

Western Australian Auditor General's Report



Operating Theatre Efficiency



Report 25: November 2015

Office of the Auditor General Western Australia

7th Floor Albert Facey House
469 Wellington Street, Perth

Mail to:

Perth BC, PO Box 8489
PERTH WA 6849

T: 08 6557 7500

F: 08 6557 7600

E: info@audit.wa.gov.au

W: www.audit.wa.gov.au

National Relay Service TTY: 13 36 77
(to assist people with hearing and voice impairment)

On request, we can deliver this report in an alternative format for those with visual impairment.

© 2015 Office of the Auditor General Western Australia. All rights reserved. This material may be reproduced in whole or in part provided the source is acknowledged.

ISSN 2200-1913 (Print)
ISSN 2200-1921 (Online)

Operating Theatre Efficiency



**THE PRESIDENT
LEGISLATIVE COUNCIL**

**THE SPEAKER
LEGISLATIVE ASSEMBLY**

OPERATING THEATRE EFFICIENCY

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

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

This audit assessed how efficiently five public hospitals used operating theatres to deliver elective surgery over a six year period from 2009 to 2014.

My report identifies that in 2014, nearly a quarter of available theatre time in elective surgery sessions was not used to treat patients. It outlines where this time is lost and provides insight into how hospitals can improve their theatre scheduling to make better use of available surgery time. It also identifies the need for the Department of Health and hospitals to better understand and make better use of their operating theatre data to address inefficiency.

I wish to acknowledge the staff at the five hospitals we audited and at the Department of Health for their cooperation with this audit.

A handwritten signature in black ink, appearing to read 'C. Murphy'.

COLIN MURPHY
AUDITOR GENERAL
18 November 2015

Contents

- Auditor General’s Overview 4
- Executive Summary 5
 - Introduction 5
 - Background 5
 - Audit Conclusion 6
 - Key Findings 6
 - Recommendations 9
 - Response from the Department of Health 10
- Audit focus and scope 11
- Inefficiencies are causing lost operating theatre time 12
 - Three quarters of elective session theatre time was used to treat patients 13
 - More than a third of elective surgery sessions started late 13
 - Reasons for late starts are not recorded by all hospitals 14
 - Thirty-one per cent of sessions finished more than one hour under or over the scheduled finish time 15
 - Five per cent of cases were cancelled on the day of surgery 17
 - The way Health calculates average turnaround time makes performance look better than it is 19
- Poor scheduling is a major cause of lost operating theatre time 21
 - Hospitals were not using all scheduled sessions 21
 - There were marked differences between the time allocated and used by each specialty 22
 - Hospitals should review session length and staff coverage to improve efficiency and reduce out of hours surgery 22
 - Effective planning for emergency cases is needed to maximise the use of operating theatres 23
 - Operating theatre schedules should be reviewed more frequently to ensure they match demand 24
- Health and hospitals can do more to understand and improve operating theatre efficiency 25
 - Better use of available data is needed to get a clear picture of operating theatre efficiency 25
 - Efforts have been made to improve analysis but the benefits are yet to be realised 26
 - Data analysis at hospitals is limited by a lack of expertise 27
- Appendices 28
 - Appendix 1: Sample Hospitals 28
 - Appendix 2: Operating Theatre Performance Measures 29
 - Appendix 3: Hospital Performance Information 30
 - Appendix 4: Potential Time 50
 - Appendix 5: Comparison of Theatre Activity and Theatre Utilisation 52

Auditor General's Overview

The efficiency of our public hospital operating theatres is just one of many important and complex issues that the Health system must manage. Efficient theatres save money, enable hospitals to manage their wait list and help minimise the time patients have to wait for surgery.



Western Australia has 112 operating theatres within 32 public hospitals, plus additional theatres at two privately operated public hospitals. Over 81,000 elective surgery cases as well as thousands of emergency surgery cases were performed in public hospitals in 2014-15.

I undertook this audit with the knowledge that assessing hospital theatre efficiency would be a difficult data driven exercise and that good communication with the clinical stakeholders and administrative staff would be essential. I am pleased to say that we received wonderful cooperation from all concerned.

We chose three metropolitan and two large regional hospitals as the basis for our assessment and drew on the expertise of a subject expert to help us navigate our way through the results. The audit focused on elective surgery, which is surgery that is medically necessary but does not have to be performed within 24 hours of diagnosis.

The audit identified a range of causes for lost theatre time and significant potential benefits from improving existing arrangements.

We estimated that theatre use across the five hospitals could increase by approximately 3 000 hours per year – hours that would be available to treat more elective surgery patients assuming that other hospital capacity is in place.

The audit also identified the need for the Department of Health and hospitals to better understand operating theatre usage and taking action to address inefficiency. This will become increasingly important as activity based funding takes hold of the health system.

Health recognises that it can improve operating theatre efficiency and to that end has welcomed the audit's findings and recommendations. I would like to thank the staff of Sir Charles Gairdner, Osborne Park, Swan District, Albany and Bunbury Hospitals as well as those at the Department of Health who provided valuable assistance and advice during the audit.

Executive Summary

Introduction

This report provides an assessment of how efficiently five public hospitals used operating theatres to deliver elective surgery over a six year period from 2009 to 2014.

To assess efficiency, we analysed the proportion of time operating theatres were used for surgery, across each hospital and also by surgical speciality. Late starts and lengthy gaps between scheduled surgical cases are examples of inefficiencies. We took into consideration the need for turnaround time between cases and that some delays and cancellations are outside a hospital's control. The average theatre time for cases in elective sessions in our sample was 70 minutes. Therefore, we have reported on significant late starts and early finishes greater than one hour. We considered whether hospitals could do more procedures with the same resources. We engaged a subject expert to review the evidence and contribute to the findings. The audit did not assess clinical processes or outcomes.

Background

Improving operating theatre efficiency can increase the number of patients treated with the same level of resources. This can save money, enable hospitals to manage their wait list and reduce the time patients have to wait for surgery.

Western Australia (WA) has 112 operating theatres within 32 public hospitals, plus additional theatres in two privately operated public hospitals. Operating theatres are used for elective and emergency surgery. The procedures performed depend on the clinical services provided at each hospital.

This audit focused on elective surgery, which is surgery that is medically necessary but does not have to be performed within 24 hours of diagnosis. The waiting time for elective surgery is driven by demand, clinical need and the availability of the facilities and people needed to deliver both the operation and after care. Common examples of elective surgery are removal of tonsils, hip replacements and cataract surgery.

Hospitals schedule elective surgery in advance in morning, afternoon or all-day blocks called sessions. Sessions are allocated to either elective or emergency surgery and to particular specialties such as orthopaedics and urology, depending on the hospital's clinical services. Hospitals or the surgeon's staff book patients into sessions based on their assessment of the time it will take to treat the patients. Starting and finishing times of sessions vary between hospitals. Sessions that end late can result in overtime payments for some staff.

A session can contain one or more cases, and a single case may involve multiple surgical procedures. The time between two cases in a session when hospital staff clean and prepare the theatre for the next case is termed 'turnaround time'.

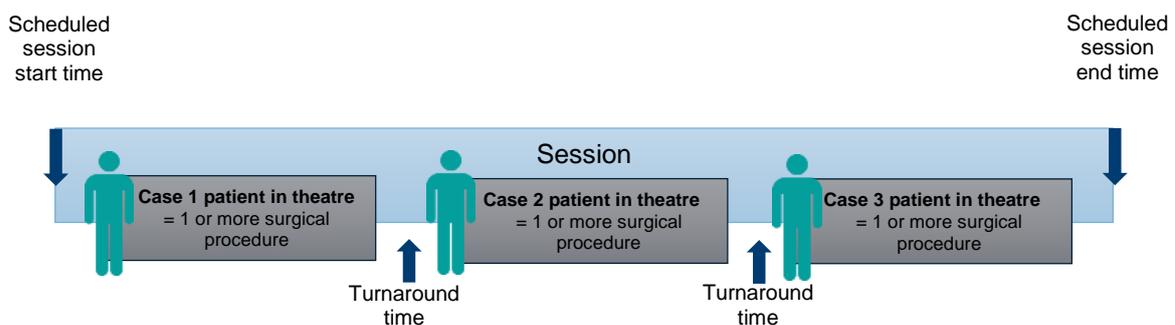


Figure 1: Components that make up an elective surgery session

The five public hospitals we reviewed capture data that tracks a patient's journey through the operating theatre, enabling measurement of efficiency. We used the data to review performance against six measures to conclude on the operating theatres' efficiency:

- theatre utilisation (the proportion of time patients are in theatre within a scheduled session)
- on time starts for the first case
- sessions that finish early
- sessions that finish late
- day of surgery cancellations
- average turnaround time between cases.

We recognise that the value of improving operating theatre efficiency is debateable if other patient flow factors are not met, such as having sufficient recovery beds available after surgery. Nevertheless, improving operating theatre efficiency and related practices such as patient bookings and operating schedules can deliver significant benefits for hospitals and patients, and contribute to reductions in waitlists. Having an accurate view of operating theatre performance and demand also enables hospitals to make more informed decisions about where capacity can be improved within planned sessions.

Audit Conclusion

Inefficiencies in the way hospitals use operating theatres mean that they have capacity to treat many more patients during elective sessions. Operating time is lost because many sessions start late or finish well before their scheduled end and a large number of cases are cancelled on the day of surgery. In addition, scheduling of operating sessions does not match predictable patterns of demand causing further lost time.

In 2014, nearly a quarter of available theatre time in elective surgery sessions was not used to treat patients. While 10 per cent of the overall time was used to clean and prepare theatres between cases, we estimate that approximately 3 000 hours was feasibly available across the five hospitals to treat many more patients. This time is equivalent to staffing two theatres for almost a year without treating any patients.

Efforts by the hospitals to improve operating theatre efficiency tend to be ad hoc with limited use of existing data. Better scheduling of surgery, in particular to take account of the demand for each clinical specialty, would allow more of the available time to be used, and reduce the need for and cost of staff working overtime. Improved direction and guidance from the Department of Health (Health) to hospitals would also bring a more determined approach to improving operating theatre efficiency.

Key Findings

- Inefficiencies exist in the operating theatres at the five sample hospitals. We analysed how 37 635 hours of planned elective surgery session time was used in 2014. Just under 25 per cent of this time was not used to treat patients. We estimate that just addressing late starts and early finishes of more than one hour could have feasibly delivered approximately 3 000 hours to treat additional patients. Time was lost because:
 - *More than a third of sessions did not start on time* – when the first case of a session starts more than 10 minutes after the schedule session start time, hospitals consider this to be a late start. In 2014, 37 per cent of elective sessions started more than 10 minutes late, and 11 per cent started more than 30 minutes late. Late starts can cause cancellations of subsequent cases. They can also cause cases to finish after the

scheduled end of the session. This results in higher staff costs through the need to pay overtime or provide staff with time off in-lieu.

