewide Anaesthesia and Peri-operative Care Clinical Network (SWAPNET) to:

- inform health service policy and clinical practice aimed at delivering consistent, efficient and effective best practice surgical care
- monitor the adequacy of workforce supply, address the imbalance between service capacity and demand, and develop new workforce strategies.

Network membership is multidisciplinary, comprising representatives of specialty groups across metropolitan, regional and rural Queensland, general practice, private practice, professional colleges and societies, quality committees and consumers.

The department provides dedicated network coordination and facilitates the delivery of network priority programs.

Together, these bodies are uniquely placed to oversee and drive statewide theatre efficiency programs and share better practice process. However, neither of these bodies are providing oversight or driving improvements to assist in theatre efficiency. They focus on high level strategic outcomes, such as the number of long-waiting patients.

Health reforms

From 2009, the Australian, state and territory governments collaborated on major reforms to address growing healthcare demand and to provide Australian states with additional financial support.

In 2011, the Commonwealth and all state and territory governments entered into the National Health Reform Agreement, enabling major reforms to the funding and delivery of health services. Under the agreement, hospitals no longer receive funding for the length of a patient's stay and the service provided. Rather, funding is related to the patient's diagnosis — for example, funding is provided for a hip replacement. The reform encouraged hospitals to become more efficient in treating patients. It removed the financial incentive to over-service by giving additional tests or interventions or keeping patients in hospital longer than necessary.

The current agreement was due to expire on 1 July 2017. On 1 April 2016, the Commonwealth and jurisdictions signed a heads of agreement to a limited extension to 30 June 2020. Under the heads-of-agreement, the Commonwealth of Australia will continue to fund 45 per cent of efficient growth. However, payments in dollar terms will now be capped; details of how the cap will operate is due to be determined by December 2016. The changes are expected to give state and territory governments more responsibility to fund public hospital services and meet any funding shortfalls.

Reducing surgery wait times

The National Partnership Agreement on Improving Public Hospital Services (the NPA) sits under the National Health Reform Agreement and runs until 30 June 2017. The NPA was established to improve efficiency and capacity in public hospitals. It established benchmarks — the National Elective Surgery Target (NEST) — and incentive payments to reduce the number of patients waiting longer than clinically recommended for elective surgery. The NPA set a gradually increasing performance target on reducing the number of patients waiting longer than clinically recommended for surgery. The target was to have no patients waiting longer than clinically recommended by 31 December 2015. Queensland came closest to achieving this in June 2015, when only 175 patients were waiting longer than clinically recommended. As at 31 December 2015, the number increased to 356 patients.

The department requires each HHS to independently manage its own surgical waiting list. The larger hospitals within a HHS commonly manage their own waitlist independently of other hospitals within their HHS. For example, the majority of The Prince Charles Hospital surgical waitlist is managed independently of the waitlists of the Royal Brisbane and Women's, Redcliffe and Caboolture Hospitals, which are all in the Metro North HHS.

Since the introduction of activity based funding (ABF) and NEST, hospital efficiency has progressively improved. Queensland public hospitals have increased the number of patients treated within the clinically recommended time.

Delivering health services efficiently

As system manager, the department has a statutory responsibility under the *Hospital and Health Boards Act 2011*, to promote the effective and efficient use of available resources in the delivery of public sector health services in the state. One way the department does this is by purchasing healthcare at an efficient price.

ABF began in 2012 under the National Health Reform Agreement. ABF facilitates a purchaser-provider model that separates the functions of funding and delivering health services. This separation is important for improving awareness of the cost of delivering health services. The aim of ABF is to shift from reimbursing hospitals for the costs they incur, regardless of what they deliver, to paying them to deliver efficient health services.

The department uses ABF to purchase health services from 13 HHSs at a fixed price (Queensland Efficient Price). The remaining three HHSs are block funded (similar to a fixed grant) due to their geographic location, lower patient numbers and fewer services offered. Appendix C explains the purchasing mechanism. In any one particular year, hospitals are able to cross-subsidise loss-making surgical services from more profitable services to balance their budgets. If a hospital is not able to deliver their services at the set efficient price they will incur a financial deficit.

Public hospitals have financial incentives to drive efficiency in this way, while maintaining high clinical safety standards. However, public sector clinical staff have no individual financial incentives to improve efficiency. Public sector specialists' salaries are not at direct risk from inefficient performance, but equally they are not rewarded for improving efficiency. They do not have performance indicators relating to theatre efficiency, for example, starting on time, maximising theatre utilisation and minimising cancellations.

In contrast, the private sector pays specialists on a fee for service basis that encourages them to be efficient with their time, while maintaining high clinical and safety standards, for example, to reduce unplanned returns to surgery.

Avoidable costs

Despite the National Health Reform Agreement driving improvements in managing cost, independent research conducted by the Grattan Institute in 2014, on 2010–11 data, suggests there is still potential for substantial savings by reducing avoidable costs across all hospital services. Avoidable costs include over-priced supplies, delays caused by cancellations on the day of surgery, late starts, poor rostering and scheduling, inefficient patient flow and patients staying longer than expected or required.

The Grattan Institute reported that Queensland in 2010–11 had the highest amount of avoidable costs, totalling just over $260 million, compared to all other Australian jurisdictions (New South Wales was the second highest with an estimation of just over $250 million).

Operating theatres

An operating theatre (theatre) is a hospital facility used for elective surgery, emergency surgery and other interventions. Hospitals schedule elective surgery into sessions run in the morning (first session), afternoon (second session) or for a full day (all day session). Each session can contain more than one surgery depending on its complexity. When patients are booked into a session they receive a letter advising them of their scheduled surgery and the preparations they need to make.

Currently, HHSs mix delivering their elective surgery cases that have no planned overnight stay (day cases) with overnight stays. Overnight stays are generally more complex, take longer and are higher risk — requiring the patient to remain under observation and care. Same day cases are generally short, low risk procedures.

Theatre teams

Theatre teams include surgeons and anaesthetists (visiting medical officers or staff specialists), registrars, anaesthetic technicians, scrub and scout nurses, and other support staff and trainees.

Hospitals assign anaesthetic and nursing staff to theatres using one of two approaches:

- in teams linked to a specialty. This allows staff to develop a close rapport with other theatre staff and to refine their skill set in one specialty, aiding in reducing changeover time and anticipating the specialist's needs. This can result in a more efficient use of theatre time.
- random approach based on staff availability. Limited effort is made to develop a small, close-knit team. The focus is on ensuring staff have broad skills and can work effectively in any specialty with all staff. This gives the hospital greater flexibility and can reduce the rates of cancellations due to lack of staff. However, this approach can result in procedures and change over time taking longer, resulting in inefficiencies.

Theatre costs

Approximately $2.039 billion was spent on surgical services in 2013–14 (about 16 per cent of the entire health budget). This included wages, depreciation and maintenance costs.

Theatre costs vary depending on the length and complexity of the surgery performed and include fixed and variable costs. Fixed costs, such as building and equipment, do not change and hospitals have limited control over these expenses in the short term. Variable costs include consumables, disposable instruments and staff. Hospitals can control variable costs by managing the usage of their theatres, effective purchasing and efficient rostering practices. All three strategies to control variable costs, if successful, lead to lower average costs per unit of activity.

Theatre management information systems

Queensland public hospitals record patient demographics and information about a patient's surgical history in theatre management systems. Theatre management systems include information such as the time the patient was admitted or wheeled into the operating room. The larger public hospitals use the department's operating room management information system (ORMIS). Theatre staff manually enter data into ORMIS and therefore, data quality is subject to the accuracy of the information manually entered.

Theatre performance

The high cost of running operating theatres and the fact that people are waiting longer than clinically recommended are sufficient reasons to ensure they're used efficiently. Efficient theatres also enable hospitals to manage their wait lists and are likely to result in more patients treated on time, as well as reduced cancellations from session over-runs.

At best, public hospitals use a suite of performance measures to assess the performance of their theatres. Outcome based measures focus on performing surgeries in a safe and timely manner. Output measures focus on the number of patients that have had surgery and the number of minutes a theatre is used.

Unlike New South Wales and Victoria, Queensland has no statewide performance measures for the efficiency of public hospital theatres. Performance measures that do exist focus on safety and the patient's experience, such as performing surgery for a fractured hip within two days.

Figure 1E lists a selection of theatre performance measures used by New South Wales. Other states in Australia measure theatre performance but do not publish their measures.

Figure 1E
New South Wales performance targets

Performance measure	Performance targets	Explanation
Starting on time	*NSW Ministry of Health:* At least 95 per cent of first cases are wheeled in the theatre on or before the scheduled start time. *WA Audit Office:* Measured the percentage of first patients wheeled into theatre or anaesthetised within 10 minutes of the scheduled start time.	Surgeries are booked to start at a specified time. Starting the first session on time provides the remaining surgical list the greatest opportunity to be completed on time and reduces the likelihood of cancelling surgery later in the day.
Elective surgery cancellations	*NSW Ministry of Health:* Less than two per cent of elective surgery is cancelled on the day of surgery. *WA Audit Office:* Measured the percentage of elective surgery cancelled on the day of surgery.	Surgery can be cancelled either by the hospital or by the patient. Hospital initiated cancellations can be caused by a lack of medical staff, equipment failure, no inpatient beds and emergency surgery. Patient initiated cancellations can be due to patients falling ill, failing to attend, failing to prepare appropriately or because they no longer require surgery. Late cancellations limit the ability of hospitals to fill the vacancy. Frequent cancellations put pressure on treating patients within the clinically recommended time.
Theatre utilisation	*NSW Ministry of Health*: Operating theatres are used 80 per cent of the available time. *WA Audit Office:* Measured the percentage of time operating theatres are used.	Elective surgeries are commonly booked to begin at 8.30 am and finish at 5.00 pm. This measure focuses on minimising the changeover time between surgeries (when theatres are cleaned and sanitised) and ensuring procedures, such as administering anaesthetics or positioning the patient for surgery, start promptly.

Source: Queensland Audit Office

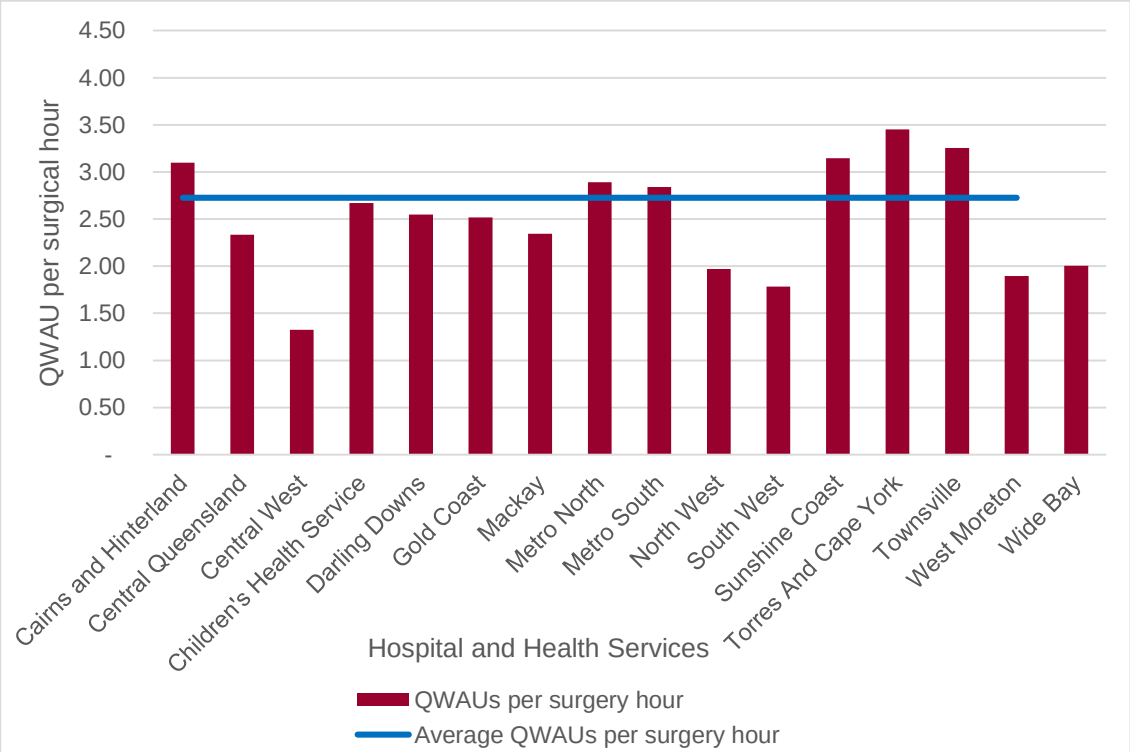
A theatre utilisation rate only reflects the amount of time a theatre is used, but not how well it is used. The rate can mask the effects of fast or slow staff performance or multiple cases. For example, a fast surgeon may complete their list earlier than expected. In utilisation reports they will look inefficient as the theatre was not used for the total time it was available for use. Another surgeon may take longer to complete their list, fully utilising their session and possibly incurring overtime. Their utilisation rate will look good as the theatre was in use for more than the allocated time, but this does not necessarily mean its use was the most efficient. Equally, a session with many cases may have a lower utilisation rate than a session with just one or two cases. This is due to multiple changeover times, which are treated as unused theatre time.

Another measure of efficiency is the surgical activity a hospital is able to complete during available hours. Hospital activity is measured using a standardised unit called the Queensland weighted activity unit (QWAU). It is a measure of the relative complexity and resource intensity of the care provided to a patient. Figure 1F outlines the surgical QWAUs each HHS has delivered per utilised surgical hour. QWAUs per utilised surgical hour are influenced by the:

- hospital's casemix — for example, more complex and resource intensive patients may be transferred to larger facilities
- degree of training a hospital is required to provide to registrars and new nurses
- general speed of nurses, anaesthetists and surgeons.

The audit did not focus on the delivery of QWAUs for these reasons.

Figure 1F
Queensland weighted activity unit delivered per utilised surgical hour



Note: Sunshine Coast HHS activity excludes approximately 39 per cent of their surgical services outsourced to the private sector (representing approximately 29 per cent of their weighted activity units).

Source: Queensland Audit Office using ORMIS data July 2014 to December 2015

This emphasises the need to book surgery time based upon the surgeon's normal speed and take into account other known variables, such as 'teaching time' required. Hospitals also need to consider theatre utilisation in light of the overall activity of theatres, for example, the complexity of the casemix (type and mix of patients treated) planned for the theatre.

Influences on theatre efficiency

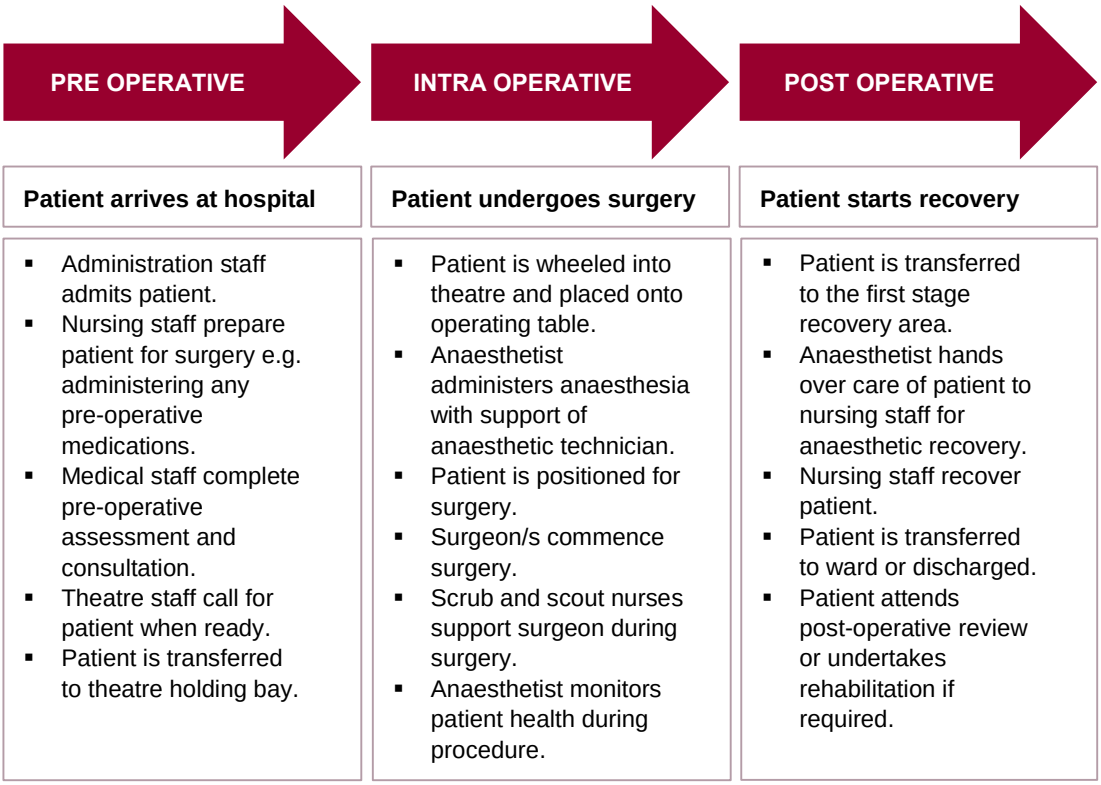
Independent research suggests public hospitals generally provide more complex care than private hospitals. A 2009 Productivity Commission research report stated that patients from public hospitals are, on average, likely to have more complex medical conditions than private hospital patients. A hospital's casemix invariably influences its theatre efficiency.

Rural and smaller regional hospitals generally provide fewer services, with many procedures discontinued due to patient safety and cost considerations. The wide range of medical and nursing skills and after-care capabilities required to sustain theatre services do not exist in smaller towns.

Accordingly, these smaller hospitals will have fewer people in surgery and a higher amount of idle theatre time, which are not necessarily marks of inefficiency. These hospitals still offer access to important health services and reduce the travel burden on rural communities. For example, they may offer obstetric services and perform a select range of procedures undertaken by visiting medical officers.

A patient's experience from the time they arrive at the hospital admission, through to their surgery and finally into recovery is complex. Figure 1G highlights the key steps involved in a patient's experience on the day of their surgery.