- *Many sessions did not finish on time* – 17 per cent of all elective surgery sessions in 2014 finished more than one hour early. This resulted in lost time that hospitals could have feasibly used for more cases, and indicates that theatre booking and scheduling systems do not make the best use of operating theatres.

Fourteen per cent of elective sessions in 2014 finished more than one hour after the scheduled finish time. Late finishes can result in overtime that may increase staff costs, impact rostering and indicate there are problems such as over booking of sessions.

- *Many cases were cancelled on the day of surgery* – in 2014, 1 244 elective cases were cancelled on the day of surgery (five per cent of cases). Data indicated that some of these cancellations could have been avoided. Cancellations at short notice can waste costly theatre time, disrupt operating theatre bookings and inconvenience patients.
- Poor scheduling is a key cause of inefficiency. Hospitals do not regularly monitor and review schedules to check whether they meet demand, minimise the impact of emergency cases and optimise the use of available theatre time. We found:
 - Hospitals did not use all of the planned elective sessions to perform elective surgery. For example, some sessions were reallocated as emergency sessions, while others were not used at all. Issues with the data meant that we could not reliably quantify the hours involved.
 - The allocation of elective surgery time to the different specialties did not match need. For example, in the six months of 2014 that we reviewed, the ear, nose and throat specialty at Sir Charles Gairdner Hospital (SCGH) used 20 per cent more sessions than were scheduled, while urology used 10 per cent less.
- Additional operating theatre time could be made available by reviewing session times and adjusting rosters to suit. For instance, up to an additional 1.5 hours per day could be made available through holding all-day sessions instead of two half-day sessions. This would have some rostering implications, but other Australian hospitals use this approach.
- Health and the sample hospitals are not making the best use of available data and information to get a clear picture of operating theatre efficiency or the causes of inefficiencies:
 - Hospitals did not meet Health's requirement to report internally on a single indicator of performance, Theatre Activity. Theatre Activity is the proportion of time a theatre is used against the time allocated. It is a different measure to Theatre Utilisation, one of the six established measures we used to assess operating theatre efficiency.
 - Theatre Activity is inadequate as a sole measure of performance:
 - Theatre Activity alone does not give the full picture of efficiency. We chose six measures used elsewhere in Australia or in Canadian or UK hospitals to assess operating theatre efficiency in the sample hospitals. The way that Health requires Theatre Activity to be measured makes performance look better than it is. For instance, sessions that finish late can achieve results over 100 per cent, boosting the aggregated average.
 - Health's reporting system does not include turnarounds that take more than 45 minutes. This masks real performance by making the average time between cases lower than the real result. For example, our calculation of turnaround time at SCGH, including turnaround times exceeding 45 minutes saw the average in 2014 jump from 11 minutes to 20 minutes.

- Health has recently developed reports for tracking performance by hospital. However these reports are not yet used across all Area Health Services to monitor operating theatre efficiency.
- Hospitals were not making full use of available data to identify efficiency issues. Data analysis is ad hoc, hospitals don't have suitably skilled data managers and upgrades to improve monitoring and reporting systems have not been made.
- Health provides some opportunities for hospitals to discuss information about improvement strategies. However further work is required to ensure all relevant hospital staff can access information and opportunities:
 - Since 2008, Health has provided nearly \$2 million to an external provider to develop performance reports at eight hospitals, but implementation of performance monitoring has been limited and there has been no overall improvement to efficiency.
 - Hospitals did not routinely use Theatre Management System (TMS) data to identify staff performance issues contributing to inefficiency and address them.

Recommendations

1. To better understand operating theatre performance and improve efficiency within public hospitals, Health should, by December 2016:
 - a) establish an effective monitoring and reporting framework that includes performance measures and targets, and provide guidance to hospitals to ensure consistent data collection and analysis
 - b) require all hospitals to ensure that operating theatre managers and key staff have the appropriate skills and allocated time to collect and audit operating theatre data to make it useful for analysis
 - c) update the Theatre Management System to improve functionality and develop a plan for improving the capability of the current data reporting system to analyse data and generate reports.
2. To provide direction and guidance on how hospitals can improve operating theatre efficiency, Health should, by March 2016:
 - a) require hospitals to complete regular reviews of operating theatre schedules using performance data
 - b) share guidance and information on strategies that have improved operating theatre performance at WA public hospitals.

Response from the Department of Health

WA Health welcomes the *Operating Theatre Efficiency* report and accepts the recommendations of the OAG.

WA Health has provided comprehensive report feedback to the OAG, detailing additional key theatre reform strategies implemented during the audit period, those currently underway, and future surgical improvement activities planned at site and system level. The report highlights the complexity of both theatre measurement for comparable efficiency performance and the complexity of scheduling, requiring active management of both emergency and elective surgery theatre demands.

Theatre efficiency remains a key priority for WA Health for both the delivery of safe, high quality, patient-focused care and to provide value for money and meet public expectations. To achieve this, WA Health's reform approach involves examination of processes in all other related areas that impact on theatre performance, including referral, booking, patient preparation, scheduling, admission and discharge.

With the implementation of the National Elective Surgery Targets (NEST) in 2012, WA Health established state-wide governance and support structures to drive improvements in patient access to elective surgery. This included strengthened leadership by hospital executive and expert clinicians through establishment of an elective demand steering group to drive key surgical reform; provision of clinical redesign training, data analysis and support for hospital based surgical service redesign projects; development of key performance indicators and measures, including safety and quality measures; development of operational dashboards and reports to assist hospitals manage performance; targeted system wide projects and strategy implementation such as separation of elective and emergency theatre and establishment of a Central Referral Service. The introduction of Activity Based Funding has further strengthened health service focus on efficiency and effectiveness, capture of costing data, reporting and management of surgical and theatre activity.

Although WA Health have achieved significant improvements in patient access to elective surgery and are a consistent high performer for waiting times nationally, we acknowledge there are further opportunities for improvements in surgical services and theatre efficiency. This includes the report recommendations of improving performance monitoring, and access to reporting and data analysis support, and promoting further collaboration and sharing of theatre reform guidance and strategy between services and across the system.

The OAG's report reaffirms the direction that Health has initiated for improving the elective surgical patient journey, including improvements in theatre efficiency. The recommendations are aligned with reform actively underway at Health Services and supported by Health. Given the scope and complexity of the ongoing reform requirements, expected implementation of all the recommendations is by July 2017.

Audit focus and scope

The audit examined whether public hospitals are managing operating theatres efficiently and focused on three lines of inquiry:

- Do hospitals use operating theatre data to monitor and measure operating theatre efficiency?
- Do hospitals have surgery scheduling systems and practices that optimise the use of operating theatres?
- Are hospitals managing operating theatres to ensure that the right staff are available at the right time?

The audit sample included Sir Charles Gairdner Hospital (SCGH), Osborne Park Hospital (OPH) and Swan District Hospital (SDH) within the North Metropolitan Health Service, and Bunbury Hospital (BH) and Albany Hospital (AH) within the WA Country Health Service.

We analysed Health's operating theatre data for elective cases booked into elective sessions over a six year period. We assessed the hospitals' performance using six measures of operating theatre efficiency drawn from other Australian jurisdictions and internationally (including New South Wales, Victoria and Ontario):

- theatre utilisation (which is different to Health's sole indicator of Theatre Activity)
- on time starts for the first case
- sessions that finish early
- sessions that finish late
- day of surgery cancellations
- average turnaround time between cases.

The appendices provide more information about the measures and hospital performance against them.

We met with Health staff who are responsible for managing operating theatres and monitoring performance. We observed operating theatres in action during five sessions to better understand the surgical environment.

We consulted with key medical and surgical stakeholders and engaged a subject expert to provide specialist analysis and advice. We did not assess clinical processes or outcomes.

This was a broad scope performance audit, conducted under section 18 of the *Auditor General Act 2006* and in accordance with Australian Auditing and Assurance Standards. Performance audits primarily focus on the effective management and operation of agency programs and activities.

Inefficiencies are causing lost operating theatre time

Health does not have a set of measures to monitor operating theatre efficiency. For this reason, we assessed the five sample hospitals' performance against six measures used by other Australian jurisdictions and internationally. Together, they provide a good picture of operating theatre efficiency.

We found hospital operating theatres were not used to their full potential. This led to lost time, higher costs and fewer patients treated within the planned session time.

We analysed how the five sample hospitals used the 37 635 hours provided through 7 554 elective surgery sessions in 26 theatres in 2014. We found that nearly a quarter of this time did not involve treating patients (Figure 2).

Although some of this time was required to clean and prepare theatres between cases, much of the time the theatres were unoccupied was due to sessions starting late or finishing early.

Late starts can cause cases scheduled for later in the session to be cancelled. Cancellations can also cause sessions to finish early. Scheduling of surgical specialties in a way that does not match demand is another contributor to sessions finishing early.

We estimate approximately 3 000 hours of operating theatre time was lost just from sessions starting more than one hour late or finishing more than one hour early.

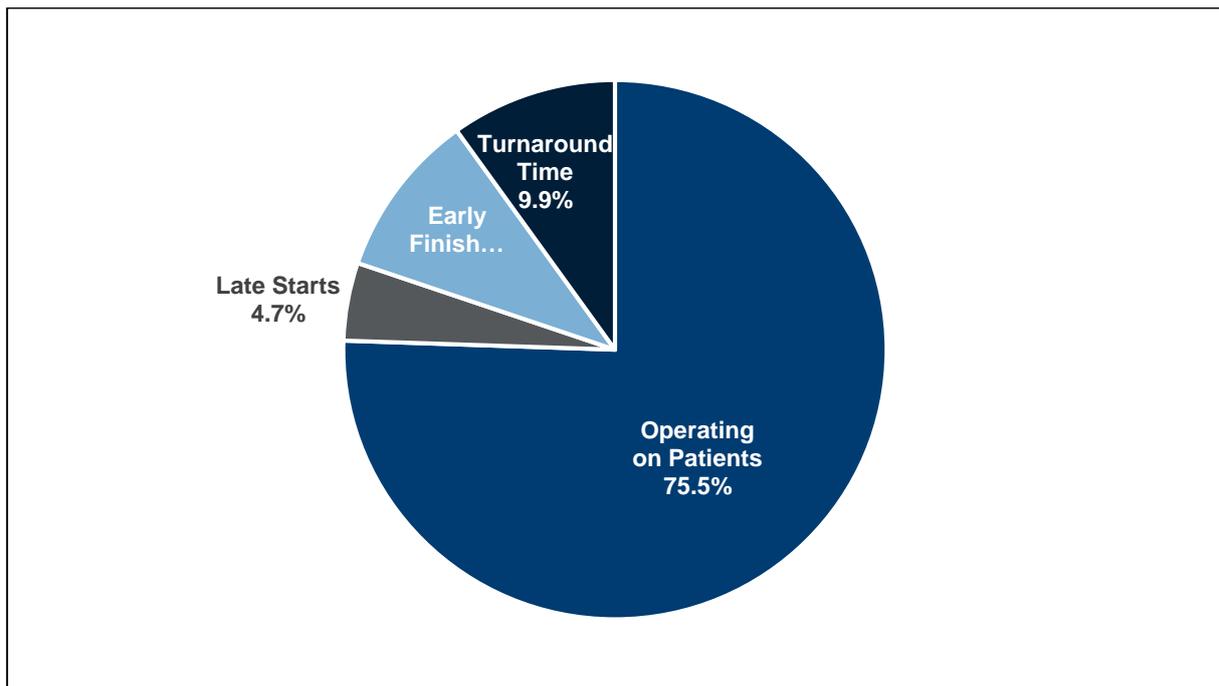


Figure 2: How time in elective sessions was used in 2014

The first section of this report highlights performance against the six measures. The second section highlights issues with scheduling and the final section focuses on how operating theatre efficiency can be improved.

Three quarters of elective session theatre time was used to treat patients

Some jurisdictions use theatre utilisation as a measure of operating theatre efficiency. Theatre utilisation shows the proportion of allocated operating theatre time used to actively treat patients.

Our five sample hospitals had an aggregated theatre utilisation rate of 75 per cent for elective surgery sessions across a six year period. By way of comparison, New South Wales (NSW) has a target of 80 per cent utilisation. None of the five hospitals achieved 80 per cent (Figure 3).

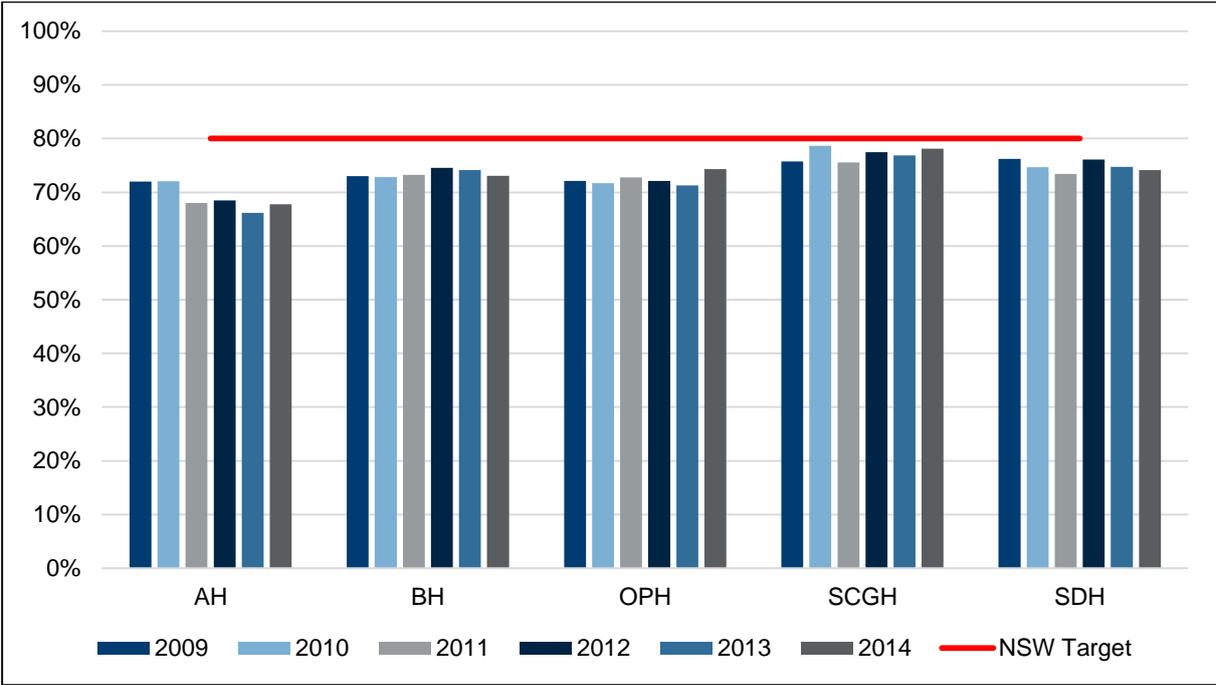


Figure 3: Annual aggregated results for theatre utilisation for elective surgery sessions by hospital 2009 to 2014

Although the percentage difference between each hospital’s performance and NSW’s target is relatively small at some hospitals, the actual amount of time, when represented as hours, shows it is significant. In 2014, the aggregated utilisation across the sample was 4.5 per cent less than the NSW target. This was equivalent to approximately 1 700 hours.

More than a third of elective surgery sessions started late

Starting elective surgery sessions late was a problem at all five hospitals. In 2014, 37 per cent of elective sessions started late, resulting in a significant lost time. For example, four per cent of sessions started more than one hour late resulting in 571 hours of unused operating theatre time.

Starting the first case of a session on time makes it more likely that the session will finish on time. It also reduces the likelihood of day of surgery cancellations.

In all five hospitals, sessions are considered to start on time if the first patient arrives in theatre or is anaesthetised within 10 minutes of the planned start time. We used the time the patient arrived in theatre as the basis for calculating operating theatre usage.

Although all the hospitals have recently made minor improvements (see Appendix 3), the proportion of sessions starting late in 2014 was still high (Table 1). OPH had the highest proportion of late starts, with two out of every three sessions starting more than 10 minutes after the scheduled start time. It also had the highest proportion of sessions starting more than 30 minutes late.

	SCGH	OPH	SDH	BH	AH	TOTAL
>10 minutes late	28%	67%	27%	42%	40%	37%
>30 minutes late	10%	17%	6%	12%	7%	11%
>60 minutes late	4%	3%	2%	5%	2%	4%

Table 1: Proportion of elective sessions that started late in 2014, based on when the first patient of the session arrived in theatre

Sessions that start late are more likely to finish late. In 2014, sessions starting more than one hour late were 2.4 times more likely to finish more than one hour late than sessions that started on time. Finishing late has flow on effects, for example it can cause the next session to start late.

Sessions that start late are also more likely to have a cancellation on the day of surgery. In 2014, elective sessions that started more than 10 minutes late were 1.5 times more likely to have a cancellation on the day of surgery compared with sessions that started on time. From the data, it is not possible to know what proportion of cancellations caused late starts, and vice versa.

Reasons for late starts are not recorded by all hospitals

All five hospitals can record the reasons why sessions start late using their Theatre Management System (TMS), a computer program developed for the management of operating theatres. However, only SCGH and SDH were recording the reasons, though during the audit OPH advised that it would begin to record the reasons.

We analysed the data from the two hospitals that recorded reasons for starting late and found that many late starts appeared to be avoidable.

At SCGH in 2014, the greatest amount of time lost from starting late was because of ‘theatre list’ reasons (Table 2). Theatre list reasons include booking errors, changes and cancellations plus interruption from emergency cases or sessions running late. In 2014, the average delay in this category was 64 minutes. More than six per cent of the time lost through late starts in 2014 was because staff were in a meeting unrelated to the delayed session.

At SDH, surgeon and anaesthetist lateness were the top two individual reasons for late starts, resulting in more than one hour per week of theatre time lost.

Reason for delay	Proportion of time lost SCGH	Proportion of time lost SDH
Surgeon reason	6%	26%
Anaesthetist reason	1%	24%
Other staff	7%	5%
Equipment	1%	1%
Transport reason	1%	1%
Unknown	3%	3%
Patient reason – late	20%	18%
Theatre list	61%	22%

Table 2: Proportion of time lost through first case delays, by reason at SCGH and SDH 2014

Although the case example below focuses on emergency sessions, it demonstrates that better planning will reduce the number of late starts.

Case Example – Gold Case protocol

To improve the proportion of scheduled morning and all-day emergency sessions that start on time, Sir Charles Gairdner Hospital implemented a new system called 'Gold Case' in 2013. This system provides a set of protocols that guide staff to select and prepare the first case to give the best chance of starting scheduled emergency sessions on time in the morning. This involves:

- confirming the night before that the patient is ready for surgery
- preparing the patient to be ready for surgery at 8am
- organising the surgical team to ensure that the session starts at 8am.

In 2014, on-time starts for morning sessions improved by 30 per cent and all-day sessions by 49 per cent while afternoon sessions, which were not part of the Gold Case approach, declined.

Thirty-one per cent of sessions finished more than one hour under or over the scheduled finish time

Sessions should finish close to the scheduled time to reduce the amount of unused theatre time, and to prevent disruption to other sessions and resourcing caused by running over time. Hospitals refer to sessions with early or late finishes as 'underruns' and 'overruns'.

The extent that sessions finish on-time is another accepted measure of efficiency, but it is important to consider the case mix and characteristics of the hospital when setting targets. In acknowledgement of these considerations, we took a conservative approach to measuring the performance of the five hospitals.

We treated sessions that ran under by more than one hour as early finishes, and sessions running more than one hour over as late finishes. This one hour threshold allows for cases to be performed slower or faster than estimated and recognises that the average time a patient spent in theatre across the hospitals was 70 minutes.

In 2014, 31 per cent of sessions finished more than one hour before or after the scheduled finish time. This indicates an inefficient use of operating theatre time and resources, and impacts theatre utilisation. This pattern of under-running and over-running sessions has been consistent over the last six years (Figure 4) and all hospitals could make improvements.