Figure 1G
Key steps in a patient's surgical experience



Notes: Figure 1F is an example of a day-of-surgery admission for an elective surgery patient. We acknowledge these steps will vary between hospitals.

Source: Queensland Audit Office in consultation with Healthcare Improvement Unit, Department of Health

Theatre staff are required to ensure each theatre is set up appropriately with the correct operating room equipment (surgical lights, operating room table, anaesthesia equipment, etc.) and surgical equipment and consumables (forceps, scalpels, drapes, sponges, etc.) for each operation.

Theatre efficiency is influenced by:

- staff availability, skill mix and experience
- culture of the theatre team/hospital
- complexity of the operation
- emergency surgery demand, including unplanned return to surgery
- patient preparation and current health status
- availability and currency of equipment and consumables
- theatre size and layout
- hospital size and layout
- patient flow and communication processes
- theatre sessions and scheduling
- training and educating registrars and students
- quality assurance and safety processes.

Hospitals across Australia and internationally have demonstrated that effective systems and practices can reduce the influence of these variables and improve theatre efficiency.

Impact of emergency surgery on theatre efficiency

Emergency surgery is an essential function of a hospital and saves thousands of lives every year. The national definition of emergency surgery is outlined in Appendix F, but is broadly understood to mean any surgery that cannot be deferred for more than 24 hours.

The larger hospitals dedicate a theatre or discrete sessions to emergency surgery to meet expected demands. Similarly, many hospitals roster on theatre staff to daytime emergency shifts instead of taking them from elective sessions or calling them in.

Not all hospitals are able to devote a theatre or sessions for emergency surgeries. Some hospitals use elective sessions, staff allocated to those sessions perform emergency surgery. This presents a balancing act in booking the appropriate number of elective surgeries to maximise theatre efficiency and minimise cancellations.

Theatre improvement projects

The department's Healthcare Improvement Unit supports hospitals to implement several improved service delivery models, including the Productive Operating Theatre, to improve theatre efficiency. It made training materials available to all relevant Queensland Health employees and 22 hospitals received training.

The department also funded eight hospitals to undertake a surgical redesign project from August 2013 to June 2014. The objective of the project was to improve patient access and experience before, during and after surgery. The project wasn't rolled out across all Queensland hospitals but, through networking, allowed hospitals to share improvement processes and ideas.

Audit objective, method and cost

The objective of the audit was to assess how efficiently Queensland public hospitals are managing their operating theatres to deliver surgical services.

The audit addressed the objective through the following lines of inquiry:

- hospitals have systems and practices in place that allow them to manage, monitor and report their operating theatre efficiency and performance
- hospitals are optimising the usage of operating theatres.

Safety and teaching outcomes and the use of procedural rooms were outside the scope of this audit.

The audit cost $505 000.

Entities subject to this audit

- Department of Health
- Theatre and costing data was obtained for public hospitals across all Hospital and Health Services (HHS) and the Mater public hospitals
- HHSs with additional field visits included:
    - Cairns and Hinterland Hospital and Health Service
    - Central Queensland Hospital and Health Service (Planning phase only)
    - Darling Downs Hospital and Health Service (Planning phase only)
    - Metro North Hospital and Health Service
    - Metro South Hospital and Health Service
    - Townsville Hospital and Health Service.

Report structure

The structure of this report is:

Chapter	
Chapter 2	Analyses operating theatre performance
Chapter 3	Assesses the robustness of coding and costing surgical services
Appendix A	Contains responses received on this report
Appendix B	Explains the audit methodology
Appendix C	Discusses how activity based funding works
Appendix D	Describes how we standardised costing data for comparative purposes
Appendix E	Groups hospitals together for comparison purposes
Appendix F	Outlines the theatre definitions used in this report
Volume 2	Provides theatre performance statistics on a hospital by hospital basis

2. Operating theatre performance

In brief

Hospital and Health Services (HHSs) are responsible for using their operating theatres efficiently to meet their community's demand, while still maintaining quality care. HHSs require mature systems and practices to plan the efficient use of their theatres and then understand and monitor theatre performance.

Conclusions

Hospitals are not efficiently using their operating theatres, and excess infrastructure capacity exists across the state. Lower usage is the result of surgeries starting late, longer changeovers between sessions, patient cancellations, finishing early and the challenge of emergency surgeries disrupting elective lists.

Findings

Unused available time and additional theatre capacity:

- Across the state, between July 2014 and December 2015, there were 18 898 hours (5.3 per cent of all available hours) of meaningful unused elective theatre time in open sessions. Providing there was sufficient demand in these sessions and bed capacity in the hospital, this unused time would provide for 7 874 operations of the average two hour duration.
- There are a further 33 310 hours of idle surgery theatre capacity in the existing hospital infrastructure. This finding relates to principal referral, children's and public acute group A hospitals, where sessions were not made available for bookings between July 2014 and December 2015. The closed sessions equate to a 17 theatre hospital operating for a year. Sessions were closed due to insufficient demand in designated specialties, maintenance, staff leave or unavailability, training or because they were unfunded.

Ability to benchmark and understand theatre performance:

- Queensland public hospitals are unable to accurately benchmark their theatre efficiency against other public hospitals across the state. This is because the Department of Health and the HHSs have not established consistent statewide theatre efficiency measures or targets.
- Theatre efficiency varies significantly across the state because there is a lack of accountability and responsibility at both an operational and management level to manage theatre performance.
- Most public hospitals are providing ad-hoc theatre performance information to management and theatre staff and therefore few nurses and specialists know their theatre efficiency.
- A combination of poor scheduling, inadequate communication and a lack of a performance culture are contributing to public hospitals under-using their operating theatres. In addition, balancing emergency operations with elective surgery also results in the cancelling of elective surgeries.

Introduction

Queensland public hospitals use a variety of targets and measures to assess how efficiently they use their operating theatres (theatres). The most commonly used is the theatre utilisation rate — the number of theatre hours used productively compared to the total available theatre hours in a session. A theatre is well used if the available scheduled time in a theatre is maximised and the unused time is minimised. An important aspect of the public hospital system is training nurses and specialists. The theatre utilisation metric looks through the effects of this training.

This chapter examines the efficient use of 221 of the state's 234 operating theatres, covering 39 hospitals. Specifically, we assessed whether Queensland public hospitals are:

- optimising the use of their theatres compared to their peer group hospitals (Appendix E describes the peer groupings for Queensland public hospitals)
- effectively monitoring and managing the key elements influencing theatre efficiency such as start time, cancellations, changeover times and human resources.

To inform our assessment, we relied on data from the Department of Health's Operating Room Management Information System (ORMIS v7) covering July 2014 to December 2015. This data includes private patients treated in public hospitals.

This data was used to assess theatre utilisation against four performance measures:

- on time starts for the first case
- changeover time between surgery
- overruns and underruns
- day of surgery cancellations.

Conclusions

Despite almost eliminating the number of patients waiting longer than clinically recommended for elective surgery, Queensland public operating theatres are not running as efficiently as they could. The underlying reason for patients waiting longer than clinically recommended is not a lack of physical operating theatres, but poor theatre efficiency and unfunded sessions.

Poor theatre use has arisen from passive management of operating theatres and various interpretations of definitions — such as start time and poor data quality. This results in:

- 60 per cent of surgeries starting late (first session)
- changeover between patients taking on average 3.5 minutes (23 per cent) longer than planned
- rate of elective day of surgery cancellations exceeding better practice targets
- 16.9 per cent of elective sessions finishing an hour earlier than scheduled but not being used for other elective or emergency patients.

Managing emergency surgery is inherently complex and hospitals are not effectively balancing this workload with elective surgery demands. Regardless of whether a hospital has dedicated theatres for emergency sessions, one of the leading causes of elective surgery cancellations is emergency operations. The rate of elective surgery cancellations in sessions with emergency operations is twice the rate compared to sessions without emergency operations.

Using theatres

All 29 hospitals we visited and surveyed (see Appendix B for survey methodology) use a theatre utilisation measure to assess their theatre performance. The Department of Health does not currently have an agreed theatre utilisation measure or target but confirmed that a target of 85 per cent is best practice. Three hospitals we visited also aimed for 85 per cent theatre utilisation. The New South Wales Agency for Clinical Innovation has set a theatre utilisation target of 80 per cent. A best practice target of 85 per cent in the average session length accommodates for the benchmark time of 15 minutes it takes to clean and set up a theatre for the next operation and relies upon starting on time and finishing as close to the scheduled end time as possible.

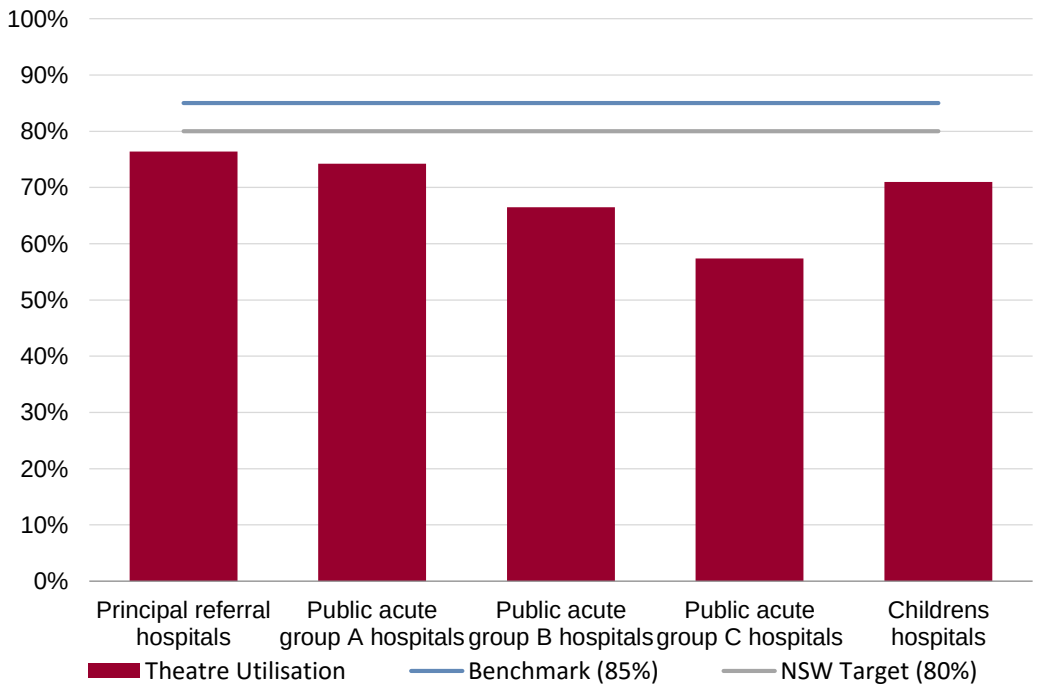
We have assessed how achievable this target is by analysing each Hospital and Health Service's (HHS's) average session length, the average number of operations performed in a session and the average changeover time booked for operations. On that basis, only two rural HHSs could not achieve this target.

Queensland's overall theatre utilisation is well below 85 per cent. Across the state (39 in-scope hospitals), operating theatres are used 73.7 per cent of the available time.

We measured theatre utilisation by calculating the time patients were in the theatre (wheels in to wheels out), compared to the available session time. This formula excludes early starts, late finishes and changeover time.

Figure 2A shows the variation between peer hospitals' (see Appendix E for peer hospital groupings) theatre utilisation. For 'Public acute group A' hospitals, theatre utilisation varied between 69.6 and 82.2 per cent. For 'principal referral hospitals', it varied between 72.8 and 79.2 per cent.

Figure 2A
Theatre utilisation performance



Note: Results for children's hospitals are for the period from December 2014 to December 2015.

Source: Queensland Audit Office using ORMIS data July 2014 to December 2015.

Figure 2B highlights a significant variation in theatre utilisation across hospitals in the same peer group.

Figure 2B
Theatre utilisation performance across peer group hospitals

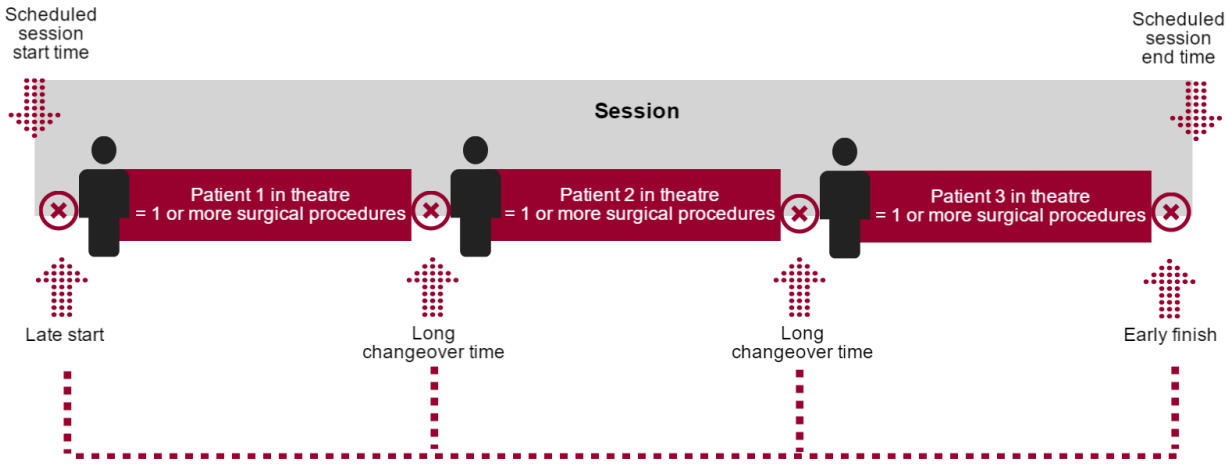
	Principal Referral hospitals	Peer Group A hospitals	Peer Group B hospitals	Peer Group C hospitals	Children's hospitals
Highest theatre utilisation performance	Princess Alexandra Hospital **79.2%**	Rockhampton Base Hospital **82.2%**	Caboolture Hospital **76.5%**	Atherton Hospital **63.6%**	Lady Cilento Children's Hospital **71%**
	Royal Brisbane and Women's Hospital **78.3%**	Robina Hospital **76.5%**	Gympie Hospital **69.0%**	Kingaroy Hospital **62.4%**	
Lowest theatre utilisation performance	Townsville Hospital **75.1%**	Queen Elizabeth II Jubilee Hospital **71.9%**	Caloundra Hospital **57.6%**	Charleville Hospital **44.1%**	
	Gold Coast University Hospital **72.8%**	Bundaberg Hospital **69.6%**	Mount Isa Hospital **55.9%**	Dalby Hospital **41.9%**	

Note: Theatre utilisation formula excludes early starts, late finishes and changeover time. Results for children's hospitals are for the period from December 2014 to December 2015.

Source: Queensland Audit Office using ORMIS data July 2014 to December 2015.

We calculated that Queensland public hospitals did not use 18 898 hours of available elective theatre time (5.3 per cent of available time) between July 2014 and December 2015. Only elective sessions with two or more hours of unused time were used in our calculation. Figure 2C shows the aggregate of lost time pressure points we included. We chose two hours because this is the approximate average length of an elective procedure across all specialties.

Figure 2C
Lost time pressure points



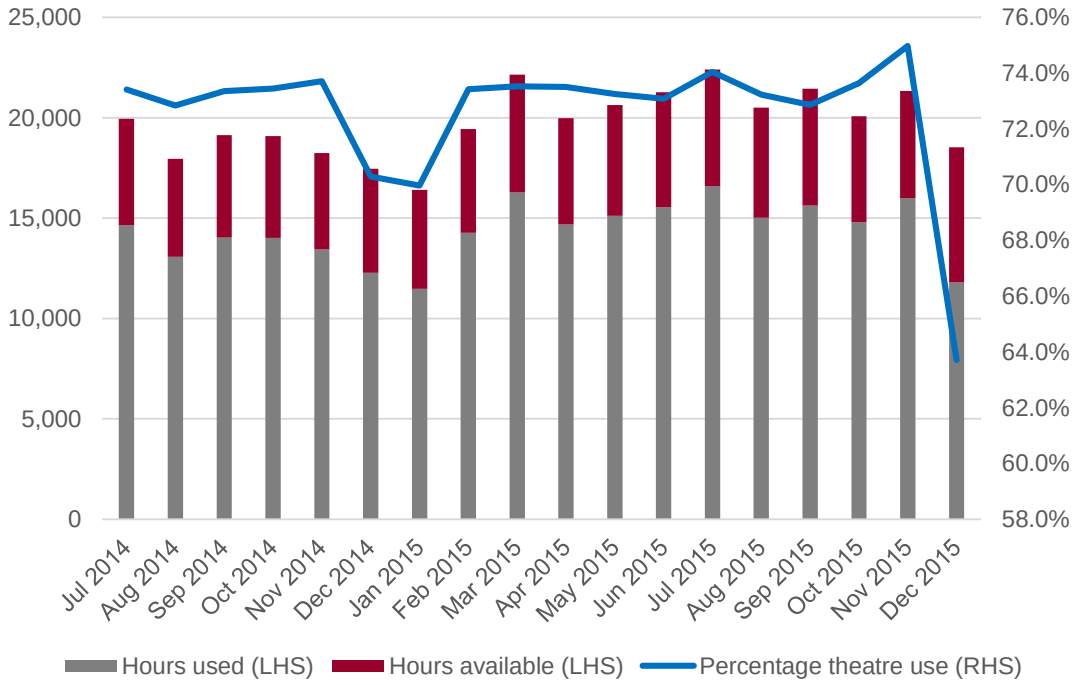
Source: Adapted from Western Australian Audit Office. Operating Theatre Efficiency – Report 25: November 2015

There were 37 617 people waiting for elective surgery as at December 2015, including 356 people who were waiting longer than clinically recommended for elective surgery. The 18 898 hours of unused theatre time equates to 7 874 operations, including allowing time for changeovers.

HHSs and hospitals determine the time theatres are open and available for use. Variables are patient demand, supply of nurses and specialists and funding for the consumables and prosthetics required.

Over the period from July 2014–December 2015, the total amount of elective surgery theatre hours available varied greatly, between 16 404 and 22 404 hours per month (an average of 19 778 hours per month). Figure 2D shows the total available session hours per month and the actual time used. Hospitals told us that in December and January many theatres are closed for staff leave and this time is utilised to undertake maintenance tasks.