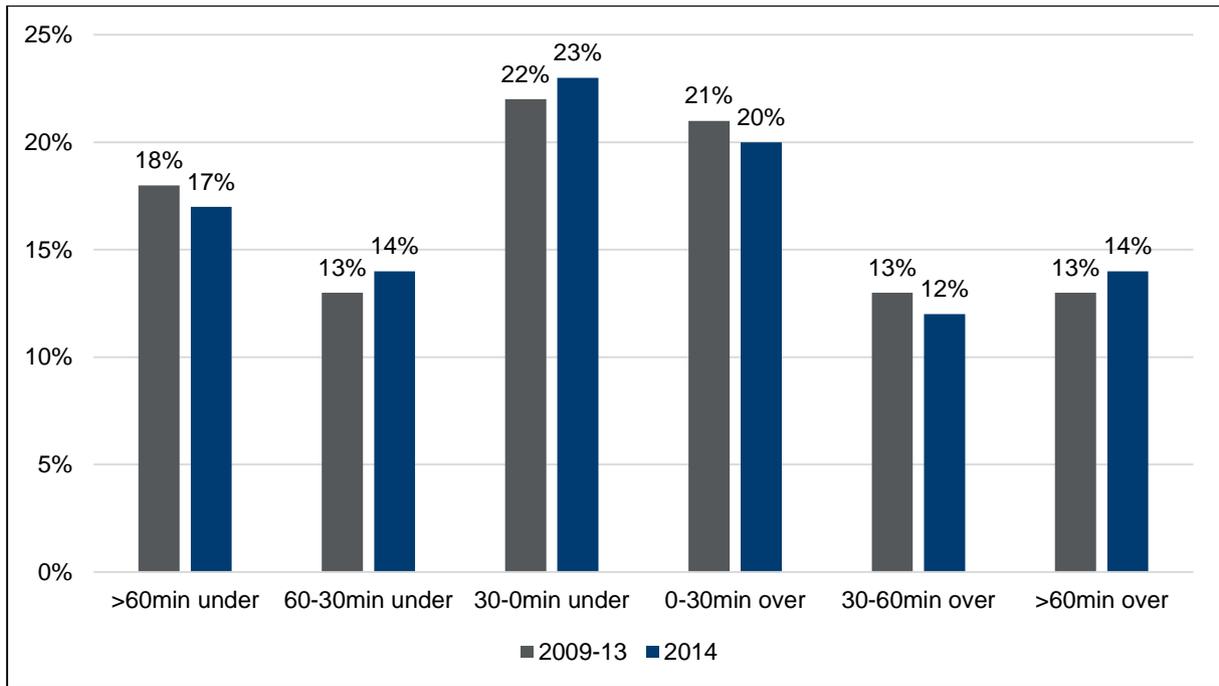


Figure 4: Variation in actual session finish times from planned session finish times

Just over 2 500 hours were lost because elective sessions finished more than one hour before schedule

In 2014, 17 per cent of all elective surgery sessions finished more than one hour early. The extent of early finishes varied from eight per cent to 39 per cent across the five hospitals (Table 3). This resulted in 2 502 hours of staffed operating theatre time that was unused and demonstrates considerable potential to perform more operations.

2014 sessions	SCGH	OPH	SDH	BH	AH	TOTAL
Proportion of elective sessions finishing >60 minutes early	21%	8%	15%	9%	39%	17%
Hours lost	1 536	135	249	206	376	2 502

Table 3: Proportion of elective sessions finishing more than one hour before scheduled finish time

The reasons for sessions finishing more than one hour early can be due to:

- under-booking or late changes to bookings for each session
- overestimation of the time required to treat cases
- cancellations on the day of surgery.

Across the five hospitals, 19 per cent of sessions that finished more than one hour early had a day of surgery (DOS) cancellation. This means at least four out of every five underruns were caused by reasons other than DOS cancellations.

The characteristics of each hospital influence whether another case can be added to a session at short notice when an underrun is anticipated. For example, SCGH may be able to fill a session with another case where the patient has already been admitted. By comparison, OPH deals largely with planned surgery and it is therefore not possible to move another case into the theatre list at short notice.

A significant number of elective sessions finished more than one hour late

In 2014, 14 per cent of elective sessions finished more than one hour late. Finishing sessions late can increase staff costs and impact subsequent sessions.

Unavoidable clinical reasons can cause overruns. However, sessions also finish late due to potentially avoidable factors such as late starts and long turnaround times between patients. For example, at BH half of the elective sessions that finished more than one hour late started over one hour late or had at least one turnaround greater than 45 minutes.

Cases that require a longer time than the length of the scheduled session will always show as an overrun. For instance, a 15-hour case booked into a nine hour all-day session would show as an overrun of six hours. In 2014, 19 per cent of sessions that finished more than one hour late had a long case. Most of these were at SCGH, which deals with more complex cases than the other sample hospitals.

Sessions that finish more than one hour late often require theatre staff to be compensated for the additional time worked, either through overtime payments or time off in-lieu. We estimate that if overtime was paid to nurses when sessions ran more than one hour late, the cost in 2014 would have been \$333 006 (Table 4). We did not estimate overtime payments to surgeons and anaesthetists as this depends on the terms of their employment.

2014	SCGH	OPH	SDH	BH	AH	TOTAL
Proportion of sessions finishing >1 hour late	13%	28%	10%	7%	10%	14%
Hours of overtime caused by sessions finishing >1 hour late	983	486	185	187	81	1 922
Estimated potential overtime cost (based on three nurses per theatre team)	\$170 315	\$84 204	\$32 053	\$32 400	\$14 034	\$333 006

Table 4: Estimated cost of overtime payments to nurses resulting from elective sessions finishing more than one hour after the scheduled finish time

In addition to overtime payments, the need for theatre staff to remain at work beyond their rostered times can also impact the following day's schedule. Employment conditions for nurses require that they have a 9.5 to 10 hour break between shifts. This means that when nurses work overtime one day, they may have to delay starting work the following day. Hospitals used a range of approaches to manage this impact, from engaging agency staff to cover shifts, to starting sessions late.

Five per cent of cases were cancelled on the day of surgery

Cancellations on the day of surgery have been a persistent problem. In the last six years, five per cent of cases (7 630 cases) booked into elective sessions were cancelled on the day of surgery. Some of these could have been avoided.

NSW has adopted a target of less than two per cent cancellations on the day of surgery. However, research indicates that a target of less than five per cent may be more appropriate for tertiary hospitals such as SCGH which deal with complex cases.

BH had the highest proportion of DOS cancellations for most of the last six years. AH had the lowest rate of DOS cancellations at two per cent, with performance against this measure relatively consistent since 2009 (Figure 5).

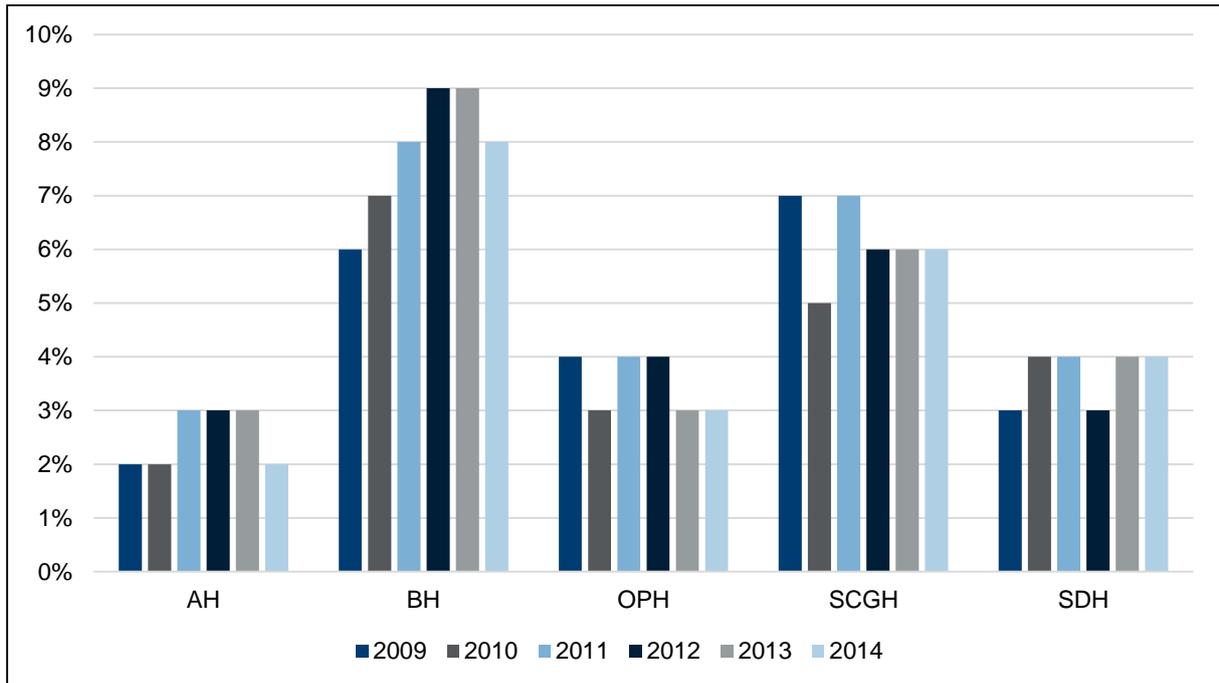


Figure 5: Proportion of elective cases cancelled from elective sessions on the day of surgery

DOS cancellations can cause unused theatre time, as hospitals cannot easily add new patients into a session given the patient would need to be admitted and physically prepared. DOS cancellations can also be a result of over booking, more urgent cases taking priority or equipment not being available. Of the five hospitals in our sample, SCGH because of its size and the clinical services it delivers, has the most potential to replace cancelled cases with other patients already admitted and requiring urgent surgery.

Patients who have their surgery cancelled at the last minute by a hospital can be disadvantaged in a number of ways. They may suffer physically by having treatment delayed and being made to fast unnecessarily. Patients may also be stressed by the inconvenience of the cancellation, and experience difficulty in rearranging transport, aftercare and in some cases accommodation.

Hospitals record the reasons for cancellations in TMS. In 2014, 1 244 elective cases were cancelled on the day of surgery. Patients being medically unfit for surgery as determined by the surgeon or anaesthetist was the most common reason (25 per cent). Fourteen per cent of DOS cancellations were because a more urgent case took priority (Figure 6).