Figure 2D
Used vs available session hours



Source: Queensland Audit Office using ORMIS data July 2014 to December 2015.

Case study 1 quantifies the number of hours theatres were closed and unavailable for use across the principal referral, peer group A and children's hospitals.

Case study 1

Excess infrastructure capacity across Queensland

In the principal referral, peer group A and children's hospitals, 33 310 hours of elective or emergency theatre time (6 203 sessions) were not made available (theatre closed) between July 2014 and November 2015. Providing there was sufficient funding, patient demand, bed capacity and available staff, this excess theatre capacity would equate to a 17 theatre hospital operating for a year.

We calculated the excess capacity in the system by using the month with the maximum theatre hours made available as a base but excluding December and January to allow for staff leave and maintenance. This assumes the average session length of 5.37 hours over the 18 months continues.

Planning theatre use

Matching demand with supply

Planning influences the overall efficient use of a theatre. Hospitals generally develop theatre planning schedules on a four-weekly cycle, where they plan each week separately. The four-weekly cycle ensures clarity and transparency:

- for arranging staff rosters
- for booking surgeries
- to allow hospitals to match supply of the medical workforce with demand for surgical services.

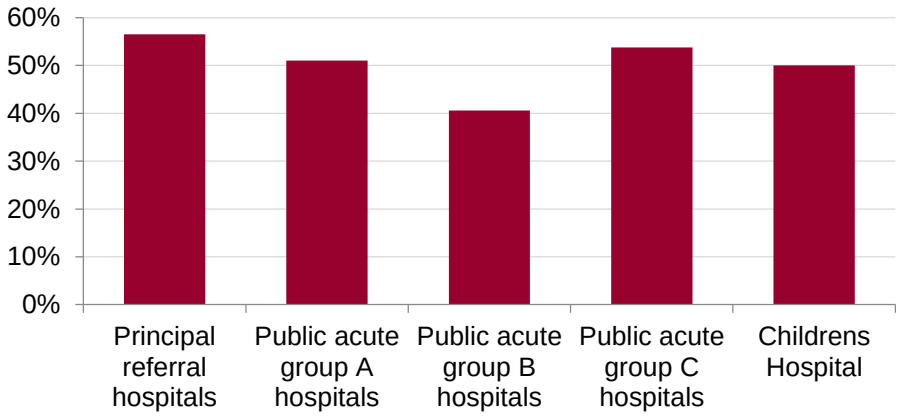
However, most hospitals are not reviewing their theatre planning schedule to match supply of their theatres, staff and beds to demand. We found theatre schedules were based on historical precedent rather than on forecast demand. Changes to the schedule were mostly within specialties rather than amending session times to drive a better theatre efficiency outcome. For example, changes included replacing an orthopaedic surgeon with another orthopaedic surgeon rather than changing to a urology session. Most hospitals were not able to demonstrate that they were reviewing demand across all specialties and adjusting their theatre schedule to match. Adjusting schedules requires lead time and consideration of the effect of the adjustment on specialists' public and private sector commitments.

A few hospitals have attempted to redesign their theatre schedules to match their current demand and the industry better practice of running full day sessions. A full day session is generally more efficient than a half day session. This is due to the ability to book patients across the middle of the day, greater flexibility for staff with the timing of lunch breaks and the ability for surgical teams to remain together and use the cooperative skills they have established over the morning.

Despite the suggested benefits of having full day sessions, Figure 2E shows that many hospitals are not predominately using full day lists. Hospitals have reported that this is in part due to:

- opposition from visiting medical officers (VMOs) who object to theatre changes due to the disruption of their private sector commitments
- VMOs or part time staff with insufficient hours or patient demand to justify a full day list, but who are required to maintain the service and meet on-call demands.

Figure 2E
Percentage of time allocated to full day elective sessions



Note: Full day lists are greater than five hours; half day lists are equal to or less than five hours. Results for children's hospitals are for the period from December 2014 to December 2015.

Source: Queensland Audit Office using ORMIS data July 2014 to December 2015.

Industrial agreement restrictions

The hospitals we visited struggled to efficiently roster staff to maximise their theatre time and minimise overtime costs. Common feedback to us was that the industrial arrangements reduced the flexibility of theatre managers to:

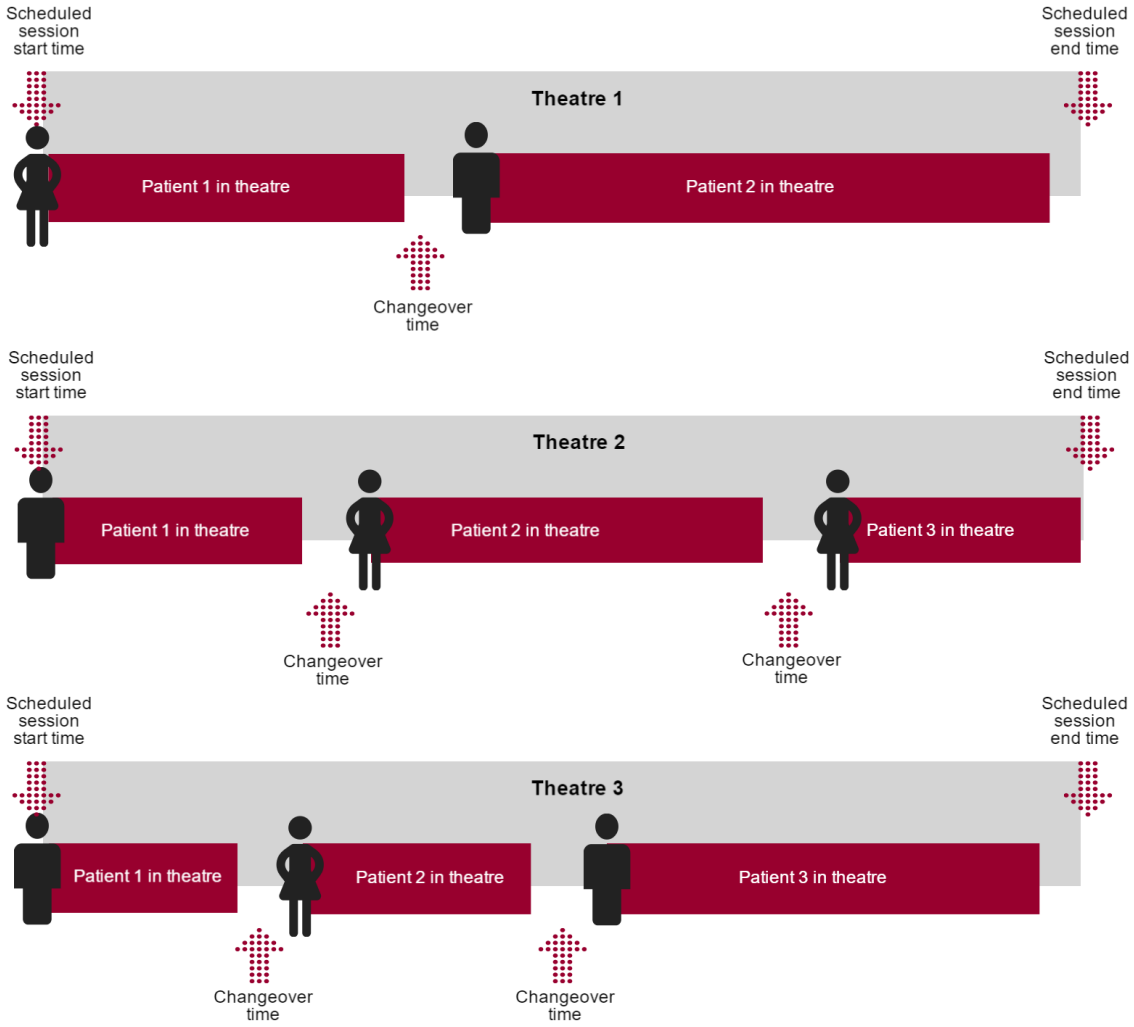
- have pre-operative staff, including anaesthetists, start earlier to ensure complex patients were prepared in time for their surgery
- extend surgery later into the afternoon to reduce the number of cancellations.

The current awards allow a start time that enables nurses' time to complete necessary medical checks and preparations for the most complex patients and have the patient ready for handover. However, most hospitals are rostering the commencement of pre-operative staff later, in an effort to balance shift changeover times and afternoon finishes with overtime. Hospitals are not effectively forecasting and scheduling staff to start earlier to prepare complex patients by the session start time, which contributes to a loss of theatre time.

The award governing anaesthetists and surgeons requires a start time of 8.00 am. Unless an anaesthetist starts early — entitling them to overtime — they frequently will have insufficient time to have a complex patient prepared for surgery by a scheduled start time of 8:30 am. Across the 39 hospitals, the average time anaesthetic work commenced before the scheduled start time for the first session was six minutes.

Staff to patient ratios are also frequently lower for preparing the morning patients than the afternoon patients. A lower ratio of staff to patients increases the risk that some of the first scheduled operations will start late because the nurses do not have enough time to prepare their patients. Conversely, rostering more staff increases the risk of under-using their staff after the morning rush. As depicted in Figure 2F, start times for the second set of surgeries are often staggered because the first set of operations finish at different times.

Figure 2F
Staggered surgery start times



Source: Queensland Audit Office

All theatre staff are required to finish by 6.00 pm, after which penalty rates or overtime are payable. Most sessions are scheduled to finish between 4.30 and 5.30 pm and, if earlier delays or emergency operations interfere with the elective schedule, it greatly increases the risk theatre managers will be required to choose to incur overtime costs or cancel the last patient of the day.

Across the 39 in-scope hospitals, 14 per cent (1 844 surgeries) of all cancellations were the result of no operating time.

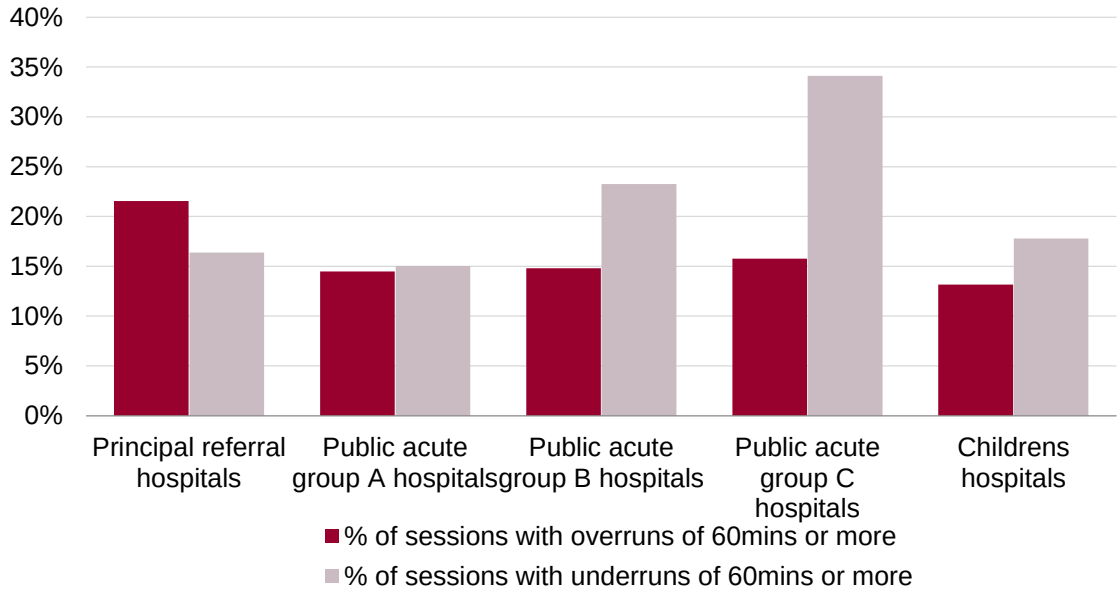
Booking elective surgery

Developing an elective surgery list is a complex process. Elective surgery coordinators are required to consider current surgery demand, strategic targets (such as reducing the number of long-waiting patients), the number of inpatient beds, treating patients in turn, training requirements and the speed of the surgeon and their registrars. The ORMIS calculates an average surgery time for each operation for each surgeon based upon their recent performance. This is a guide only and can be overwritten. Elective surgery coordinators use this information and input from specialty directors to determine how much time is needed for each surgery.

When a session does not meet the planned time, it is referred to as either an overrun or underrun.

Figure 2G captures the percentage of sessions with overruns and underruns of 60 minutes or more across peer groups. We chose 60 minutes for underruns to allow for quicker than expected procedures and 60 minutes for overruns to allow time to teach and address minor surgical complications.

Figure 2G
Percentage of sessions with overruns and underruns of 60 minutes or more



Note: Results for children's hospitals are for the period from December 2014 to December 2015.

Source: Queensland Audit Office using ORMIS data July 2014 to December 2015.

Session underruns

Statewide, 16.9 per cent of sessions had an underrun (finished before scheduled time) of 60 minutes or more, of which 88 per cent resulted from booking cancellations within 24 hours of surgery. Cancellations within 24 hours are hard to fill with elective patients due to the short notice given to elective surgery coordinators. It is equally problematic to allocate emergency patients into these sessions as the patient's condition may not match the specialty, or there may be no emergency patients requiring surgery.

Underruns can occur due to a variety of other reasons, for example:

- a longer, complex case is booked and there is no suitable emergency or elective patient to fill the remainder of the session
- the theatre team determines there is not enough time to finish the last case and cancels it.

Hospital staff advised us that they aim to finish by the scheduled time to avoid overtime payments.

All underruns of 60 minutes or more resulted in 24 348 hours of staffed theatre time that was unused over July 2014 to December 2015, or the equivalent of running a 12 theatre hospital for a year.

Session overruns

The challenge hospitals face in accurately scheduling elective surgery is reflected in their session overruns. Across the state, 17.4 per cent of sessions had an overrun of 60 minutes or more. This represents an effort by hospitals to minimise cancelling an elective surgery at the end of the day.

Starting late by 10 minutes or more and emergency operations in elective sessions respectively contributed to 45.1 per cent and 16.4 per cent of all overruns greater than an hour.

Some hospitals, however, close the afternoon session for certain specialties earlier, for example, at 3.30 pm, to ensure that overruns past 5.00 pm do not occur. In these situations, operations are actually planned to be finished at 5.00 pm or 5.30 pm, which results in the sessions appearing to run over.

The large volume of overruns may result in overtime payments to nurses, specialists and support staff. It also affects the ability to use rostered resources for what they were rostered to do at the time the overrun occurred. For example, morning sessions running into the afternoon may prevent a specialist from attending an outpatient clinic.

Starting on time

Starting on time influences the overall efficient use of a theatre. In most cases, the hospital has control over the ability to start on time, for example, through rostering staff on at the appropriate times. In other instances, events outside the hospital's control can delay surgery, for example, a patient arriving late.

When the first case starts on time it increases the likelihood that the surgery session will finish on time and decreases the likelihood of hospitals cancelling patients later in the day. There is no Queensland statewide performance target for starting on time but other jurisdictions target 95 per cent as good practice. Therefore, we measured whether 95 per cent of Queensland elective surgery sessions start on time.

During our theatre walkthroughs we observed theatre staff recording the time key events occurred in a consistent manner. However, start time targets and definitions varied. Starting on time was defined in various ways, including:

- 'wheeling the patient into the theatre' by the scheduled start time
- commencing the first procedure (positioning the patient for surgery, commencing skin preparation etc.) by the scheduled start time
- commencing anaesthetic procedures by the scheduled start time.

Theatre staff from three hospitals confirmed to us that they did not know their hospital's definition of starting on time. In nine locations, we also found different definitions of starting on time across different staff within the same hospital.

To assess Queensland theatre start times, we looked at the percentage of first cases wheeled into theatre by the scheduled start time and at various intervals past the scheduled start time. (New South Wales (NSW) and Western Australia (WA) measure from the time the patient is wheeled into theatre). We also examined the percentage of hospitals that began the first procedure of the first case within 30 minutes of the scheduled start time.

Queensland's start time performance against other jurisdictions

Queensland has the lowest percentage of on time starts when compared with public hospitals from NSW and WA, the only two jurisdictions with publically available information. Across 39 in-scope hospitals, 35 per cent of patients (first cases of all sessions) were wheeled into theatre by the scheduled start time, compared to 44 per cent in NSW. This is shown in Figure 2H.

Fifty seven per cent of Queensland patients (first cases of all sessions) were wheeled into theatre within 10 minutes of the scheduled start time, compared to 63 per cent in WA. This is shown in Figure 2I.

Figure 2H
1st cases wheeled into theatre on time

Figure 2I
1st cases wheeled into theatre within 10mins

Notes: New South Wales results cover 2010–2012. Western Australia's results cover 2014. Queensland's results cover July 2014 – December 2015. Results include first and second sessions.

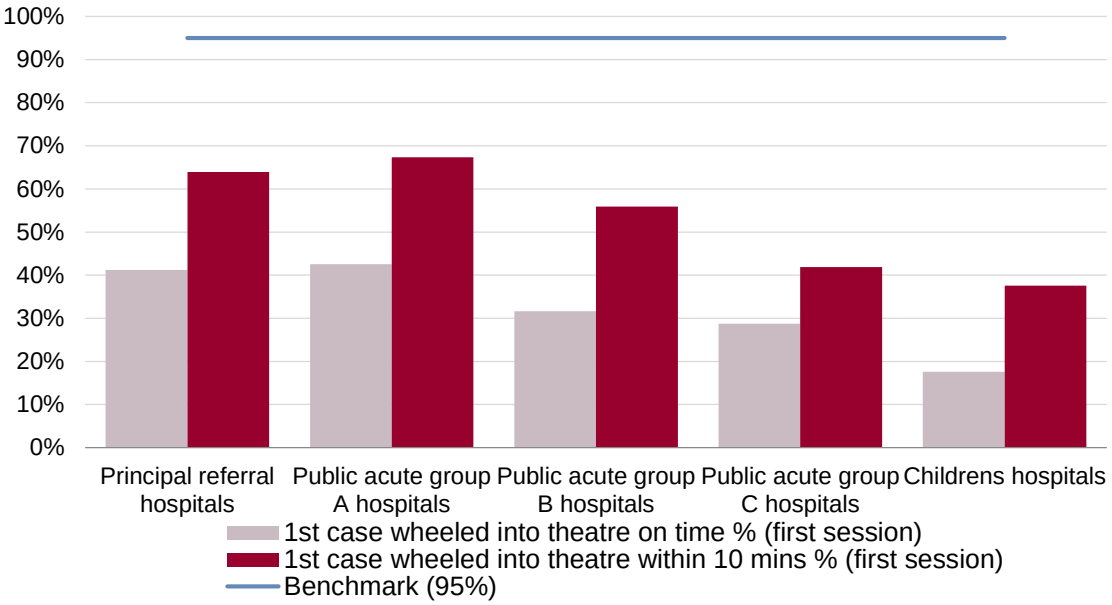
Source: Queensland Audit Office using ORMIS data July 2014 to December 2015, NSW Auditor-General's Report 'Managing operating theatre efficiency for elective surgery' and WA Auditor-General's report 'Operating theatre efficiency'.

Wheeling elective surgery patients into theatre

Theatre start time performance based on wheeling the patient into the operating theatre varies significantly across the state. Performance between peer hospitals best illustrates this variation. Hospitals have the greatest control over the first case of the first session of elective surgery starting on time. If the first case starts late, or has unforeseen complications, the second session can be delayed and hospital initiated surgery cancelations can increase.

Figure 2J highlights the variance of start time performance across peer groups compared to the 95 per cent on time start benchmark. The variation between peer groups for the first case of the first session being wheeled into theatre by the scheduled start time ranged from 17.6 to 42.6 per cent. The variation remained wide, at 37.6 to 67.3 per cent, for first cases wheeled into theatre within 10 minutes of the scheduled start time. No peer group is consistently starting on time.

Figure 2J
First cases wheeled into theatre by the scheduled start time and within 10 minutes



Note: Results for children's hospitals are for the period from December 2014 to December 2015. Start time results exclude Charleville hospital.

Source: Queensland Audit Office using ORMIS data July 2014 to December 2015.

Figure 2K highlights an even higher variation in start time performance across hospitals in the same peer group.

Figure 2K
Start time performance across peer group hospitals

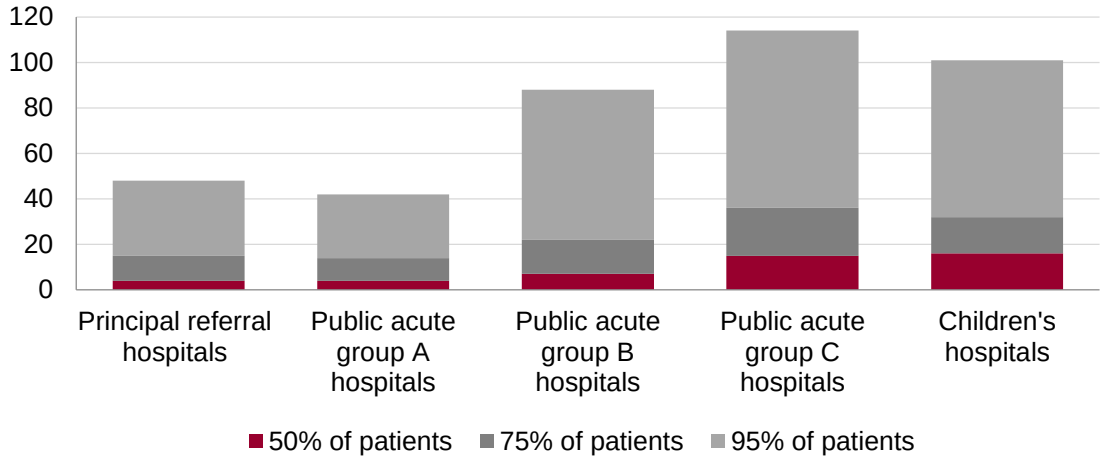
	Principal referral hospitals	Peer group A hospitals	Peer group B hospitals	Peer group C hospitals	Children's hospitals
Highest performance (1st case wheeled into theatre by the scheduled start time)	The Royal Brisbane and Women's **55.7%**	Rockhampton Hospital **77.7%**	Redland Hospital **53.6%**	Warwick Hospital **61.8%**	Lady Cilento Children's Hospital **17.6%**
	Princess Alexandra Hospital **42.7%**	Logan Hospital **66%**	Caloundra Hospital **36.7%**	Dalby Hospital **41.7%**	
Lowest performance (1st case wheeled into theatre by the scheduled start time)	Townsville Hospital **30.7%**	Robina Hospital **22.6%**	Gladstone Hospital **16.3%**	Thursday Island Hospital **5.8%**	
	Gold Coast University Hospital **28.2%**	Cairns Base Hospital **16.6%**	Mount Isa Hospital **10.9%**	Innisfail Hospital **3.5%**	

Note: Result calculated based on the percentage of first cases (first session) wheeled into theatre by the scheduled start time. Hospitals that aim to commence anaesthetic procedures by the scheduled start time will have a lower start time performance. Results for children's hospitals are for the period from December 2014 to December 2015.

Source: Queensland Audit Office using ORMIS data July 2014 to December 2015.

Figure 2L outlines how long it takes across the entire population to wheel the first elective surgery patient (first case of the first session) into the operating theatre. It shows that 75 per cent of patients in principal referral hospitals and public acute group A hospitals are wheeled into theatre within 20 minutes of the scheduled start time. It takes principal referral hospitals and public acute group A hospitals approximately another 25 minutes to wheel the remaining 25 per cent of patients into theatre. The Children's hospital and the smaller and more regional public acute group B and C hospitals take approximately 10 minutes longer to wheel in the first 75 per cent but approximately 55 minutes longer to wheel in the final 25 per cent of patients.

Figure 2L
Time taken to wheel the first patients into the operating theatre



Notes: The final 5 per cent have been excluded to allow for outliers and data anomalies. Results are for the first session. Results for children's hospitals are for the period from December 2014 to December 2015. Start time results exclude Charleville hospital.

Source: Queensland Audit Office using ORMIS data July 2014 to December 2015.

Commencing the first procedure

Thirteen of the 29 hospitals we visited and surveyed defined starting on time as commencing the first procedure (for example, positioning the patient for surgery) by the scheduled start time. Examining the percentage of hospitals that commenced the first procedure of the first case within 30 minutes of the scheduled start time amplifies the difficulty hospitals are having starting elective surgery on time.

Statewide, only 57.6 per cent of hospitals commence the first procedure (first case of the first session) within 30 minutes of the scheduled start time.

Common causes of late starts

ORMIS allows theatre staff to record the reason for delays. Hospitals can choose from 39 different delay reasons. ORMIS also has a free text capability that allows hospitals to document why the ‘patient was not ready' or why the 'surgeon was unavailable'. This allows hospital managers to identify the underlying causes for late starts, reducing cancellations and improving the patient experience.

Statewide, the function that requires a delay reason after a pre-determined amount of time has been set as optional. This has allowed theatre staff to avoid recording the delay reason for approximately 54 per cent of first cases that started late by at least 10 minutes. This means that hospitals cannot readily identify and address the cause of late starts.

Theatre staff told us they do not record the reason for delay because:

- it is common practice not to record delay reasons
- they are too busy
- the delay relates to visiting medical officers' travel time, which they are entitled to
- the reason was unknown.

The most commonly recorded reason for the first case of any session of elective surgery to start late by 10 minutes or more is a lack of staff, surgeons, anaesthetists or nurses (12.4 per cent of late starts or 3 940 surgeries) and 'patients are not ready for surgery' (8.7 per cent of late starts or 2 803 surgeries).

Hospitals do not record why the staff are unavailable (for example, undertaking other clinical duties), making it difficult to determine the cause, but do record which cohort of staff was unavailable, for example, the surgeon. Surgical directors informed us that, other than in orthopaedics, it would be rare for the surgeon to be delayed because they were undertaking ward rounds or attending clinical meetings.

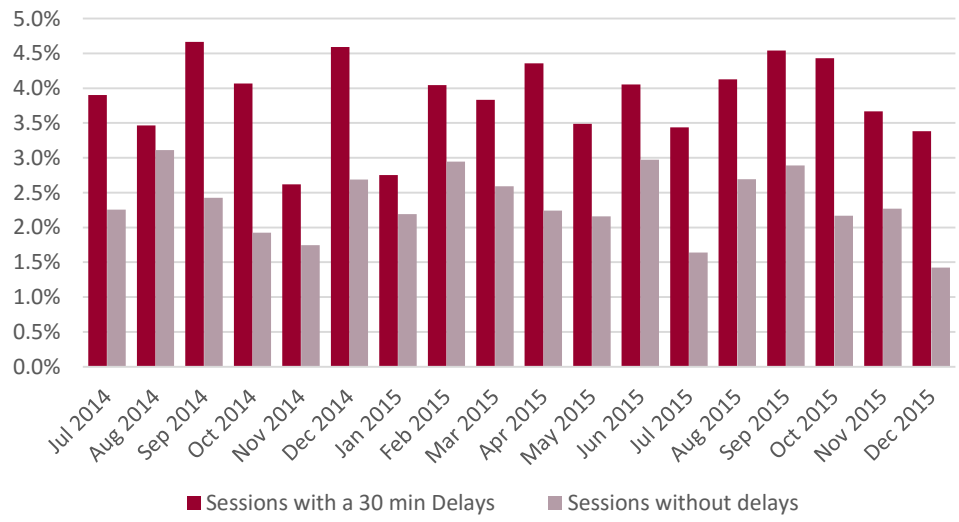
There are varieties of reasons why a patient may not be ready for surgery. The majority relate to delays with perioperative care. Hospitals frequently do not record why the patient is not ready. Therefore, it is difficult to determine if these delays were avoidable.

We observed eight operations. Four of the eight operations started after the scheduled start time because either the surgeon arrived late, the patient's preparation took longer than expected, or the anaesthetist did not have sufficient time to complete their interventions due to a lack of communication with the perioperative nurse.

Impact of late starts and session delays

The impact of late starts contributes to hospital initiated cancellations on the day of surgery. The rate of cancellations on the day of surgery increased from 2.08 to 3.76 per cent for sessions when a delay of 30 minutes or more occurred. This equates to 4 002 patients who did not receive surgery as planned. This is shown in Figure 2M. Other factors independent of the initial delay, such as complications during surgery or emergency cases, may have resulted in the need to cancel an elective surgery.

Figure 2M
Percentage of hospital initiated cancellations in sessions with a delay of 30 minutes or more compared to sessions without a delay



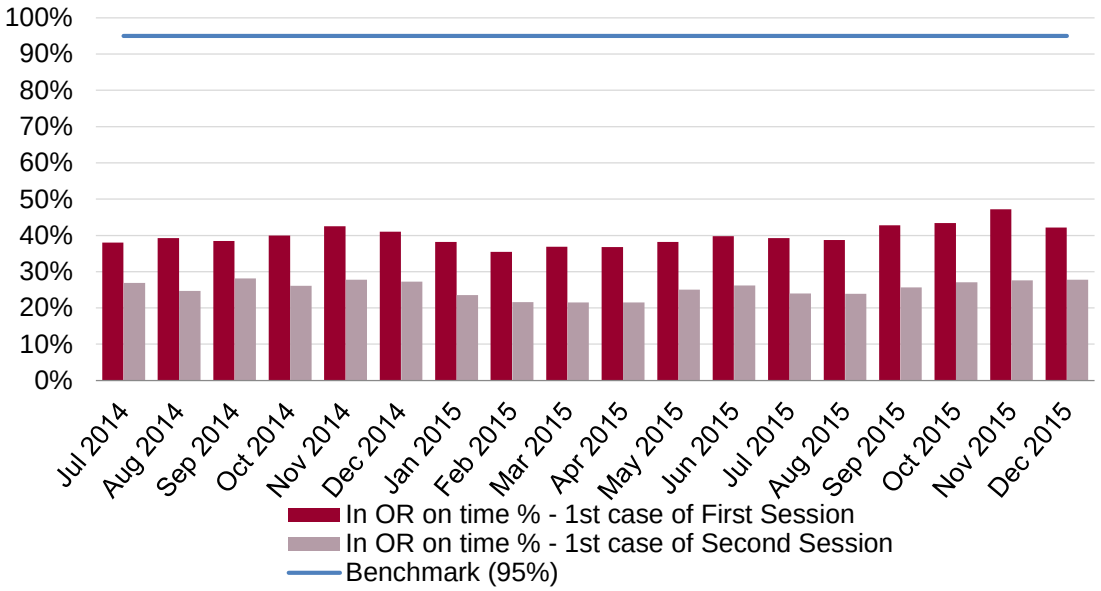
Source: Queensland Audit Office using ORMIS data July 2014 to December 2015.

Late starts can also lead to session overruns, forcing patients to fast for longer and increasing overtime costs. We found that sessions with a late start of 60 minutes or more had an average overrun of 54 minutes, indicating they do not make up the lost time over the duration of the session (2 835 sessions). Sessions without a late start had an average overrun of 29 minutes (61 184 sessions). Late starts are resulting in an increased overrun of 25 minutes.

Morning session delays also affect the afternoon sessions. Most hospitals either shut the theatre down for a lunch break, maintaining the same nursing and anaesthetic team, or start the second session immediately after the completion of the morning session with a different theatre team. In both scenarios, if the morning session runs late, the afternoon session is delayed.

Figure 2N compares the start time — wheeling a patient into theatre — between the first (morning) and second (afternoon) session over the last 18 months across the state.

Figure 2N
Percentage of on-time starts; first vs second session



Source: Queensland Audit Office using ORMIS data July 2014 to December 2015.

Responsibility for starting on time

It is unclear who is responsible for ensuring theatres start on time. In the past, senior nurses managed their theatres, making sure everything and everyone was in place to start on time. In some hospitals we observed the surgeon managing the theatre; in others it was the anaesthetist or the theatre nurse. Staff at 14 hospitals confirmed that those responsible for monitoring theatre efficiency on the ground did not have the authority they required. Eight hospitals stated it was the Nurse Unit Manager's role, but reinforced the point that they lacked the authority to do so.

Changeover between surgeries

Theatre teams need changeover time to clean and prepare the operating theatre for the next patient. The time will vary depending on the complexity of the procedures, but an experienced staff member will have a good understanding of the expected time to allow. An efficient changeover relies on the hospital having the next set of equipment ready for surgery, staff available to clean the theatre and the next patient appropriately prepared to be wheeled into the theatre.

Between July 2014 and December 2015, 10 minutes and 15 minutes respectively were allocated for changeover in 9.4 per cent and 85.3 per cent of all surgeries (a total of 94.7 per cent of all changeovers). A slow changeover time contributes to lower theatre utilisation.

Changeover time between elective surgery

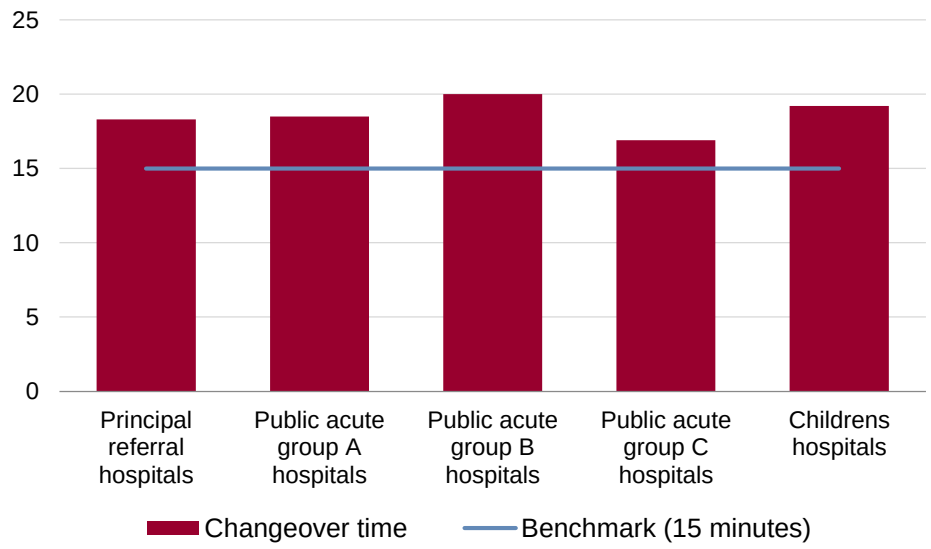
Statewide changeover time is exceeding the benchmark target of 15 minutes. This is also the target NSW uses. Public acute group B hospitals have the highest average changeover time of 20 minutes between elective surgeries. This is shown in Figure 2O.

In the elective surgeries we observed, scout nurses commenced the clean-up and instrument count before surgery was completed. Theatre nurses and orderlies used the time between patients to clean the floor, replace consumables and bring in the next set of trays. The changeovers we observed were all completed within 15 minutes.

Staff told us that longer changeovers were most commonly the result of:

- the next patient not being ready for surgery
- anaesthetic staff accompanying the previous patient to recovery and therefore being unable to commence work on the next patient
- theatre staff being on breaks
- a full recovery ward
- waiting for availability of an orderly to collect a patient from theatre.

Figure 2O
Average changeover time between elective surgeries



Note: Results for children's hospitals are for the period from December 2014 to December 2015.

Source: Queensland Audit Office using ORMIS data July 2014 to December 2015.

Changeover time between emergency surgery

In dedicated emergency sessions, the changeover time across the state is 25.9 minutes, approximately 10 minutes longer than elective sessions and almost twice the benchmark target of 15 minutes. Staff told us that preparing a patient for emergency surgery frequently contributed to longer changeover times. The nature of emergency surgery means that it is hard to plan and is often complex.

Most hospitals run emergency sessions during standard daylight hours and perform emergency surgery after hours on a basis of clinical need. Some hospitals do not have dedicated emergency sessions and perform emergency surgery as required during elective sessions.

Hospitals group similar elective surgeries together to have consistent staff and equipment. This generates time efficiency. Only the larger hospitals segregate emergency sessions into orthopaedic and/or general surgery to achieve these efficiencies. In other hospitals this is unlikely due to the lower throughput of patients. This contributes to longer changeover times while equipment and appropriately skilled staff are being sourced.

Cancelling elective surgery

Cancelling elective surgeries can result in unused theatre time and therefore lower theatre utilisation. It also adversely affects the patient, particularly those who have travelled long distances, and who have to reorganise their time away from school, work or other commitments.