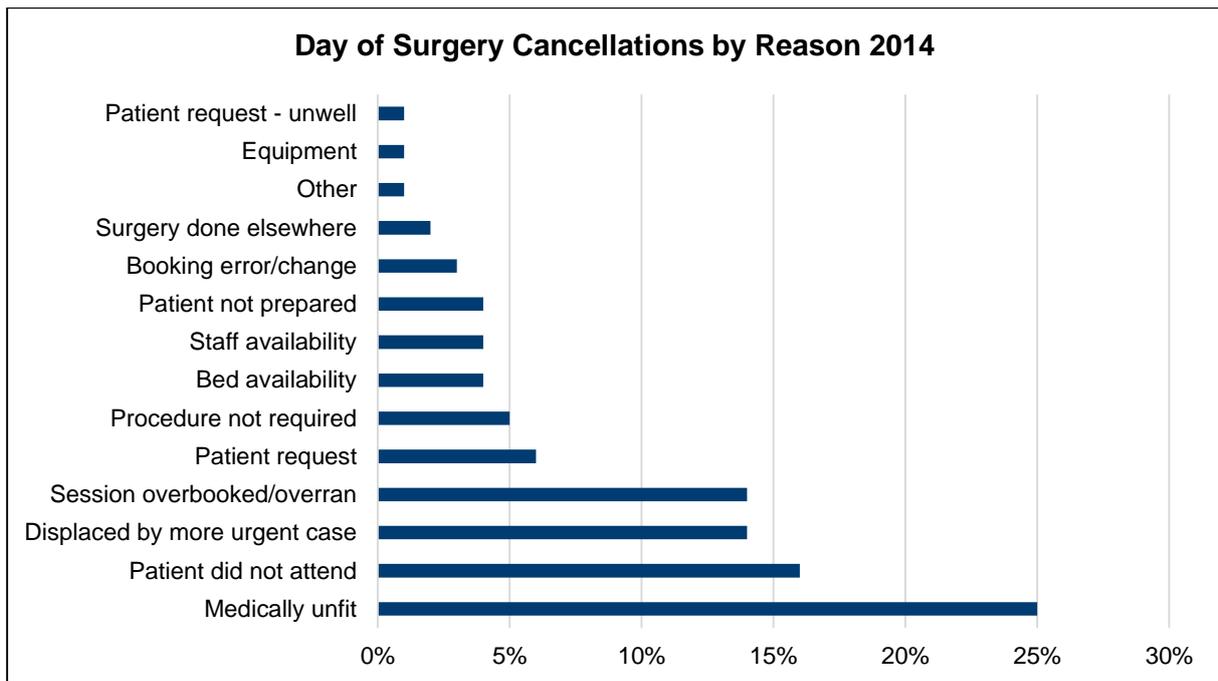


Figure 6: Reasons for DOS cancellations of patients from elective sessions in 2014

Although some DOS cancellations are unavoidable, a significant number were caused by the patient not presenting at the hospital. In 2014, 16 per cent of DOS cancellations (198 patients) were for this reason. Hospitals reported that some patients did not attend because there was a problem with booking or pre-admission process, or they did not want to have the surgery performed.

Each hospital devises their own booking and pre-admission checks, depending on the hospital's broader patient flow structure and whether or not the theatre lists are managed by the surgeons' rooms. If the bookings and pre-admission checks are done at the surgeons' rooms, hospitals have very little visibility of a patient's readiness for surgery.

Better communication processes with patients could reduce the number of cancellations occurring on the day, potentially reducing the amount of operating theatre time not used.

Case studies have shown that improved pre-admission processes, such as confirming appointments by telephone two to 30 days prior to the date of surgery, can significantly reduce DOS cancellations. At the time of our audit, SCGH had commenced a six month trial for orthopaedic patients, where a pre-screening phone call is made to determine if they need to come into the pre-admission clinic or not. The hospital also reported that it was introducing other initiatives to improve communication with patients.

The way Health calculates average turnaround time makes performance look better than it is

The time in a session between one patient leaving the operating theatre and the next patient arriving is termed 'turnaround time'. This time is used to clean and prepare the operating theatre for the next patient. Long turnaround times reduce the time the operating theatre is used to treat patients and can be an indicator of broader hospital issues including bed or equipment availability or poor scheduling.

Turnaround time targets are important for enabling the assessment of performance. The targets should reflect the relevant specialties. Neither Health nor the five hospitals have established targets for turnaround time.

Health advised that in 2014, the average turnaround time at each of the five hospitals ranged from six to nine minutes. However, we found this to be misleading as Health does not include turnarounds of greater than 45 minutes or record the reasons for them.

Long turnarounds can be caused by factors such as changing from one specialty to another within an elective session or equipment not being available. By not capturing the reasons, Health and the hospitals can only guess whether it is a serious problem that needs addressing.

Our calculations showed that including turnarounds of greater than 45 minutes increased the average considerably (Table 5), especially at SCGH and BH where 6.7 per cent and 5.2 per cent respectively, of all turnarounds took longer than 45 minutes.

2014	SCGH	OPH	SDH	BH	AH
OAG	20 minutes	11 minutes	8 minutes	16 minutes	15 minutes
Health	9 minutes	8 minutes	6 minutes	8 minutes	9 minutes

Table 5: Average turnaround times for each hospital in 2014, as advised by Health and calculated by the Office of the Auditor General (OAG)

Using available session time for other specialities can have short-term efficiency benefits. However, it presents a long-term efficiency challenge, as multi-specialty sessions have longer set up and turnaround times.

We found the average turnaround time between cases of different specialties in elective sessions was three times longer than the average turnaround time between cases of the same specialty.

Poor scheduling is a major cause of lost operating theatre time

Hospitals develop operating theatre schedules by assigning each specialty or surgeon with one or more sessions across each month. Cases are then booked into those sessions by the hospital or surgeons.

Achieving efficient use of the operating theatres requires consideration of many factors such as the demand for elective and emergency surgery, staffing and surgeon availability, average procedure times and the length of each session.

We found that poor scheduling contributed to unused sessions, under and overruns and disruption from emergency cases. Hospitals do not regularly monitor and review schedules to check whether they meet demand, minimise the impact of emergency cases and optimise the use of available theatre time. Better scheduling could help hospitals to treat more patients during planned sessions.

Hospitals were not using all scheduled sessions

Hospitals did not use all of the planned elective sessions to perform elective surgery. Elective session time can be reallocated for other surgical purposes, such as to hold an emergency session. However, as hospitals can delete unused sessions from TMS, there is a risk hospitals do not know how many scheduled elective sessions are unused altogether. This, alongside other data issues, means it is not possible to estimate the total hours that operating theatres were unused due to cancelled sessions and it is unlikely that hospitals consider this as lost time.

We reviewed the schedules and analysed TMS data to determine how many sessions each of the hospitals planned to use for elective surgery and how many elective sessions were actually used (Table 6). We found that four out of the five hospitals planned for more elective sessions than was used, and that some of these excess sessions were not used despite having staff allocated to them. In contrast, BH used all of its elective sessions plus 83 of its scheduled emergency sessions to perform elective surgery.

Hospital	Number of planned half day elective sessions shown in schedule	Number of elective sessions used (from TMS)	Difference	Difference (as %)
SCGH	2475 (1 January to 30 June only)	2464	11	0.4%
OPH	1236	1199	37	3.0%
SDH	1197	1107	90	7.5%
BH	1349	1432	-83	-5.8%
AH	865	820	45	5.2%

Table 6: Review of planned elective sessions against the number recorded in TMS – 1 January to 24 December 2014

There were marked differences between the time allocated and used by each specialty

Effective scheduling requires the right number of sessions to be allocated to each specialty to match resources with demand. Across the sample, we found that some specialties used considerably more sessions than were allocated while others used considerably less (Table 7). This imbalance causes inefficiency and increased administrative burden on theatre managers to rearrange schedules, bookings and staffing to address variation. Improved scheduling will enable hospitals to better meet anticipated need.

Hospital	Specialty	Proportion of planned sessions used
SCGH	Ear, Nose and Throat	20% more
	Urology	10% less
OPH	Ophthalmology	24% more
	Orthopaedics	21% less
SDH	Ophthalmology	6% more
	Gynaecology	43% less
BH	General	18% more
	Ear, Nose and Throat	10% less
AH	General	13% more
	Ear, Nose and Throat	9% less

Table 7: Examples of where the specialty session allocation is more or less than what was required by hospitals in 2014

Although specialties may appear to need more or fewer sessions, it is also important to consider how much of the allocated session time was used to treat patients. Using theatre utilisation to assess this, we found:

- at AH, urology used all but two sessions, but theatre utilisation averaged only 55 per cent. Fifty-nine per cent of their sessions finished more than one hour early and six per cent started more than one hour late
- at SDH, 82 per cent of allocated elective dental sessions were used. Of those used, the theatre utilisation was 76 per cent and 17 per cent of sessions finished more than one hour early
- at SCGH, ophthalmology used 100 per cent of its allocated sessions. However, the theatre utilisation was only 70 per cent and more than one quarter of the sessions finished more than one hour early.

Hospitals should review session length and staff coverage to improve efficiency and reduce out of hours surgery

At all sample hospitals, the scheduled start time of operating theatre sessions was between 8.00 and 8.30am and scheduled finish time was between 4.30 and 5.30pm, Monday to Friday. Where morning (AM) and afternoon (PM) sessions were held, there was a break of up to 1.5 hours between these sessions. For all-day sessions, surgery could be performed over the full length of the session with no scheduled break. We found that the current session times did not give hospitals the best chance of completing work within planned sessions and some additional time could be leveraged to increase available theatre time.

At SCGH, we found that the current session lengths did not allow for long and complex cases to be performed during scheduled hours, which caused sessions to regularly overrun. Of the sessions that finished more than one hour late in 2014, 37 per cent of these had a single case that ran longer than the scheduled session length. This shows there is a considerable need for longer sessions. Staff advised that holding lengthier sessions and evening sessions to manage longer cases and overall demand has been considered but not implemented.

At AH, session times often did not reflect the actual hours theatre staff treat elective patients. Cases for a particular specialty are regularly undertaken before the morning start of a scheduled elective session, often causing subsequent sessions to start late.

In 2014, nearly 70 per cent of AH's late morning starts occurred where these treatments had taken place before the scheduled session. Given the regularity of this occurrence, the hospital should consider including them in the morning sessions so all anticipated activity is set out in the schedule.

We found elective surgery cases starting and finishing outside of elective hours at BH, SDH and OPH. Hospitals should consider the frequency of these cases and the feasibility of factoring them into the schedule to allow for a more planned approach.

One way for hospitals to leverage more time to better meet demand and case length without altering start and finish times is to hold more all-day sessions. We found that taking an all-day approach provides up to an additional 1.5 hours of session time, per theatre per day.

Under this approach, the session is not ended by the requirement for nurses to have a lunch break, instead an additional nurse is provided to allow the session to continue uninterrupted. SCGH uses this approach to manage coverage of all-day sessions.

Appendix 4 explains the potential to realise additional time from within planned operating theatre hours. Although this may require some hospitals to engage additional nursing staff, it would improve overall efficiency. Extending operating hours, for example from 8.00am to 8.00pm would also deliver increased operating theatre time. However, we acknowledge that there would be significant staffing, rostering and financial impacts to consider.

Effective planning for emergency cases is needed to maximise the use of operating theatres

To optimise efficiency, hospitals need to understand the demand for emergency cases and their impact on elective sessions. For instance, a major consideration for some hospitals is the impact of performing emergency caesarean sections. A well balanced and managed schedule, based upon reliable demand data will enable hospitals to minimise disruption to elective sessions, meet clinical demands and reduce unplanned overtime.

Depending on demand, hospitals can either have a dedicated emergency theatre, include emergency sessions within the schedule or treat emergency cases within elective sessions as required. Health advised that most hospitals have separate theatres or theatre sessions to treat emergency cases and that the day to day impact of emergency cases is not predictable, although it is relatively constant over longer periods of time.

We found that having dedicated emergency sessions won't always prevent interruptions to elective sessions. For example, at BH in 2014, 24 per cent of planned elective sessions were interrupted by emergency cases and a high proportion of cases, mostly emergency, were treated out of session hours.

The allocation of too much emergency session time is also inefficient. SDH allocated too much time to emergency sessions with less than a quarter of the time in these sessions used for emergency cases. A better alignment of demand at SDH could have allowed significantly more time to be available to treat elective patients.

Operating theatre schedules should be reviewed more frequently to ensure they match demand

All five hospitals would benefit from more frequently using their surgical demand data to modify their operating theatre schedules to match demand.

We showed earlier (Table 7) the imbalance between demand and allocation of sessions. Case studies from other Australian public hospitals show that informed scheduling increases efficiency within regular session times and reduces out of hours work.

To help us assess whether the session allocation was well matched with demand, we examined the schedules of one metropolitan (SCGH) and one regional hospital (BH) against actual performance over set periods in 2014.

When we used the actual demand to develop theoretical schedules we found that opportunities did exist to considerably improve scheduling. While this exercise did not take into account broader resourcing and staffing inputs, it nevertheless showed that it is a step hospitals should take to match demand.

At SCGH, the schedule for orthopaedic and general surgery did not match demand, with some surgery performed out of hours. Our revised theoretical schedule responds to this demand to give the hospital a better chance of treating cases in these specialties within planned sessions across the 13 theatres. Performance data shows that one theatre was only used for 70 per cent of the available time over the past six years. SCGH would therefore need to decide whether to continue using it at this level, or leverage the remaining capacity going forward by booking more cases.

BH performed a considerable amount of both elective and emergency surgery following the end of the afternoon session. Our theoretical schedule adds an evening session to address this demand in a more planned way. The schedule also alters the allocation of orthopaedic trauma, gynaecology and obstetrics sessions and provides flexibility to assign sessions to other specialties as required.

How quickly hospitals can change schedules to be more responsive to demand depends somewhat on the conditions of the surgeons' employment.

As acknowledged by Health staff, it may be difficult for SCGH to improve its scheduling and adjust session allocations to better match the demand for the different specialities in the short term. This is because SCGH employs salaried surgeons on five-year contracts. Hospitals using Visiting Medical Practitioners (VMPs) and other incentivised payment structures for surgeons may have greater capacity to adapt their scheduling to meet demands for the different specialities.

Health and hospitals should consider examining the current employment and payment models to determine which arrangements best support hospitals to improve efficiency and meet demand.

Health and hospitals can do more to understand and improve operating theatre efficiency

The Health portfolio is highly complex with numerous critical success factors. While operating theatre efficiency is one of many important factors, we were surprised that Health does not have an overall strategy for monitoring and improving performance in this area. Although it provides some direction and guidance to hospitals such as on waitlist management, and compiles some data for ad hoc performance reporting, more effort is required to achieve operating theatre efficiencies.

For the reasons listed above, it was not surprising that individual hospitals gave varying importance to operating theatre efficiency and have inconsistent approaches to internally monitoring performance. The lack of consistent data and regular analysis means that operational issues such as late starts are either not identified or not addressed in a timely way. Resource planning and theatre scheduling is done without adequate use of performance data, resulting in lost time.

Better use of available data is needed to get a clear picture of operating theatre efficiency

Health has not prioritised the development of operating theatre performance measures and targets. In 2011, Health's internal performance directorate identified the need for measures to monitor the efficient and effective use of operating theatres. However, consistent measures are still not in place across WA public hospitals.

In 2015, Health released a Strategic Intent statement which describes its priority aim of implementing and reporting on common efficiency and benchmarking standards to improve the efficiency and effectiveness of hospitals' services. Although the extent to which operating theatre efficiency is a focus is not clear, Health has recently developed reports for tracking operating theatre performance by hospital. However these reports are not yet used across all Area Health services to monitor operating theatre efficiency.

Health requires hospitals to report internally every month on a single performance indicator, Theatre Activity. This is the proportion of used theatre hours to total allocated theatre hours, expressed as a percentage.

We found no evidence that hospitals considered performance against this measure each month though it was considered at the Area Health level. Although a single measure is not sufficient to indicate the level of efficiency at each hospital, it is a starting point for high level assessment.

We also found that the way the Theatre Activity measure is calculated gives a misleading view of performance.

Theatre Activity calculates the total time the operating theatres are occupied, including any time after the scheduled finish time (see Appendix 5). This can produce results well over 100 per cent if a session runs over time, causing aggregated results to be inflated and to make operating theatres look more efficient than they are. This differs from the calculation of Theatre Utilisation by NSW, which examines the proportion of the planned theatre time the operating theatres are occupied, which is always less than 100 per cent.

Despite the calculation differences between the measures, WA uses NSW's target of 80 per cent. As mentioned earlier, none of the hospitals met the 80 per cent Theatre Utilisation target between 2009 and 2014. Figure 8 below shows that the Theatre Activity measure gives a more favourable, but less reliable picture of operating theatre performance than the theatre utilisation measure.

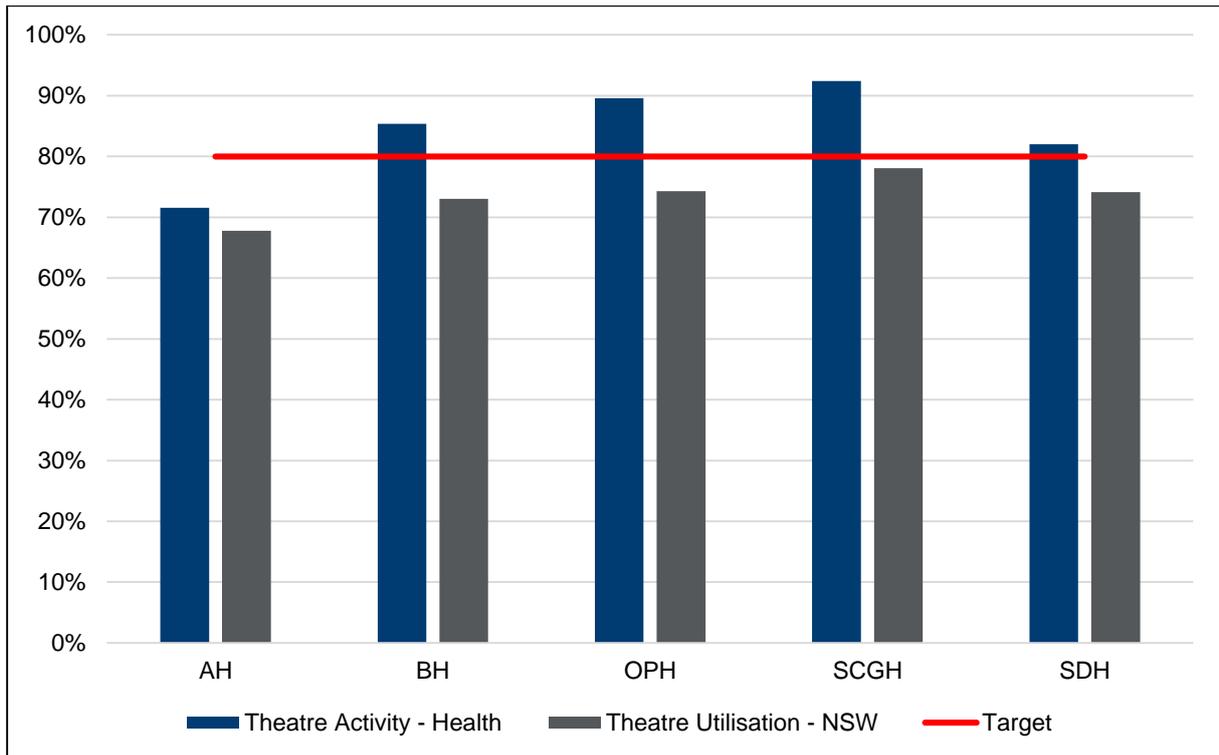


Figure 8: Use of elective session time by hospital for 2014 represented using Health’s Theatre Activity and NSW’s Theatre Utilisation approaches

Efforts have been made to improve analysis but the benefits are yet to be realised

Health’s lack of monitoring of operating theatre performance across the State’s hospitals has also seen a lack of guidance provided to hospitals on how to collect and analyse operating theatre data in a consistent and accurate way. Health has invested \$2 million on external support to improve hospitals’ understanding of performance but this has not been successful.

Useful data can be collected in TMS but Cognos, the business intelligence and performance management system used to generate reports from the data, runs on outdated software. Cognos does not allow benchmarking between hospitals. The software is old and no longer supported by the manufacturer and producing reports is slow, which is a disincentive to users.

Since 2008, Health has spent nearly \$2 million on a new performance monitoring tool and benchmarking support to eight public hospitals. However, the use of a tool and program from the United States, Theatre Compass (TC), has been slow to realise the intended benefits. Health has received negative feedback from hospitals using the program. Concerns about it include not being designed for Australian hospitals and the lack of value add over the existing Cognos.

Health considered cancelling the contract in 2010 and again in 2011. Since that time, it has been trying to develop other business intelligence alternatives, more suited to Western Australian operating theatres. Despite this, Health has continued to add hospitals to the contract at additional cost and is now the biggest user of TC in Australia. The current contract runs until 30 June 2016, with an option to extend to 2018.

Four of our five sample hospitals have TC, but none appear to have realised the anticipated benefits.

SCGH introduced TC in 2008 but no longer use it to monitor performance. OPH engagement with the program has been low. SDH has used the program to address overruns, however performance has declined since implementation. BH used TC reports to analyse the impact of emergency surgery and subsequently amended their surgery schedules to include emergency sessions to reduce the impact on elective surgery.

Data analysis at hospitals is limited by a lack of expertise

Hospitals are not effectively analysing operating theatre data, thereby missing opportunities to identify issues that impact efficiency and provide formal feedback to staff.

Data collection and auditing is allocated to nursing managers and staff on an ad hoc basis. None of the sample hospitals had a dedicated and appropriately skilled data manager to guide and oversee TMS, as recommended in the Australian College of Operating Room Nurses (ACORN) standards.

SCGH has attempted to address this by assigning auditing and reporting responsibilities to a part-time clinical nurse, however an appropriate position funded specifically for data management does not exist. Data responsibilities at the other hospitals rest with senior nursing staff.

Without a data manager, there is a greater risk to the quality of performance information. We found omissions and errors in the operating theatre data at all hospitals. Any error has the potential to affect the quality of the performance data. For example, staff at AH did not notice a dramatic change in reported performance cause by incorrect data and lack of audit processes.

We identified data issues with 1.6 per cent of cases (2 621 cases) from elective sessions, and excluded these sessions from our analysis. The data issues included:

- inconsistencies such as a patient being anaesthetised a day after they had their surgery and two patients being in the same theatre at the same time
- data omissions where the nursing staff failed to enter sufficient information to determine when the patient arrived and/or left the theatre.