Hospitals measure cancellations either on the day of surgery, within 24 hours, within 48 hours or a combination of these three measures. This is because hospitals have less flexibility to rearrange their lists to maximise theatre time the closer to surgery the cancellation is made.

Day of surgery cancellations

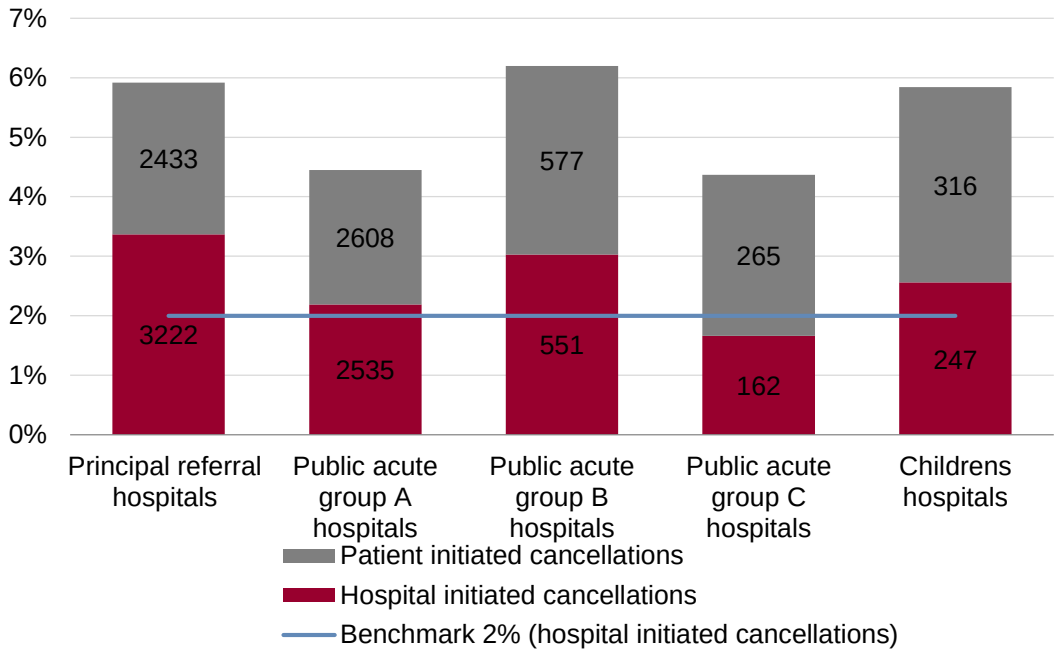
At 2.7 per cent, Queensland's hospital initiated day of surgery cancellation rate is above our benchmark rate of 2 per cent. The combined patient and hospital initiated cancellation rate at 5.2 per cent (12 939 patients over July 2014 to December 2015) is higher than both Western Australia's (5 per cent) and New South Wales's (4.1 per cent) publicly reported rate.

Twenty-four of the 29 hospitals we asked monitor cancellations on the day of surgery, as these cancellations have the largest impact on patient experience and theatre efficiency. Hospitals also monitor cancellations within 24 and/or 48 hours.

The department has not set a day of surgery cancellation target. The New South Wales Agency for Clinical Innovation has set a self-acknowledged ambitious target of 2 per cent for hospital and patient initiated cancellations on the day of surgery. We measured hospital initiated cancellations on the day of surgery against a target of 2 per cent.

Figure 2P highlights the percentage of hospital and patient initiated cancellations on the day of surgery across peer groups. The blue line in Figure 2P outlines the 2 per cent hospital-initiated cancellation benchmark.

Figure 2P
Percentage of hospital and patient initiated cancellations on the day of surgery



Note: Results for children's hospitals are for the period from December 2014 to December 2015.

Source: Queensland Audit Office using ORMIS data July 2014 to December 2015.

Hospital initiated cancellations

Between July 2014 and December 2015, hospitals cancelled an average of 2.7 per cent of elective surgeries on the day of surgery, affecting 6 387 patients.

Hospitals cancel elective surgery for a variety of reasons. The most common reason to cancel an elective surgery on the day is a lack of available theatre time. This is distinct from cancelling an elective patient for an emergency patient. Cancelling for emergency patients is the second most common cancellation reason given. The third most common reason is the surgeon or the anaesthetist chose not to perform the surgery — for example, there may have been an unexpected co-morbidity which resulted in the surgeon cancelling the surgery.

Figure 2Q outlines the top 10 reasons recorded for hospitals cancelling elective surgeries on the day of surgery.

Figure 2Q
Hospital initiated cancellations on day of surgery

ORMIS cancellation reason (paraphrased)	Per cent of all cancellations	Number of cancelled elective surgeries
No operating theatre time	14.63%	1 844
List rearranged for other priority cases	7.01%	883
Surgeon or anaesthetist elected not to perform the surgery or removed the patient from the list	6.35%	800
Unfit for surgery due to the hospital's preparation	6.25%	788
No intensive care beds available	4.19%	528
Surgeon or anaesthetist unavailable or insufficient staff	3.32%	418
No wards beds available	2.55%	321
Equipment failure/unavailable	1.98%	250
The patient was treated as an emergency	1.86%	234
Surgeon or anaesthetist is on leave	1.90%	239
Other* (Hospital initiated cancellations)	0.65%	82
Hospital initiated cancellations	**50.67%**	**6 387**
Patient initiated cancellations	**49.33%**	**6 217**
Total cancellations	**100%**	**12 604**

Note: Within ORMIS there are another eight categories of hospital initiated cancellations. Data entry errors occur, for example, when the booking officer accidently books the wrong day for surgery; correcting their error appears as a cancellation, 308 (2 per cent) instances of this have been removed. A further 27 (0.21 per cent) cancellations on the day of surgery due to natural disasters have also been removed.

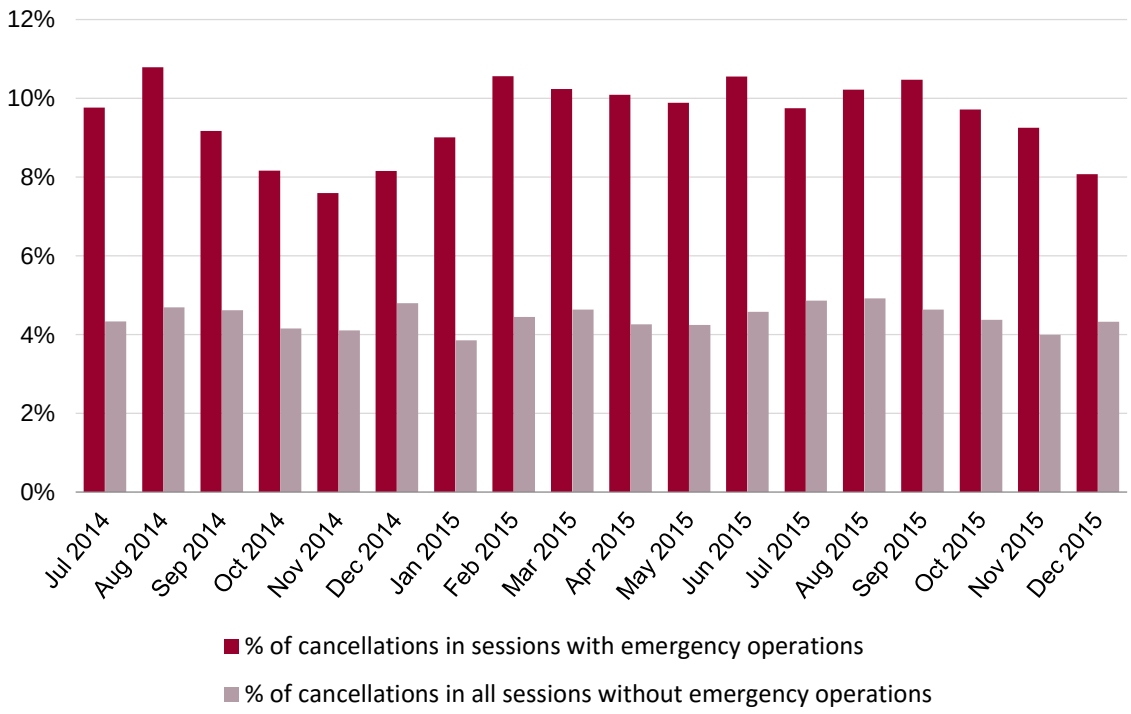
Source: Queensland Audit Office using ORMIS data July 2014 to December 2015

Emergency operations affecting elective surgeries

Figure 2R highlights the influence emergency surgery has on elective surgery cancellations. Sessions that include emergency cases are more than twice as likely to result in elective surgery cancellations. This is because either the nursing and specialist staff leave the theatre to attend an emergency, or the elective session is used to undertake an emergency case. In either case, insufficient time remains at the end of the scheduled session to undertake the elective operation and the hospital chooses not to use overtime to complete the scheduled cases (that is, fund the session running late).

The results shown in Figure 2R occur in hospitals with and without dedicated emergency sessions and theatres.

Figure 2R
Percentage of cancellations on the day of surgery — with and without emergency cases



Source: Queensland Audit Office using ORMIS data July 2014 to December 2015.

A management technique to reduce cancellations includes rostering sufficient staff to cover emergency surgeries. Hospitals typically focus on orthopaedic and general surgery, as these are the most common specialties performing emergency surgery. However, due to the unpredictable demand, some hospitals decide against this, due to budgetary pressures or lack of free theatre space and therefore, decide to use staff presently rostered on.

Patient initiated cancellations

Patient related reasons contributed to 49.2 per cent of all 'day of surgery' cancellations. Patients who were too sick, for example, with a cold, or who had not fasted, resulted in 23.9 per cent of cancelled elective surgeries. A further 11 per cent of cancellations were because the patient failed to attend the hospital for their surgery and did not notify the hospital or failed to wait for their surgery. Figure 2S shows the top four patient initiated reasons for cancelling elective surgeries on the day of surgery.

Figure 2S
Top four patient initiated cancellations

ORMIS cancellation reason	Percentage of all cancellations	Number of cancelled elective surgeries
Unfit for surgery due to the patient's condition	23.91%	3 014
Failed to attend on the day of surgery	10.98%	1 384
Patient cancelled booking on the day of surgery	8.29%	1 045
No longer requires treatment	5.10%	643
Other*	1.04%	131
Patient initiated cancellations	**49.33%**	**6 217**
Hospital initiated cancellations	**50.67%**	**6 387**
Total cancellations	**100%**	**12 604**

* Note: ORMIS captured another four categories of patient initiated cancellations reasons. Results exclude 308 cancellations (2 per cent) on the day of surgery due to data entry errors and a further 27 (0.21 per cent) due to natural disaster.

Source: Queensland Audit Office using ORMIS data July 2014 to December 2015.

Hospitals have limited control over patient initiated cancellations, but they can influence outcomes through effective management. Across the state, patient management varies. Contacting patients in the lead up to their surgery can be an effective tool to ensure patients will attend the hospital and are ready for their surgery. Twenty of the 29 hospitals we asked confirmed they call patients in the days leading up to their surgery to remind them of the date, arrival time and fasting requirements.

Monitoring theatre performance

Departmental support

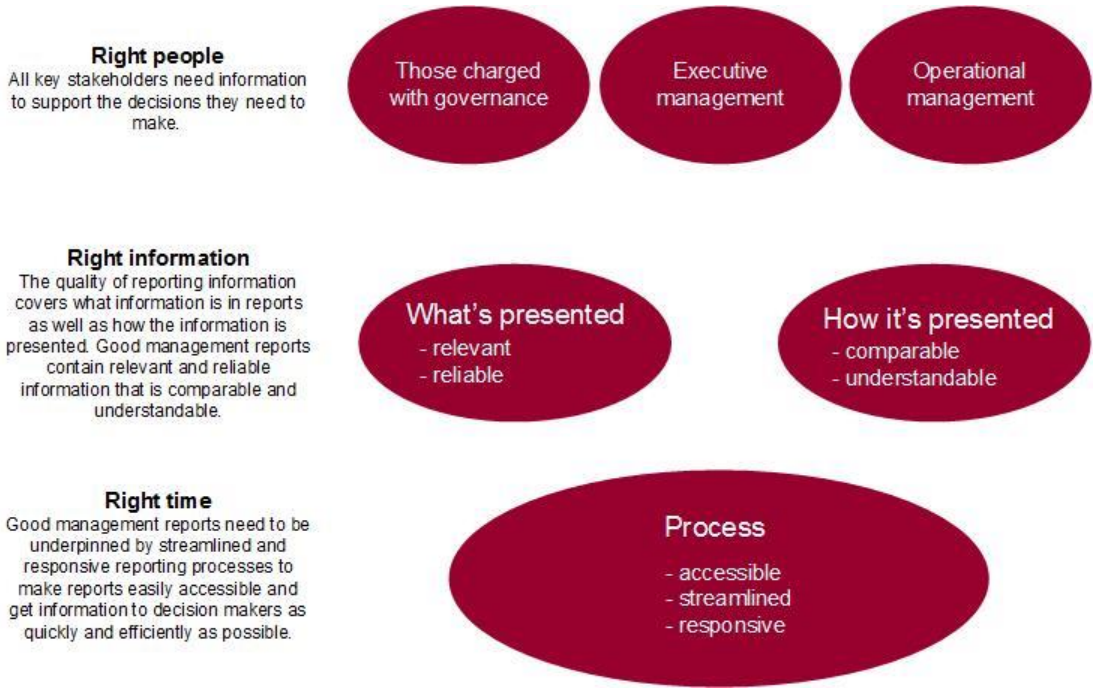
The department does not monitor theatre performance, set performance measures or targets or provide best practice guides to improve theatre efficiency. The department does provide a variety of performance report templates to hospitals, for example, from the decision support system, to assist hospitals to manage their theatre performance.

The department also provides a dictionary of terms for operating theatres to help with consistency. However, hospitals use different definitions when interpreting theatre data for entry into ORMIS. We have included a selection of definitions from the HHSs in Appendix F. Without clearly defined and agreed definitions, theatre performance measures and targets, it is difficult for hospitals within and across HHSs to benchmark against each other, identify better practices and address poor practices.

Hospital oversight

In *Hospital and Health Services: 2014–15 financial statements* (Report 5: 2015–16) we outlined that good management reporting is about getting the right information to the right people at the right time to allow managers to manage their business effectively and efficiently. Figure 2T outlines these principles.

Figure 2T
Principles of management reporting



Source: Queensland Audit Office

Reporting on theatre efficiency to the executive management group varied from providing a summary of key theatre efficiency measures and outcome measures, such as the number of patients waiting longer than clinically recommended, to just the outcome measures. A member of the executive management committee is not always a member of the theatre management committee, and relies on receiving relevant and reliable information at the right time. Ensuring the executive management group is informed of how theatres are performing allows a HHS-wide strategy and an informed perspective of what is and isn't working well.

At the operational level, all but one hospital we visited had established a theatre management committee (TMC). TMCs generally meet on a monthly basis. Most hospitals had tasked their TMCs with responsibility to monitor and report theatre efficiency.

Hospital staff suggested that the right people are not attending theatre management meetings, nor are they getting the right information. Thirteen of the 29 hospitals we asked advised that appropriately authorised people are not attending TMCs. Those responsible for monitoring theatre efficiency lack sufficient information to make informed decisions or understand their performance, for example, benchmarking or trend data.

The information HHSs provide to the TMCs varies from basic default system reports to detailed reports that highlight performance results and barriers to efficiency. As a result, they do not always have the right information to discuss theatre efficiency at these meetings.

Accurate data, interpreted correctly, enables hospital management to understand their performance and barriers to efficiency and to drive improvements. Entering non-clinical information, such as time stamps and delay reasons, into ORMIS often appeared to be a 'tick and flick' exercise, without sufficient appreciation by theatre staff of the value of accurate data. Case study 2 highlights the importance of accurate and consistent interpretation of data fields and measures.

Case study 2

Changing the method of data entry

One HHS's surgical administration team commenced a HHS-wide review into theatre efficiency in the months preceding the commencement of this audit. They undertook a patient and data walkthrough to understand why theatre utilisation was below expectations.

The HHS team discovered that staff from one hospital were not recording emergency operations conducted in elective sessions to the session, only the theatre. Across 39 hospitals, we identified 4 885 emergency operations that were conducted in elective sessions, but not counted in the utilisation reports from July 2014 to December 2015.

The hospital corrected its utilisation reports to accurately reflect the activity occurring by educating staff in the correct way to code emergency operations. This improved the hospital's reported utilisation result from 65.5 per cent to 76.2 per cent (a 10.7 per cent improvement).

Managing underperformance

One hospital we visited noted that on time starts improved after providing performance information to theatre staff. Most of the hospitals we visited do not provide information of this nature to their staff, depriving them of the chance to understand the effect of the team's actions.

Feedback from theatre staff, including senior clinicians, also suggests that hospitals are not actively managing poor theatre utilisation, such as late starts or excessive changeover times. Fifteen of the 29 hospital staff we spoke with stated that their hospitals did not manage underperformance. Eight hospitals confirmed that there is a documented process to manage underperformance, but say it is not effective. Medical staff agree that underperformance, such as late starts, has become common practice and said their culture is not conducive to starting on time.

Staff we spoke to said that specialty based teams aided in building a culture of accountability but noted the limitations in smaller hospitals, where nursing and anaesthetic staff need the skills to work across all specialties.

The hospital administrators we spoke to felt that the long lead time to replace specialists and the lack of sufficient specialists in their location often hampered their ability to effectively manage their staff.

Recommendations

Theatre performance

We recommend that all HHSs:

1. facilitated by the Department of Health, develop and implement a suite of agreed upon definitions, performance measures and targets to support HHSs and hospitals to manage, benchmark and improve theatre performance
2. require their theatre management committees (or equivalent) to monitor the efficient use of theatres and to provide regular easy to read and relevant performance reports to their theatre staff. Reports should include upstream and downstream pressure points, such as delays in preparing the patient for the anaesthetic team and a lack of ICU beds
3. clarify and formally communicate roles, responsibilities and accountability in delivering efficient surgical services, both operationally and strategically.

We recommend that the Department of Health:

4. issue the definitions, performance measures and targets that the HHSs agree upon as guidance to hospitals and provide education and implementation support to help hospitals improve their theatre efficiency.

Theatre planning

We recommend that all HHSs:

5. require their hospitals to regularly review their theatre schedules to ensure supply of specialty theatre sessions best matches their demand for services
6. revise surgery staff rosters to minimise late starts, early finishes and hospital initiated cancellations on the day of surgery.

Theatre data quality

We recommend that all HHSs:

7. undertake rigorous data quality audits and train staff to ensure they enter data consistently and accurately.

3. Coding and costing of surgical services

In brief

Hospital and Health Service (HHS) staff record information about the surgical services patients receive. The Australian Government has defined nationally consistent standards — called Diagnostic Related Groups (DRGs) — for coding patient records in a clinically meaningful way. The DRGs relate the number and type of patients treated to the resources required in a hospital. Accurate and timely recording of patient information, using the national codes, is important so the Department of Health can pay the HHSs correctly for the services they deliver.

Hospitals also use this information to plan, conduct research and benchmark against other hospitals to identify opportunities for improvement.

Conclusions

HHS theatre managers do not have a good understanding of the cost of delivering surgical services. A lack of timely and accurate information hampers their ability to manage their theatres and benchmark their performance.

A lack of sufficiently qualified coding staff is preventing HHSs from accurately coding surgical services consistently. The coders they can attract have little time to train new coders or to run audit programs to reduce the risk of coding errors going unnoticed.

Findings

- Twenty-eight per cent of the 592 patient cases (episodes of care) we audited in 2014–15 and 2015–16 had coding errors. Of those records with an error, approximately 6 per cent had an incorrect DRG recorded. This means the hospital would have received funding for the wrong DRG. In some cases this is more than what they were entitled to and, in other cases, less.
- Hospitals find it difficult to recruit and retain appropriately qualified coding staff. Coding managers do not have sufficient resources to meet coding deadlines and also to run an effective education and audit program to improve the quality of coding.
- Costing data is inaccurate and, at times, misleading. This reduces the ability for hospital administrators and directors to make properly informed decisions.
- Specialty and nursing directors do not know if they are delivering their services in a cost-effective way, as they are not provided with the right information.
- Surgical services in nine HHSs are costing more than they should, in part because hospitals do not use cost data to understand the cost of surgical services.

Introduction

Every patient admitted to hospital for surgery has details of all the treatment they receive over the course of their stay recorded. Medical coding teams take the details of the treatment provided and classify it according to nationally consistent standards called Diagnostic Related Groups (DRGs). This information provides a clinically meaningful way of relating the number and type of patients treated (for example, the casemix) to the resources required to treat them. It allows the data to be used at local, state, national and international levels for planning and research purposes.

For example, it is used to:

- compare casemix and services between hospitals and across jurisdictions
- aid service and workforce planning
- develop health policy
- target programs to prevent patients needing hospitalisation.

Once a patient leaves hospital, the staff assign a standardised weighted activity unit (WAU) to their surgical outcome (for example, a knee replacement or gall bladder removal). The WAU is used to measure the complexity of the activity. More intensive and expensive activities are worth multiple WAUs; the simpler and less complex are worth fractions of a WAU.

The Department of Health purchases clinical services from 13 Hospital and Health Services (HHSs) on an activity basis. They pay the HHSs for the number of WAUs they deliver multiplied by the fixed price — known as the Queensland Efficient Price (QEP). The department calculates the QEP using the average cost of activity delivered by all HHSs. Therefore, the actual costs incurred by a HHS to deliver their surgical services may be above or below the QEP.

In this chapter we assess whether:

- public hospitals are accurately coding their clinical services (assessed at four hospitals)
- public hospitals understand and manage the cost of clinical services and whether clinical services are being delivered efficiently.

We also looked at whether hospitals are using costing information to inform decision-making about future service delivery.

Conclusions

HHS's theatre managers are not using the patient-level data to better understand the drivers of their costs and look for ways to improve efficiency of service delivery.

Theatre managers are not using patient-level data to inform their decision-making because reports are not provided at all, or are not provided in a timely manner. Even if they were, the costing information is inaccurate as some of the data in the patient-level systems is poorly allocated to patients.

HHSs are increasing throughput of patients to drive cost efficiency in theatres, more so than focusing on understanding the underlying cost drivers.

HHS are finding it difficult to attract and retain qualified coding staff and this has made it difficult to ensuring the coding of surgical services is complete and accurate. This is resulting in reactive internal coding audit programs to detect errors. The level of coding errors we detected in a targeted sample illustrates the difficulty HHSs are facing.

Coding clinical services

Clinical coding is such an important and time consuming task in a hospital that specific roles are dedicated to coding medical records. A clinical coder's main duties are to analyse medical records and assign standard codes. Clinical coding results show the number, type of patients treated and resource required but are not used to determine the costs of surgical services.

Each HHS assigns its team of clinical coders across its principal referral, peer group A or peer group B hospitals. Commonly, peer group C and D hospitals either have records sent to the largest facility in their HHS or coders visit the hospital on a cyclical basis to code the medical records.

Across the state, and particularly outside of South East Queensland, hospitals are struggling to attract, retain and train sufficient numbers of clinical coders. Several of the hospitals we visited do not have sufficient staff to devote to coding education and auditing. The lack of staff is resulting in hospitals:

- not being able to devote the appropriate time to train graduates or new coders to supplement their staff pool
- not engaging with clinicians on an ongoing basis to ensure medical records adhere to the standards required for coding purposes
- failing to implement robust internal coding audits
- not partaking in coding peer reviews at neighbouring HHSs, in lieu of external coding audits.

The effect is that coding accuracy suffers and additional pressure is placed on meeting coding submission deadlines for statistical (research, analysis and forward planning) and regulatory purposes.

Coding accuracy

We assessed the accuracy of surgical coding at four Queensland public hospitals covering the 2014–15 financial year and the first three months of 2015–16. At each hospital we tested 74 surgical admissions per year.

We identified a 25.7 per cent error rate in 2015–16 and 30.7 per cent error rate in 2014–15. These coding errors resulted in 6.1 per cent (2015–16) and 6.8 per cent (2014–15) requiring a DRG change. A change in DRG either increases or decreases the amount of money a hospital is entitled to. Coding errors, such as missed additional diagnosis (such as diabetes) or procedures also affect the accuracy of casemix data that HHS and the department use for workforce and strategic planning.

Figure 3A outlines the results of our assessment of coding the diagnosis and procedures accurately in a patient's episode of care across four hospitals. The changes in DRGs that we observed were evenly split between increasing and decreasing the resources required to treat the patient and were the result of coder error.

There will always be a small degree of subjectivity in assigning codes and a level of error in coding. The volume of errors in the data indicates a lack of coder experience, absence of a robust audit program and pressure to meet deadlines. For example, once it was determined that a DRG was an 'A' level — resulting in the maximum financial amount that a hospital can claim — coders stopped searching for additional diagnosis or procedures.

Due to the target nature of our audit, the error rates cannot be extrapolated across the entire hospital population.

Figure 3A
Clinical coding audit results

Hospital	July 2014–June 2015			July–Sept 2015		
	DRG changes on the account of errors	Episodes with one or more errors	Total errors	DRG changes on the account of errors	Episodes with one or more errors*	Total errors
Hospital A (Principal referral hospital)	3	17	38	4	10	18
Hospital B (Public acute group A hospitals)	7	21	42	7	22	53
Hospital C (Public acute group A hospitals)	3	15	34	4	16	25
Hospital D (Principal referral hospital)	5	38	81	5	28	62
	18	**91**	**195**	**20**	**76**	**158**

Note: Not all errors result in a DRG change but affect the accuracy and ability for hospitals to understand their casemix and effectively plan and address emerging healthcare issues in their community. The four hospitals were afforded a comprehensive debrief and provided detailed coding reports.

Source: Queensland Audit Office

The common causes of errors were:

- inexperienced coders
- unclear coding processes and procedures, particularly for verifying diagnosis and procedures
- pressure to meet deadlines.

Costing clinical services

The Independent Hospital Pricing Authority (IHPA) produces the Australian Hospital Patient Costing Standards. Accompanying the standards is a guideline and best practice principles on how to adhere to the cost model that all jurisdictions agreed to. The department mandates its adoption and provides a supplementary guide to assist HHS in adhering to the IHPA standards.

Although HHSs record surgical costs, they are not able to provide timely and accurate costs at a patient level. This is resulting in:

- hospitals not using patient costing information to manage costs
- a lack of incentive to drive efficient delivery of surgical services.

The hospitals we visited produce costing reports many months after the end of a financial year, often for the entire financial year. This means that costing information can be a year old before it reaches management. The delays and inaccuracies are caused by patient-level clinical systems that feed data into the costing system. Some systems, such as payroll, have a period of data settlement and quality assurance before information is ready for costing.

Costing systems

Most hospitals use a costing system separate to their general financial management system and patient management system. The costing system draws on information contained in various systems to allow costs to be allocated to separations (discharged patients). However, hospitals largely use their costing systems to comply with government reporting requirements, rather than to understand and manage costs at a patient level.

Cost management at a HHS level

The service agreement between the Department of Health and HHSs allows HHSs to manage their surgical costs at a HHS level instead of a hospital level. This makes it easier to deliver surgical services in a manner which suits the HHSs' board and community expectations.

Queensland's consolidated surgical services deficit result is less than 4.8 per cent of the total reported cost. However, based on the 2013–14 surgical costing data, eight HHSs and the Mater public facilities are not delivering surgical services at the QEP (marked as 'surplus or deficit' in Figure 3B), indicating scope to improve cost efficiency. Figure 3B outlines the revenue at the QEP, the reported cost of services, and the surplus or deficit on a per bed day at a HHS level for elective and emergency surgery. The per-bed day measures provide an indication of the cost comparison between HHSs.

Figure 3B
HHS 2013–14 surgical services financial position

HHS	Revenue $'000	Cost $'000	Surplus /deficit $'000	Cost per bed day $	Surplus /deficit per bed day $
Cairns and Hinterland	107 401	94 626	12 775	2 484	335
Central Queensland	53 490	47 940	5 550	2 521	292
Children's	46 864	57 101	-10 237	3 754	-673
Darling Downs	66 942	65 328	1 614	2 758	68
Gold Coast	183 722	207 911	-24 189	3 284	-382
Mackay	40 354	42 633	-2 279	3 211	-172
Mater public facilities	141 763	144 413	-2 651	3 330	-61
Metro North	508 469	531 547	-23 078	3 084	-134
Metro South	396 934	411 561	-14 626	3 196	-114
North West	7 665	7 588	76	3 118	31
Sunshine Coast	99 986	105 054	-5 068	2 857	-138
Townsville	161 729	151 438	10 291	2 625	178
West Moreton	65 039	65 724	-686	3 228	-34
Wide Bay	62 629	69 540	-6 911	3 212	-319
Totals	**1 942 986**	**2 002 405**	**-59 418**	**3 052**	**-90**

Note: Cost per bed day is calculated by the cost divided by the occupied bed days. This excludes Group D hospitals. Depreciation is excluded as the department funds this separately

Source: Queensland Audit Office using Department of Health costing data submitted to the Independent Hospitals Pricing Authority

Figure 3C recasts the surgical services financial position into hospital peer groups to allow comparison to other figures throughout this report.

Figure 3C
HHS 2013–14 surgical services financial position

Peer group	Revenue $'000	Cost $'000	Surplus /deficit $'000	Cost per bed day* $'000	Surplus /deficit per bed day $
Principal referral hospitals	576 254	622 310	-46 056	3 333	-247
Public acute group A hospitals	727 170	741 285	-14 115	2 985	-57
Public acute group B hospitals	301 565	291 538	10 027	2 942	101
Public acute group C hospitals	337 997	347 272	-9 275	2 849	-76
Totals	**1 942 986**	**2 002 405**	**-59 418**	**3 052**	**-91**

Note: Cost per bed day is calculated by the cost divided by the occupied bed days. Mater Adults has been grouped with principal referral hospitals. Mater Mothers and Mater Children's have been grouped with public acute group A hospitals. Depreciation is excluded as the department funds this separately

Source: Queensland Audit Office using Department of Health costing data submitted to the Independent Hospitals Pricing Authority.

Reliability of costing reports

We found that the key use of costing reports at the hospital level is to determine whether the allocation of costs between major business lines (inpatient, outpatient, emergency department, mental, subacute) appear to be reasonable.

While the demand from theatre managers for patient-level costing information varied, the importance of this data for managing theatres was not well understood. The specialty directors at the hospitals we visited were managing on a cost centre basis, not on an activity basis. Nor were they seeking to understand if the costs of delivering services were greater or less than the funding received. Twenty-four of the 29 hospitals we asked stated that the theatre management committee does not receive costing at a specialty or patient level.

The hospitals we spoke to are allocating the largest cost components — theatre nurses and medical wages — to patients, firstly by reference to the theatre minutes for their surgery. This may not always align with the actual time that nurses and specialists spent working on the patient. The remainder of these costs are allocated by dividing monthly cost centre costs by the number of patient days used.

Variations in theatres costs

Large variations in reported costs per episode within hospitals and between hospitals is probably due to the cost allocation methods, which mask or exacerbate real differences in clinical practice. Our analysis in this chapter was undertaken after standardising data, for example, demographics and admission source. See Appendix D for the methodology.

Case Study 3 demonstrates the variation in reported operating theatre costs for carpal tunnel release, a fairly simple and low-resource-intensive procedure.

Case study 3

Variation in operating room staffing costs

Operating theatre costs for nursing, technical, and medical staff are typically allocated to patients based on the number of minutes the patient spends in theatre. The quality of data recording for the number of minutes or number of staff is poor at some facilities, resulting in huge variation in allocated surgical costs.

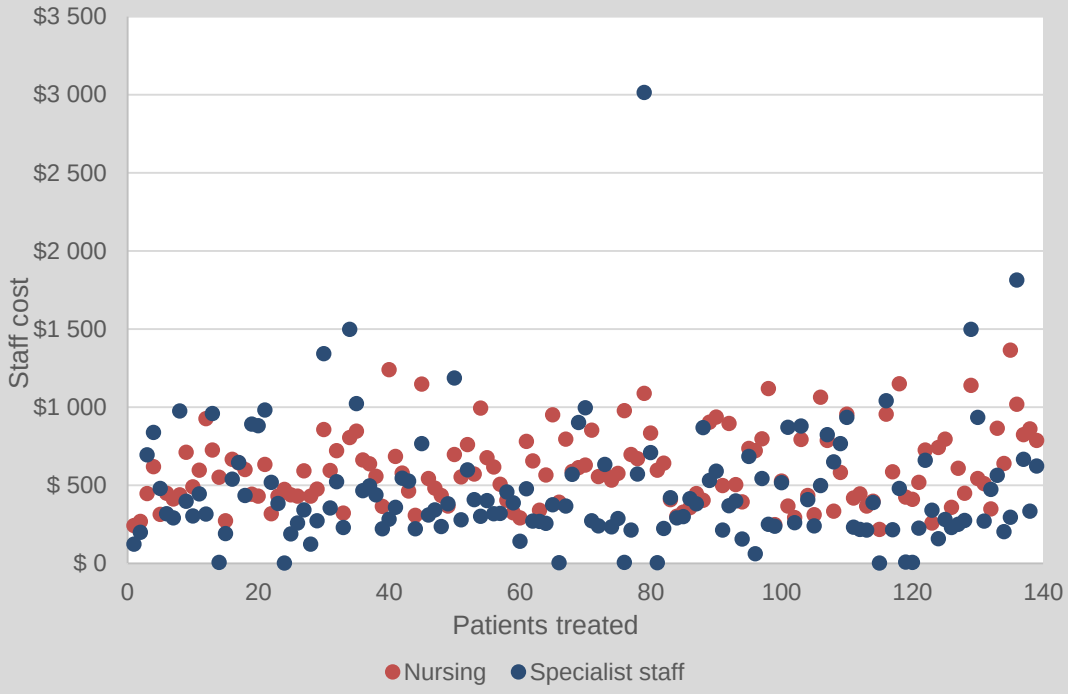
The graph below maps the nursing and specialist staff cost for carpal tunnel release (DRG B05Z) to each patient treated at one major principal referral hospital. A carpal tunnel release is a procedure performed on the wrist to treat carpal tunnel syndrome and is typically a same-day surgical case. It shows the cost ratio of nurses to specialists varies significantly and the actual report costs do not follow a trend.

Legitimate reasons for cost variations include:

- additional time the patient waits in the theatre for the procedure to begin or for a space in the recovery room to become available
- staff who are assisting with the procedure are receiving training, resulting in the procedure taking longer
- complications arising during the surgery.

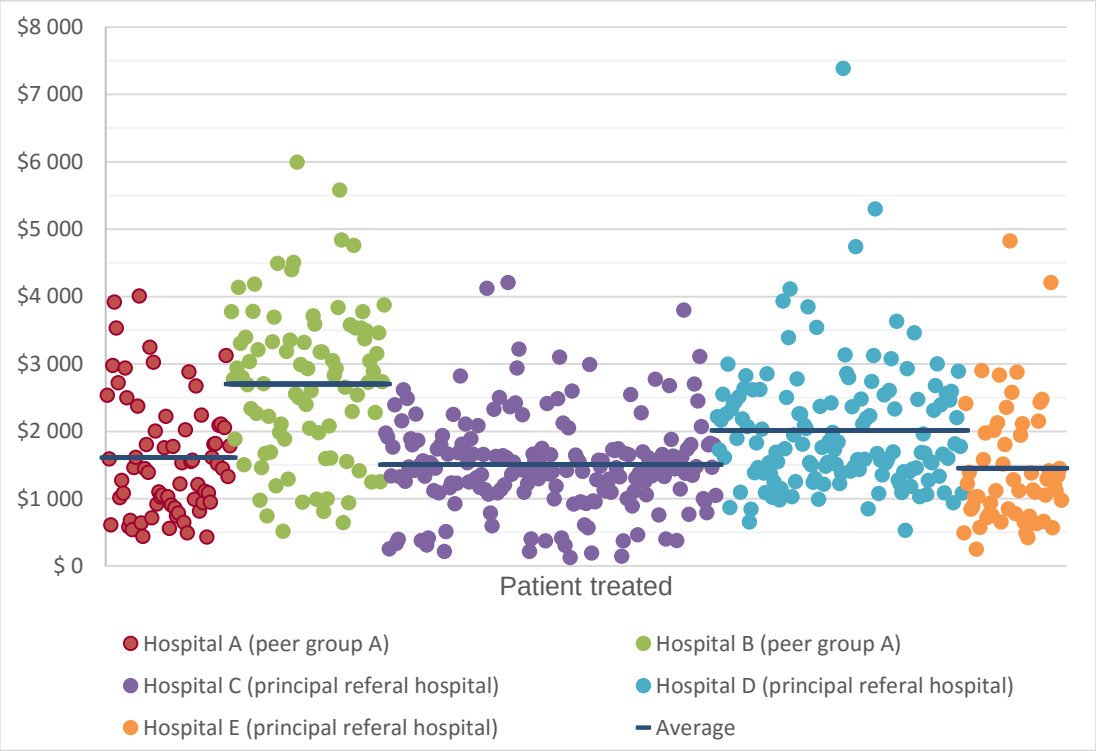
However, it is not always possible to separate legitimate costs from costing problems.