All hospitals reported that TMS was audited, but the process varied between hospitals and did not include all anaesthetic data. Across the five hospitals between 2009 and 2014, nine per cent of cases in elective sessions did not have anaesthetic times recorded. The trend over the last three years has been worsening, with an increase in the proportion of cases missing anaesthetic times from seven per cent in 2012 to 10 per cent in 2014.

The lack of a data focus also means that TMS functionality is not optimised. For example, at the start of our audit only two hospitals used TMS to capture reasons why the first case was delayed. Staff advised that new modules were not installed and updates requested by users were not done.

Health's TMS Business User Group was established to progress collaborative work on TMS. It meets monthly, but not all hospital sites using TMS attend. BH was unaware the group was still active.

All five hospitals have made only limited and ad hoc use of their data to inform staff of efficiency problems, such as low session utilisation by surgeons. Regular reporting of meaningful information would give hospitals a better chance of engaging staff to work towards reducing avoidable inefficiencies.

Appendices

Appendix 1: Sample Hospitals

Hospital	Size and Clinical Services	Operating Theatres	Proportion of Admissions from Elective Surgery Waitlist in WA (from Health admissions data 2013-14)	Notes
North Metropolitan Health Service (NMHS)				
Sir Charles Gairdner Hospital (SCGH) Nedlands	<ul style="list-style-type: none"> Major metropolitan hospital Approximately 600 beds Emergency, elective surgery and a range of clinical services including complex cases 	13	12%	Tertiary training hospital Joined with OPH 2014
Osborne Park Hospital (OPH) Stirling	<ul style="list-style-type: none"> Medium metropolitan hospital Approximately 200 beds Elective surgery, maternity and aged care – no emergency (except caesareans) 	3 <i>Note: an additional 2 theatres were opened in 2015</i>	5%	Joined with SCGH 2014. Health has indicated that OPH may be expanded to include an emergency department.
Swan District Hospital (SDH) Middle Swan	<ul style="list-style-type: none"> Large metropolitan hospital Approximately 200 beds Emergency, elective surgery and a range of clinical services including maternity 	4	5%	Closing in Nov 2015
WA Country Health Service (WACHS)				
Bunbury Hospital (BH)	<ul style="list-style-type: none"> Major regional hospital Approximately 150 beds Emergency, elective surgery and a range of clinical services including maternity 	3	5%	Co-located with St John of God Bunbury (private hospital)
Albany Hospital (AH)	<ul style="list-style-type: none"> Large regional hospital Approximately 120 beds Emergency, elective surgery and a range of clinical services including maternity 	3 <i>Note: until 2013 only 2 theatres. Additional theatre when Albany Health Campus was opened</i>	3%	

Appendix 2: Operating Theatre Performance Measures

Health does not have a set of performance measures to monitor operating theatre efficiency across the state. We have therefore assessed operating theatre efficiency based on six established measures and research from other jurisdictions.

Theatre Utilisation

Theatre Utilisation is a measure of how much time operating theatres are occupied by patients of the total time the theatres are allocated for use. NSW's target is 80 per cent. Theatre Utilisation has only been calculated for elective sessions and used theatre time excludes turnaround time. Theatre utilisation is shown in comparison with Health's Theatre Activity measure (Appendix 5).

First case start on time

First case start on time reports the proportion of sessions where the first case of the session starts on or before the scheduled session start time. WA does not have a target, but the Theatre Management System (TMS) in use at hospitals allows for sessions to start within 10 minutes of the scheduled session start time. NSW has a target of 95 per cent of sessions to start on or before the scheduled start time (no grace given).

Underruns

Underruns is a measure of the number of sessions that finished before the scheduled finish time. There is no recognised target or best practice available in the literature, other than the need for this measure to be appropriate, based on the case mix of the hospital. Our analysis identified that the average elective case time across all the sample hospitals was 70 minutes, so it was determined that underruns would be reported as sessions that finish more than one hour before the scheduled finish time.

Overruns

Overruns is a measure of the number of sessions that finished after the scheduled finish time. There is no recognised target or best practice available in the literature, other than the need for this measure to be appropriate based on the case mix of the hospital. Our analysis identified that the average case time across all the sample hospitals was 70 minutes, so it was determined that overruns would be reported as sessions that finish more than one hour after the scheduled finish time.

Day of Surgery Cancellations

Day of surgery (DOS) cancellations is the proportion of elective cases that are cancelled on the day of surgery. WA does not have a target for DOS cancellations. The NSW target for DOS cancellations is less than two per cent. However, research from the United States indicates that for tertiary hospitals, it may be more appropriate to set a higher target to allow for an increased number of cancellations on the day of surgery due to the nature of the patients (tertiary hospitals typically treat higher risk patients). Based on these factors we believe an appropriate target for DOS cancellations for tertiary hospitals is less than five per cent.

Turnaround Times

Turnaround time is the average number of minutes between one patient exiting the operating theatre and the next patient in the same session entering the operating theatre. WA does not have a target for turnaround time, and there is no common target in other jurisdictions.

Appendix 3: Hospital Performance Information

Overview

Data was obtained from the Theatre Management System (TMS) for each hospital for the six year period 1 January 2009 to 31 December 2014. Data included all cases completed in the 26 theatres (excluding procedure rooms and theatres opened in 2015) as well as cancellations, with separation of cancellations to allow reporting on those cases that were cancelled on the day of surgery.

For the six measures, we have only reported activity during elective sessions: morning (AM), afternoon (PM) and all-day sessions. The times that these sessions run varies within and between hospitals and this has been taken into consideration. Sessions where one or more cases have been identified with a data error or inconsistency were excluded from the analysis to ensure the data is not skewed.

Albany Hospital

Albany Hospital (AH) has three operating theatres, but before the hospital was redeveloped in 2013, there were two. Three per cent of the State's elective surgery cases are completed at AH. Elective surgery sessions run from 8:15am to 5:15pm Monday to Friday, with AM and PM sessions separated by a one hour break.

Day of Surgery Cancellations

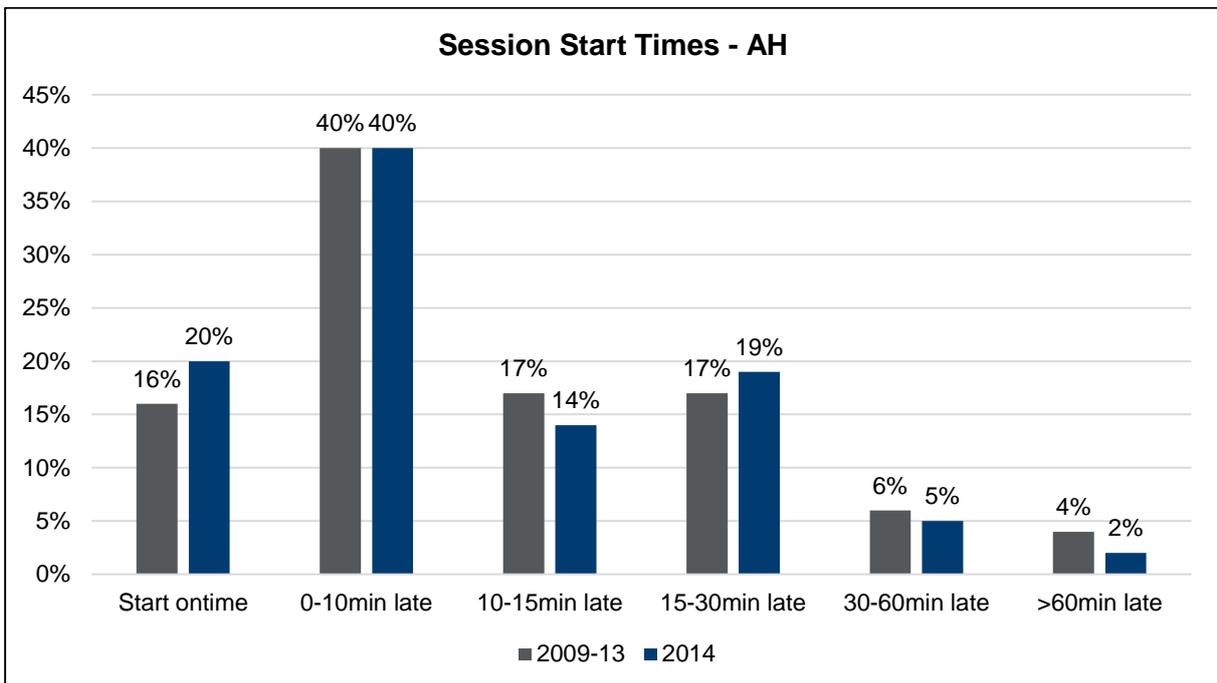
	2009	2010	2011	2012	2013	2014
Total elective cases booked	2 915	2 893	2 742	2 984	2 924	3 153
Number elective cases cancelled on DOS	71	66	76	77	79	63
Per cent DOS cancellations	2%	2%	3%	3%	3%	2%

Proportion of Day of Surgery Cancellations by Reason

Reasons for DOS Cancellations	2009	2010	2011	2012	2013	2014
Bed availability	14%	27%	10%	17%	9%	8%
Booking error/change	3%	2%	5%	3%	1%	3%
Displaced by more urgent case	10%	3%	1%	8%	14%	13%
Equipment	0%	0%	8%	4%	9%	3%
Medical/clinical	41%	39%	32%	39%	28%	30%
Other/unknown	1%	1%	5%	4%	0%	8%
Patient did not attend	10%	3%	10%	9%	11%	13%
Patient not prepared	0%	2%	1%	0%	1%	1%
Patient request	11%	15%	7%	10%	14%	16%
Patient request – unwell	0%	0%	0%	0%	0%	0%
Procedure done elsewhere	6%	6%	4%	0%	4%	0%
Procedure not required	3%	2%	11%	5%	6%	0%
Session overbooked/overran	1%	0%	3%	0%	3%	2%
Staff availability	0%	0%	3%	1%	0%	3%