Variation in operating room staffing costs: 2013–14: carpal tunnel release



There are large differences in reported costs at the component level in routine minor surgical cases, such as carpal tunnel release (DRG B05Z). Reported theatre costs at one hospital ranged from $941 to $4 503. The average operating cost between the 18 hospitals that performed more than 26 procedures varied between $240 and $2 703. In Figure 3D we present the five hospitals with the greatest variation in reported cost.

Figure 3D
Top five 'carpal tunnel release' theatre cost spread variation: 2013–14



Notes: Eighteen in-scope hospitals performed at least 26 carpal tunnel releases (DRG B05Z); admission was not via the emergency department.

Source: Queensland Audit Office using Department of Health costing data submitted to the Independent Hospitals Pricing Authority.

Sixteen of 18 hospitals who performed more than 26 carpal tunnel release surgeries had operating room cost variations of over $1 000 between the minimum and maximum reported costs (excluding the bottom and top five per cent as outliers). A thousand dollar variance represents 43 per cent of the reported average cost at these hospitals.

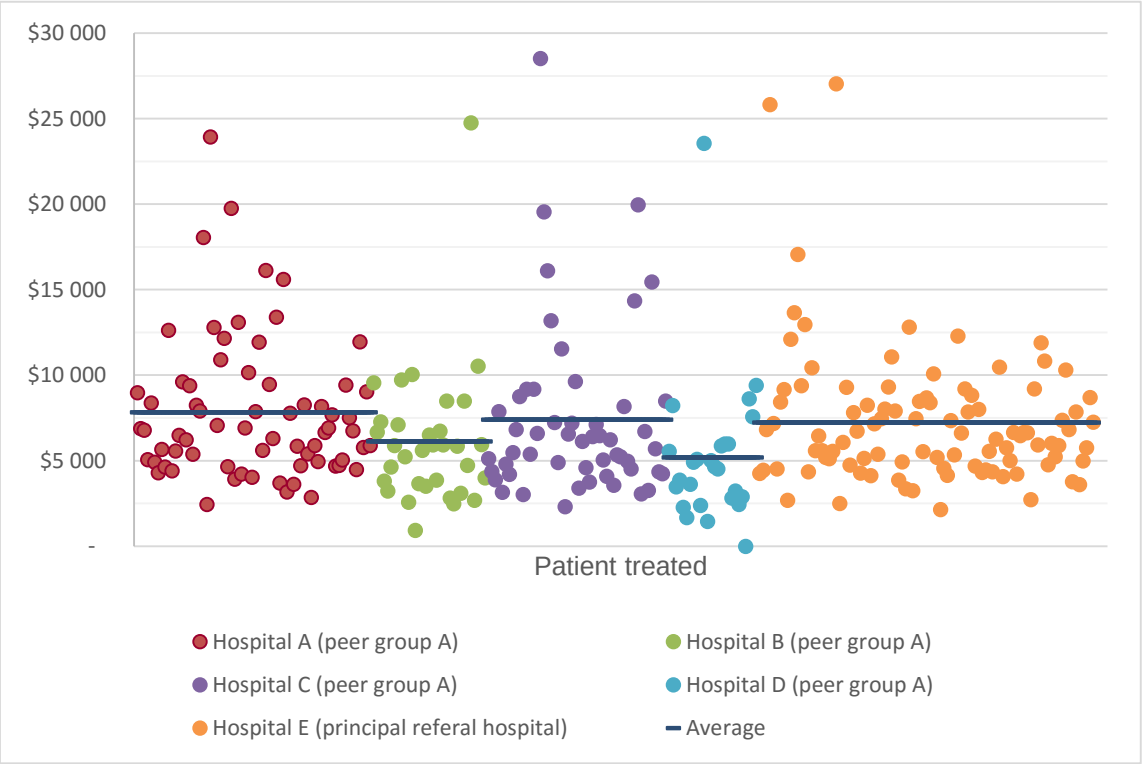
The high variance in reported costs of care at the episode level within hospitals for routine minor surgery indicates that the data can only be used as a rough screening tool for management and efficiency improvements.

Hospitals explained to us that variations were due to:

- incorrect entry of the number of surgical minutes taken or the number of staff who were present
- inability to distinguish between which grade of nurses or doctors were present for the procedure
- incorrect capture of theatre costs through the general ledger in a given month, with a subsequent adjustment in a later month — affecting the cost allocated to specific patients in both months.

Variations were also seen in more complex cases, such as other hip and femur procedures (DRG I08B). This DRG consumes greater theatre time and usually involves more theatre staff, for example, additional nurses. Figure 3E compares the five hospitals with the largest spread in operating room and prosthetic costs for other hip and femur procedures. It also highlights a variation of $2 640 in the average cost across these hospitals.

Figure 3E
Top five 'other hip and femur procedures' theatre and prosthetic cost variation 2013–14



Notes: Sixteen in-scope hospital performed at least 26 surgeries (DRG I08B); admission was not via the emergency department.

Source: Queensland Audit Office using Department of Health costing data submitted to the Independent Hospitals Pricing Authority

The analysis shows the way hospitals currently allocate costs to DRGs does not result in an accurate record of the cost of service delivery. Therefore, this information is of little value to hospitals in driving cost improvements at a DRG level.

Prosthetics is another area where we identified significant variation in costing results. There is a clinical and legal requirement to monitor implants in patients for many years after surgery, for safety reasons. However, the cost of these implants is frequently not accurately captured or accurately transferred into the costing systems. As a result, some hospitals are spreading prosthesis costs to patients who don't receive a prosthesis at all, whilst others are reporting unusually high prosthetic costs.

Case study 4

Variation in prosthetic costs

Prosthetics are any implement left in a patient, for example, surgical screws or rods. Not all surgical procedures require a prosthetic. A carpal tunnel release (DRG B05Z) is a procedure performed on the wrist to treat carpal tunnel syndrome; it does not require any prosthetics.

In the 2013–14 year eight of 18 hospitals who performed more than 26 carpal tunnel releases had allocated some prosthetic costs to the patient, ranging from $1 to $362.

Prosthetics are always used for a DRG I08B (other hip and femur procedures). Of the 16 hospitals who performed more than 26 emergency procedures, three allocated no prosthetic costs to some patients, and a further nine allocated less than $200. Across these sixteen hospitals, the average prosthetic cost per episode varied between $319 and $2 251.

This indicates that HHSs and their hospitals do not really know what it costs to deliver these surgical services and how, if at all, they can be more cost-efficient. In part, this is due to sub-optimal data collection in patient-level clinical systems, or how these systems feed data into the costing model and are used to allocate costs.

In both examples used in this case study the bottom and top five percent of cost outliers have been excluded from our analysis to provide more meaningful and standardised analysis.

Hospital administrators and costing managers rely on variation at an individual DRG level 'washing out' over a larger number of episodes to provide a reasonable estimate of the overall average cost to the state. However, these assumptions depend on implementation of consistent allocation rules and general accounting systems.

Financial incentives to be cost-efficient

When the government established the HHSs in 2012, the department compared the reported cost of services delivered by each HHS to the QEP to determine how efficient each HHS was at that time.

The department provided the cost-inefficient HHSs with transitional grants to ensure they could continue to provide medical services to their communities. The cost-efficient HHSs were funded at less than the QEP, but sufficient to continue to maintain services for their communities. This clawback allowed the department, as system manager, to determine what services were purchased and where.

Each year, the department reviews how efficient each HHS is and adjusts their funding up or down accordingly, to ensure they can continue to provide required services. This process prevents excessive cash accumulating within the HHSs. However, it reduces the financial incentive for HHSs and hospitals to be more cost-efficient because the majority of excess funds are not available to be reinvested into the HHSs' services as they see fit.

Funding services on a close to break-even basis has lessened the motivation for managers to seek and understand costing information. Since frontline managers rarely use costing information to improve efficiency, the drive to improve the accuracy of cost data has also been minimal.

Recommendations

Medical coding

We recommend that all HHSs:

8. improve the framework supporting coding in hospitals by:
   - ensuring their hospitals develop a comprehensive internal coding audit program, in conjunction with the HHS's internal audit function, that focuses on quality and standardisation
   - undertaking a formalised and structured peer reviewing program.

Costing/funding

We recommend that all HHSs:

9. improve the accuracy and timeliness of patient-level costing of hospital services and provide meaningful reports to directors and to the theatre management committee.

Costing/funding

We recommend that the Department of Health:

10. reviews the purchasing incentives to encourage efficiency and reward better performing HHSs.

Appendices

Appendix A— Comments

In accordance with s.64 of the *Auditor-General Act 2009*, a copy of this report was provided to the following entities with a request for comment.

Responsibility for the accuracy, fairness and balance of the comments rests with the head of these agencies.

- the Department of Health
- all Hospital and Health Services
- the Mater Health Service

Comments received from Chief Executive Officer, Mater public services

Queensland Audit Office

Mater public services, Queensland public hospital operating theatre efficiency

Response to relevant recommendations provided by Group Chief Executive Officer, Mater public services on 13 April 2016.

Recommendation	Agree / Disagree	Timeframe for Implementation	Additional Comments
Theatre performance			
We recommend that all HHSs: 1. facilitated by the Department of Health, develop and implement a single suite of agreed upon definitions, performance measures and targets to support HHSs and hospitals to manage, benchmark and improve theatre performance.	Yes	Q1 2016/2017	Key Mater contacts to be involved in relevant meetings with other HHSs to develop definitions, performance measures and targets. Mater contact to conduct sufficient consultation with relevant internal teams and provide regular updates to Executive Committees.
We recommend that all HHSs: 2. require their theatre management committees (or equivalent) to monitor the efficient use of theatres and to provide regular easy-to-read and relevant performance reports to their theatre staff. Reports should include upstream and downstream pressure points, such as delays in preparing the patient for the anaesthetic team and a lack of ICU beds.	Yes	Q2-4 2016/2017	Key Mater contacts to work with Data coordinator and Elective Surgery Coordinator to design relevant reports. These reports will be provided to the Executive Committees fortnightly.
We recommend that all HHSs: 3. clarify and formally communicate roles, responsibilities and accountability for delivering efficient surgical services, both operationally and strategically.	Yes	Q2 2016/2017	Medical and Nursing Theatre Directors to update position descriptions and service plan to clarify roles, responsibilities and accountability. Position descriptions and service plan to be provided to Executive Committees for endorsement before being cascaded to theatre teams formally.
We recommend that the Department of Health: 4. issue the definitions, performance measures and targets that the HHSs agree upon as guidance to hospitals and provide education and implementation support to help hospitals improve their theatre efficiency.	Yes	Q4 2016/2017	

Responses to recommendations

Recommendation	Agree / Disagree	Timeframe for Implementation	Additional Comments
Theatre planning			
We recommend that all HHSs: 5. require their hospitals to regularly review their theatre schedules to ensure supply of specialty theatre sessions best matches their demand for services.	Yes	Q1-4 2016/2017	Medical and Nursing Theatre Directors to review theatre schedules monthly to ensure supply of specialty theatre sessions best matches their demand for services. Directors will be aware of demand for services through their membership on the Executive Committees.
6. revise surgery staff rosters to minimise late starts, early finishes and hospital initiated cancellations on the day of surgery.	Yes	Q1-4 2016/2017	Key Mater contacts, Elective Surgery Coordinator and Administration officers review staff rosters monthly.
Theatre data quality			
We recommend that all HHSs: 7. undertake rigorous data quality audits and train staff to ensure they enter data consistently and accurately.	Yes	Q3 2016/2017	Key Mater contacts to work with Data coordinator to undertake quarterly data quality audits, and provide a brief quarterly training session to all staff on data entry.
Medical coding			
We recommend that all HHSs: 8. improve the framework supporting coding in hospitals by: • ensuring their hospitals develop a comprehensive internal coding audit program in conjunction with the HHS's internal audit function, that focuses on quality and standardisation • undertaking a formalised and structured peer reviewing program.	Yes	Q3 2016/2017	Analytics and Performance team to provide regular updates to Executive Committees in regard to the development of our internal coding audit program, including a formalised and structured peer review element.
Costing/funding			
We recommend that all HHSs: 9. improve the accuracy and timeliness of patient level costing of hospital services and provide meaningful reports to directors and to the theatre management committee.	Yes	Q2 2016/2017	Key Mater contacts and Elective Surgery Coordinator to meet with the relevant Data & Analytics team and Finance team to design a template for costing and design a meaningful report to be provided monthly to Medical and Nursing Theatre Directors.
We recommend that the Department of Health: 10. review the purchasing incentives to encourage efficiency and reward better performing HHSs.	Yes	Q4 2016/2017	

Comments received from Director-General, Queensland Health

Queensland Government

Enquiries to: Mr Michael Zanco
Executive Director
Healthcare Improvement Unit
Clinical Excellence Division
Telephone: 3328 9134
File Ref: DG079799

13 APR 2016

Mr Andrew Greaves
Auditor-General
Queensland Audit Office
PO Box 15396
CITY EAST QLD 4002

RECEIVED
15 APR 2016
QUEENSLAND AUDIT OFFICE

Dear Mr Greaves

Thank you for your letter dated 23 March 2016, regarding the Queensland Audit Office Performance audit on managing public hospital theatre efficiency.

I acknowledge receipt of the Queensland Audit Office's proposed report to be tabled in Parliament. I note that you have written to all Hospital and Health Service Chief Executives and as such I have sought their feedback to inform my response. I provide the comments in this letter for inclusion in the final report.

Providing effective and efficient health services is a complex matter that needs to take into consideration a number of factors, particularly in an environment where demand is greater than supply. Hospital and Health Services are required to balance a number of internal and external priorities as part of delivering quality care to the people of Queensland, with improvements to the system requiring transformational change over a number of years. This included hospital theatres needing to balance the demands of emergency activity with planned elective surgery.

Pressures in health come from the requirements of an ageing population, the introduction of expensive medical technologies and greater community expectations for access to health services. However, it is evident that public hospitals could provide better care by being more efficient and reducing waste. As such, the Department of Health welcomes all opportunities to improve the quality, safety and efficiency of our services.

The Department of Health considers that due to the variation in which the Operating Room Management Information System (ORMIS) is used in Queensland, the data extracted by the Queensland Audit Office should be interpreted with caution.

The data captured within the ORMIS database is not subject to consistent data quality validation processes nor does it account for practice variation in each facility. Given these limitations, the findings of the audit should be interpreted in the context of the status and quality of the data set.

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Comments received from Director-General, Queensland Health

It is important to note that the report only considers one element of the delivery of surgical services. It incorporates no analysis such as patient outcomes, safety and quality metrics or patient satisfaction. Managing operating theatre efficiency is complex, as evidenced by the fact that there are no definitions nationally.

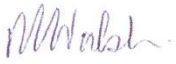
Effective clinical benchmarking requires a best-practice approach based on evidence and includes data broader than time based measures. The surgical and perioperative professional community looks at a range of non-time related indicators, in addition to time related indicators, to measure patient outcomes. Each clinical specialty undertakes peer review of significant cases as part of ensuring the delivery of high quality patient care. Measures such as unplanned returns to the operating room, wrong site surgery and anaesthetic complications are examples of accepted operating room benchmarks. These measures are critical to ensuring the operating environment is safe and effective. I would therefore request that the report acknowledges that it only considers one element of the delivery of efficient and effective surgical services and does not include analysis of patient outcomes, safety and quality metrics or patient satisfaction.

The ability to benchmark across peer hospitals or the system is difficult. For example, across the tertiary hospitals in Queensland, super specialties have been established to improve overall system efficiency. For example the Princess Alexandra Hospital undertakes liver and renal transplants and is the State's leader in spinal surgery. The Royal Brisbane and Women's Hospital undertakes upper limb orthopaedics and is the leader in burns and trauma. The Prince Charles Hospital is Queensland's leading cardiac service and undertakes cold orthopaedics. Therefore, it is not entirely accurate to benchmark across theatres and sub-specialty groups without adjusting for these differences, because it is not a like-for-like comparison and does not account for the differing complexities these surgeries encompass.

The Department of Health looks forward to working with the Hospital and Health Services to progress the recommendations given our commitment to continually improve the efficiency and overall quality of surgical services across the State. As requested, please find attached the completed table with regard to the recommendations outlined in the report.

Should you require further information, the Department of Health's contact is Mr Michael Zanco, Executive Director, Healthcare Improvement Unit, Clinical Excellence Division, on telephone 3328 9134.

Yours sincerely



Michael Walsh
Director-General
Queensland Health

2

Responses to recommendations:

Department of Health Queensland public hospital operating theatre efficiency

Queensland Audit Office
better public services

Response to relevant recommendations provided by Department of Health on 5 April 2016.

Recommendation	Agree / Disagree	Timeframe for Implementation	Additional Comments
Theatre performance			
We recommend that all HHSs: 1. facilitated by the Department of Health, develop and implement a single suite of agreed upon definitions, performance measures and targets to support HHSs and hospitals to manage, benchmark and improve theatre performance.	Agree	30 June 2017	Dependent on Recommendation 4 timelines
We recommend that all HHSs: 2. require their theatre management committees (or equivalent) to monitor the efficient use of theatres and to provide regular easy-to-read and relevant performance reports to their theatre staff. Reports should include upstream and downstream pressure points, such as delays in preparing the patient for the anaesthetic team and a lack of ICU beds.	Agree	30 June 2017	
We recommend that all HHSs: 3. clarify and formally communicate roles, responsibilities and accountability for delivering efficient surgical services, both operationally and strategically.	Agree	1 January 2017	
We recommend that the Department of Health: 4. issue the definitions, performance measures and targets that the HHSs agree upon as guidance to hospitals and provide education and implementation support to help hospitals improve their theatre efficiency.	Agree	1 January 2017	The Department will undertake a formalised process of consultation with HHSs to co-develop the Guideline, incorporating global best practices where appropriate, to best suit the needs of public hospitals in Queensland.

1

Responses to recommendations:

Queensland Audit Office
better public services

Recommendation	Agree / Disagree	Timeframe for Implementation	Additional Comments
Theatre planning			
We recommend that all HHSs: 5. require their hospitals to regularly review their theatre schedules to ensure supply of specialty theatre sessions best matches their demand for services.	Agree	1 January 2017	
6. revise surgery staff rosters to minimise late starts, early finishes and hospital initiated cancellations on the day of surgery.	Agree	1 January 2017	
Theatre data quality			
We recommend that all HHSs: 7. undertake rigorous data quality audits and train staff to ensure they enter data consistently and accurately.	Agree	1 December 2017	
Medical coding			
We recommend that all HHSs: 8. improve the framework supporting coding in hospitals by: • ensuring their hospitals develop a comprehensive internal coding audit program in conjunction with the HHS's internal audit function, that focuses on quality and standardisation • undertaking a formalised and structured peer reviewing program.	Agree	1 December 2017	
Costing/funding			
We recommend that all HHSs: 9. improve the accuracy and timeliness of patient level costing of hospital services and provide meaningful reports to directors and to the theatre management committee.	Agree	1 December 2017	
We recommend that the Department of Health: 10. review the purchasing incentives to encourage efficiency and reward better performing HHSs.	Agree	1 July 2017	The Department will review options for providing improvement payments

2

Appendix B—Audit methodology

Performance audit approach

The audit was conducted in accordance with the *Auditor-General of Queensland Auditing Standards — September 2012*, which incorporate the requirements of standards issued by the Australian Auditing and Assurance Standards Board.

The audit was conducted between July 2015 and February 2016. The Department of Health, all Hospital and Health Services (HHSs) and Mater public facilities were subject to this audit.

The Mater public facilities are administered by a non-public sector entity and were included in this audit under the provisions of Section 36A of the *Auditor-General Act 2009* (the Act).

Section 36A of the Act allows the Auditor-General to conduct an audit of a matter in which a public sector entity (in this case the Department of Health) is giving or has given property, including money, to a non-public sector entity (in this case the Mater public facilities). The object under the Act includes to determine whether the money has been applied economically, efficiently and effectively for the purposes for which it was given to the non-public sector entity.

The Mater public facilities' operating theatre data was unreliable due to overlapping operations and therefore, has been excluded from our analysis. Information pertaining to the cost of their surgical services has been included in our analysis.

Approximately 39 per cent of the 2014–15 Sunshine Coast HHS surgeries have been undertaken in private hospitals under two contractual fee per surgery arrangements, representing approximately 29 per cent of their delivered weighted activity units. These arrangements require a minimum volume of activity be undertaken in private hospitals. The outsourcing arrangements commenced prior to the period analysed and continued for the duration of the audit. This activity is not captured in the Operating Room Management Information System (ORMIS) and performance data for this has not been included in this audit.

The audit included:

- eight patient theatre walk-throughs at five hospitals:
  - Cairns Base Hospital
  - Rockhampton Hospital
  - Toowoomba Hospital
  - Royal Brisbane and Women's Hospital
  - Logan Hospital
- interviews with HHS staff across eight hospitals:
  - directors of medical services, executive and divisional directors, directors of surgery, specialty directors, surgeons and registrars, nursing directors, nurse unit managers, clinical nurse consultants, scrub and scout nurses, anaesthetists, anaesthetic technicians, elective surgery coordinators, ORMIS managers and administrators, finance managers, coding managers, and business managers
- interviews with Department of Health staff from the Healthcare Improvement Unit and the Healthcare Purchasing and System Performance Division
- forums with the Statewide Surgical Advisory Committee and the Statewide Anaesthesia and Peri-operative Care Clinical Network
- analysis of data from:
  - ORMIS V7 for public and private patients who received treatment in a public theatre

  - waitlist data
  - departmental costing data submitted to the Commonwealth
  - targeted sample of hospital coding data
- review of departmental guidance documents and data dictionaries
- review of HHS performance reports, improvement plan acquittal reports and internal policy documents
- survey of all theatre nurse unit managers, directors of anaesthesia, directors of surgery, directors of peri-operative services and elective surgery coordinators. A low response rate to the survey resulted in the results being statistically invalid. The results were used to complement other sources of audit evidence.

An independent reference panel provided independent advice to the audit team. The panel comprised a:

- private sector anaesthetist
- private hospital director of medical services
- retired general surgeon currently directing the development of public hospital policy advice.

Coding audit

We undertook a coding audit at four public hospitals to test the level of accuracy. We tested 74 surgical admissions per year. We applied:

- a tolerable error rate of 5 per cent
- an expected error rate of 1.2 per cent
- a low reliance on controls with a high reliance on sampling.

The audit over the 2014–15 financial year focused on general accuracy of coding diagnosis and procedures and for 2015–16 the focus was on DRGs with a high variation in the cost rate (adjusted for volume) of ‘A’ level episodes (the most resource intensive) amongst Queensland public hospitals.

Data sources

We did not audit the accuracy of data supplied to us, but undertook reasonableness checks and tested formulas and results with the Department of Health and eight HHSs to ensure its acceptance.

The Department of Health provided us with the ORMIS v7 table extracts for all public hospitals that used the system

Appendix C—How activity based funding works

How activity based funding works

Activity based funding (ABF) is the tool used by the system manager to standardise the method of counting and classifying hospital activity. Service agreements between the Department of Health (the department) and each Hospital and Health Service (HHS) are based on the department's funding and purchasing models. In broad terms, the funding model determines the price at which the department purchases services from HHSs, and the purchasing model determines the volume of services that are purchased.

Theatre, recovery (ward nurses) and prosthetics are the three most expensive cost categories that form part of the entire cost of providing the surgical service. A surgical service also includes any radiology, pathology and pharmaceutical costs.

The price of services

The Queensland Efficient Price (QEP) is based on the average cost of ABF funded facilities, adjusted for clinical education and training, specified grants, state escalation rates, and the cost of blood products devolved to the HHSs.

Incentive for hospitals to improve the accuracy of patient-level costing or productivity throughput has been initiated in 2014–15 with the break from using the national efficient price, but using Queensland costs to derive the average price, and in the setting of state localisations for unavoidable costs.

Weighting services

Each occasion of service is given a weighting against a standard weighted activity unit, indicating its relative use of resources. The department has developed Queensland Weighted Activity Units (QWAUs) derived from the National Weighted Activity Units (NWAUs).

The difference between QWAUs and NWAUs for acute inpatients is illustrated in Figure C1:

Figure C1 — Comparing national weighted activity units with Queensland weighted activity units

NWAUs	QWAUs
Standardises treatment using Australian refined diagnostic related groups	Standardises treatment using Australian refined diagnostic related groups
Private patients funded at reduced rate	Private patients funded equally to public patients to take into account own source revenue
Pharmaceutical benefits (PBS) costs excluded	PBS included
	A range of location adjustments to encourage improved patient outcomes, for example, reduced funding when certain surgeries are not performed within clinically recommended times.

Source: Queensland Audit Office from Department of Health, Health Funding Principles and Guidelines 2015–16

Each QWAU is rated as one (1). An occasion of service is a percentage of a QWAU. For example, a keyhole gall bladder removal is 1.4125 QWAUs.

Standardising the price of services

The revenue paid to the HHS for an occasion of service is calculated using the formula:

QEP x QWAU = funding ($)

Using the gall bladder example, the department would purchase the surgery for $12 951:

1.4125 QWAUs x $4 676 QEP = $6 604.85

For this revenue, the HHS delivers all aspects of the surgery, including any imaging, pharmacy and wards costs.

Figure A2 provides an example of the costs included in a surgery. Costs are grouped into categories, known as cost buckets. The more mature a hospital's costing of resources to surgeries, the more accurately decisions can be made.

Figure C2 — Fictitious example, average cost component

	Pharmacy	Operating rooms	Ward supplies	Spec procedure suites	Prosthesis	On-costs	Hotel	Depreciation	Total
Direct	215	3 736	327	19	6 080	861	436	0	11 674
O/head	27	797	443	3	0	0	0	399	1 669
Total	242	797	770	22	0	861	436	399	**13 343**

Source: Queensland Audit Office

If a hospital is cost-efficient, it will generate a surplus from the surgery. If it is inefficient, it will not have received enough revenue to cover its costs and will need to subsidise the service through more profitable services. In this example, the hospital will need to subsidise this surgery by $392.

Appendix D—Costing standardisation

The cost of providing services varies depending on many variables; some of which are outside the control of hospitals. We standardised the data using a risk-adjusted benchmark length of stay and cost of each episode based on the following variables:

- The Diagnostic Related Code assigned to the patient
- Admission type (emergency or elective)
- Admission source (regular or transfer in)
- Discharge destination (home, acute transfer, type change or died)
- Co-morbidity level (high or low)
- Age group (0, 1–16, 17–34, 35–49, 50–64, 65–79, 80+)

This methodology is similar to that endorsed by Queensland hospitals who participate in industry-led Health Roundtable discussion and analysis.

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Appendix E—Hospital groupings

The Australian Institute of Health and Welfare (AIHW) published revised peer grouping for Australian public and private hospitals. The 'Australian hospital peer groups' publication categorises hospitals into peer groups based on the type and nature of service they provide. For the full list of hospital peer groups and sub groups refer to AIHW's website.

The AIHW categorises acute hospitals into the following subgroups:

Figure E1

Acute hospital category	Description
Principal referral hospitals	Principal referral hospitals are public acute hospitals that provide a very broad range of services, have a range of highly specialised service units, and have very large patient volumes. The term 'referral' recognises that these hospitals have specialist facilities not typically found in smaller hospitals.
Public acute group A hospitals	Public acute group A hospitals are public acute hospitals that provide a wide range of services typically including a 24-hour emergency department, intensive care unit, coronary care unit and oncology unit, but do not provide the breadth of services provided by principal referral hospitals.
Public acute group B hospitals	Public acute group B hospitals are those public acute hospitals that do not have the service profile of the principal referral hospitals and group A hospitals, but do have a 24-hour emergency department; they typically provide elective surgery and have specialised service units such as obstetric, paediatric and psychiatric units.
Public acute group C hospitals	Public acute group C hospitals include those public acute hospitals that provide a more limited range of services than principal referral hospitals or public acute group A and B hospitals, but do have an obstetric unit, provide surgical services and/or some form of emergency facility (emergency department, or accident and emergency service).
Public acute group D hospitals	Public acute group D hospitals are acute public hospitals that offer a smaller range of services relative to the other public acute hospital groups, and provide 200 or more separations per year. They are mostly situated in regional and remote areas. This document excludes group D hospitals.

The AIHW categorises women's and children's hospitals into the following subgroups:

Figure E2

Women's and children's Hospital category	Description
Children's hospitals	Children's hospitals specialise in the treatment and care of children. Hospitals in the children's hospitals subgroup have a children's separations proportion over 80 per cent.
Women's hospitals	Women's hospitals specialise in the treatment of women. The hospitals in the Women's hospitals subgroup have a women's separations proportion over 70 per cent.
Combined women's and children's hospitals	Combined women's and children's hospitals specialise in the treatment of both women and children. Hospitals in the combined women's and children's hospitals subgroup are those hospitals that have both a children's separations proportion over 50 per cent and a women's separations proportion over 25 per cent, but do not meet the guidelines for the children's hospitals or women's hospitals.

Peer groups for the 39 in-scope hospitals:

Figure E3

Peer group	Hospital	Remoteness
Principal referral hospitals	Gold Coast University Hospital	Major cities
	Princess Alexandra Hospital	Major cities
	Royal Brisbane and Women's Hospital	Major cities
	The Prince Charles Hospital	Major cities
	Townsville Hospital	Outer regional
Public Acute group A hospitals	Bundaberg Hospital	Inner regional
	Cairns Hospital	Outer regional
	Hervey Bay Hospital	Inner regional
	Ipswich Hospital	Major cities
	Logan Hospital	Major cities
	Mackay Base Hospital	Inner regional
	Nambour General Hospital	Inner regional
	Queen Elizabeth II Jubilee Hospital	Major cities
	Redcliffe Hospital	Major cities
	Robina Hospital	Major cities
	Rockhampton Base Hospital	Inner regional
	Toowoomba Hospital	Inner regional

Peer group	Hospital	Remoteness
Public acute group B hospitals	Caboolture Hospital	Major cities
	Caloundra Health Service	Major cities
	Gladstone Hospital	Inner regional
	Gympie Hospital	Inner regional
	Maryborough Hospital	Inner regional
	Mount Isa Hospital	Remote
	Redland Hospital	Major cities
Public acute group C hospitals	Atherton Hospital	Outer regional
	Charleville Hospital	Remote
	Dalby Hospital	Inner regional
	Emerald Hospital	Outer regional
	Innisfail Hospital	Outer regional
	Kingaroy Hospital	Inner regional
	Longreach Hospital	Very remote
	Mareeba Hospital	Outer regional
	Proserpine Hospital	Outer regional
	Roma Hospital	Outer regional
	St George Hospital	Remote
	Thursday Island Hospital	Very remote
	Warwick Hospital	Inner regional
Public acute group D hospitals	Beaudesert Hospital	Inner regional
Children's hospital	Lady Cilento Hospital	Major cities

Note: The AIHW provided no peer grouping for Robina hospital. We have categorised it as a 'public acute group A hospital' based on its characteristics. Mater adult hospital and Mater Mother's hospital have been grouped together as a 'public acute group A' hospital.

Source: Queensland Audit Office and the Australian Institute of Health and Welfare.

Appendix F—Definitions

Scheduling definitions

Figure F1

Item	Description
Resourced hours	Total number of staffed hours (session time).
Sessions	The normal period of time available to be allocated to a physician/surgeon/service for surgery. The actual period may vary from one facility to another but is typically 3.5 to 4 hours for a morning or afternoon session and 7 to 8 hours for an all-day session.
In-session hours	Hours of case time performed during session time including the total time for procedures commenced or completed within the session.
Out-of-session hours	Resourced and non-resourced hours of case time performed outside of session time. Includes early start and overrun hours.
Early start hours	Hours of case time performed prior to the normal scheduled session start time.
Overrun hours	Hours of case time performed after the end of scheduled session finish time.
Total case time	Time between commencement of anaesthetic procedures and being wheeled out of the operating room.
Turn-around time	Time (mins) between the completion of a case to the commencement of the next case in a continuous session.
Actual case start time	Time the patient commences their anaesthetic.
Late starts	Unplanned time (mins) between the scheduled start of the first operation of a session to the actual start (time patient in operating room).
Over-runs	Unplanned time (mins) to the actual case finish time in excess of the session end time.
Scheduled session	A session allocated to the operating theatre suite timetable a minimum of 7 days prior to the session commencing.
Session start	Time session is to commence, resources allocated and staff rostered.
Session finish	Time session is scheduled to be completed, resources not allocated and staff not rostered beyond this time.

Source: Queensland Health data dictionary version 3.3 for operating theatres provided by Healthcare Improvement Unit, Department of Health.

Elective and emergency surgery

On 12 June 2015, the Australian Institute of Health and Welfare amended the definitions of elective, emergency and other surgery. The current definitions in the table below provide greater clarity to medical staff and medical administrators to allow more accurate comparisons across jurisdictions. The current definitions were not in effect for the period of time during which we undertook our data analysis (July 2014 to December 2015).

Term	New national definitions	Definition during analysis period
Elective surgery	Elective surgery is planned surgery that can be booked in advance as a result of a specialist clinical assessment resulting in placement on an elective surgery waiting list.	Elective care where the procedures required by patients are listed in the surgical operations section of the Medicare Benefits schedule book, with the exclusion of specific procedures frequently done by non-surgical clinicians.
Emergency surgery	Emergency surgery is surgery to treat trauma or acute illness subsequent to an emergency presentation. The patient may require immediate surgery or present for surgery at a later time following this unplanned presentation. This includes where the patient leaves hospital and returns for a subsequent admission. Emergency surgery includes unplanned surgery for admitted patients and unplanned surgery for patients already awaiting an elective surgery procedure (for example, in cases of acute deterioration of an existing condition).	Not formally defined. Commonly hospitals categorise all surgery arising from a presentation at an emergency department as emergency when the surgery must be performed within 24 hours.
Other surgery	Other surgery includes procedures that cannot be defined as either emergency or elective surgery, for example, transplant surgery and planned obstetrics procedures.	Not formally defined. Commonly hospitals categorise semi-planned procedures, such as birthing services, as other.

Source: Queensland Audit Office from the Australian Institute of Health and Welfare.

Auditor-General Reports to Parliament

Reports tabled in 2015–16

Number	Title	Date tabled in Legislative Assembly
1.	Results of audit: Internal control systems 2014-15	July 2015
2.	Road safety – traffic cameras	October 2015
3.	Agricultural research, development and extension programs and projects	November 2015
4.	Royalties for the regions	December 2015
5.	Hospital and Health Services: 2014-15 financial statements	December 2015
6.	State public sector entities: 2014-15 financial statements	December 2015
7.	Public non-financial corporations: 2014-15 financial statements	December 2015
8.	Transport infrastructure projects	December 2015
9.	Provision of court recording and transcription services	December 2015
10.	Queensland state government: 2014–15 financial statements	December 2015
11.	Management of privately operated prisons	February 2016
12.	Follow up Report 12: 2012-13 Community Benefits Funds: Grant Management	February 2016
13.	Cloud computing	February 2016
14.	Financial risk management practices at Energex	April 2016
15.	Queensland public hospital operating theatre efficiency	April 2016