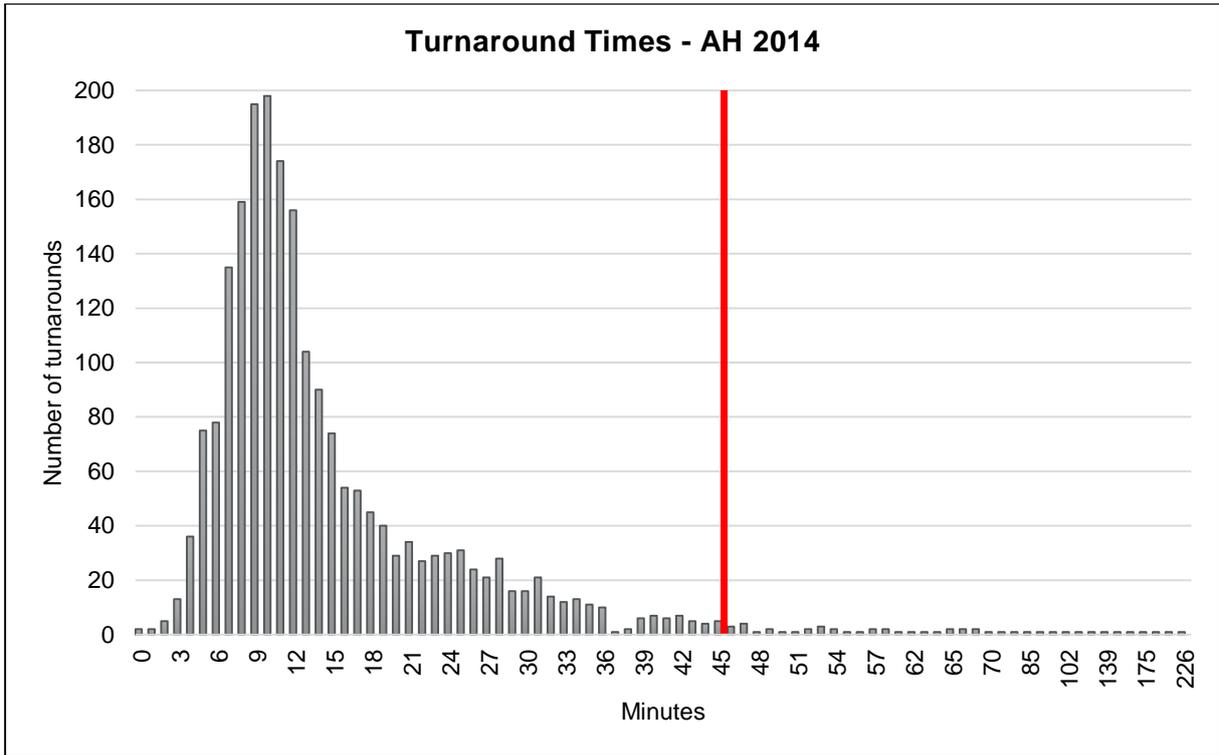
First Case Start on Time

	2009	2010	2011	2012	2013	2014
Number sessions starting >10min late	226	242	218	264	275	193
Per cent sessions starting >10min late	37%	42%	38%	51%	53%	40%
Number sessions starting >30min late	49	38	52	70	63	35
Per cent sessions starting >30min late	8%	7%	9%	13%	12%	7%
Number sessions starting >60min late	21	12	26	21	25	11
Per cent sessions starting >60min late	3%	2%	5%	4%	5%	2%
Hours lost from starting >60min late	55	22	50	33	52	23



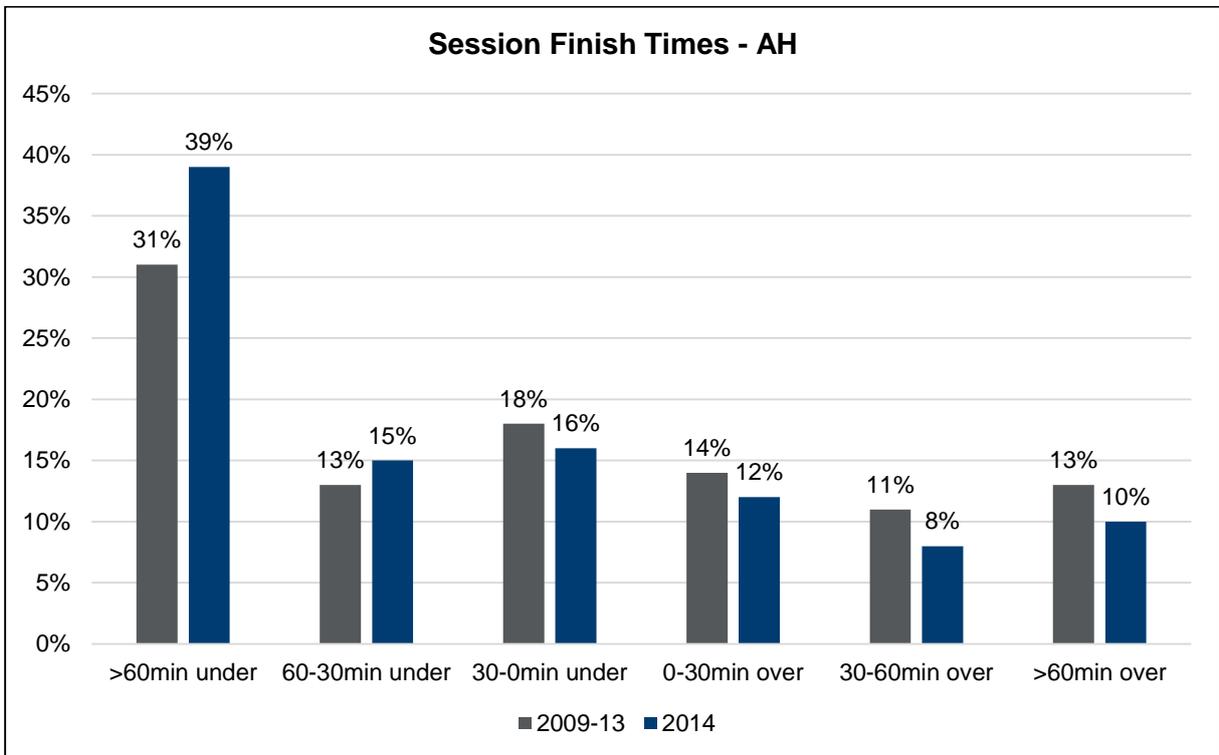
Turnaround Times

	2009	2010	2011	2012	2013	2014
Number of turnarounds	1 990	1 922	1 901	2 061	1 952	2 056
Average turnaround time (minutes)	15	14	14	14	16	15
Number of turnarounds >45min	62	55	43	45	53	51
Per cent turnarounds >45min	3.1%	2.9%	2.3%	2.2%	2.7%	2.5%
Number of turnarounds with change in specialty	26	24	20	31	16	16
Average turnaround time when there is a change in specialty (minutes)	51	47	23	20	64	26



Red line: Health's reporting excludes turnaround time data beyond this point of 45 minutes.

Accuracy of Session Finish Times



Underruns

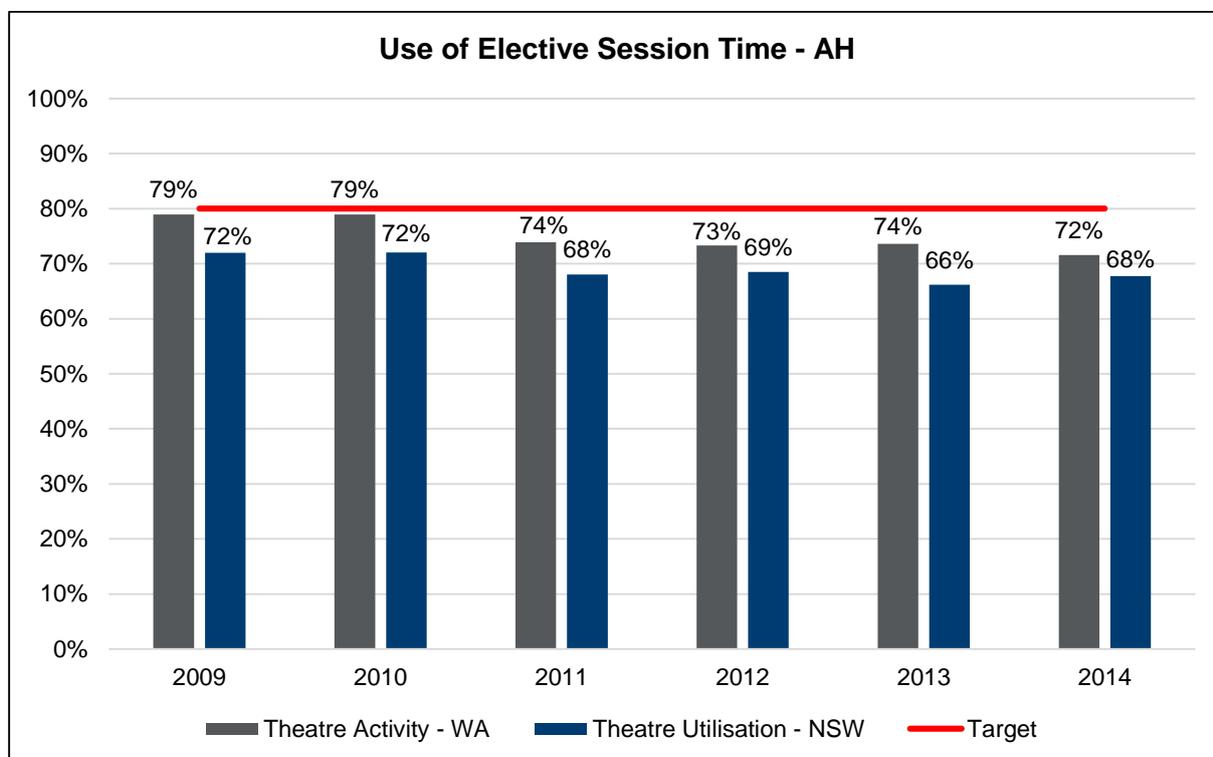
	2009	2010	2011	2012	2013	2014
Number sessions finished >1hr early	131	137	197	209	206	185
Per cent sessions finished >1hr early	21%	24%	35%	40%	40%	39%
Hours lost because finished >1hr early	279	283	450	471	448	376
Hours lost per theatre because sessions finished >1hr early	140	142	225	236	224	94
Proportion of sessions that finished >1hr early that had a DOS cancellation	12%	13%	13%	12%	11%	10%

Overruns

	2009	2010	2011	2012	2013	2014
Number sessions finished >1hr late	77	73	70	57	73	45
Per cent sessions finished >1hr late	13%	13%	12%	11%	14%	10%
Hours overtime because finished >1hr late	165	136	154	108	236	81
Hours overtime per theatre because sessions finished >1hr late	83	68	77	54	118	20

Theatre Activity and Theatre Utilisation

	2009	2010	2011	2012	2013	2014
Theatre Activity – WA Health	79%	79%	74%	73%	74%	72%
Theatre Utilisation – NSW Health	72%	72%	68%	69%	66%	68%



Bunbury Hospital

Bunbury Hospital (BH) has three operating theatres. BH performs five per cent of the State's elective surgery. Elective surgery sessions run from 8:00am to 5:00pm Monday to Friday, with AM and PM sessions separated by a one hour break.

Day of Surgery Cancellations

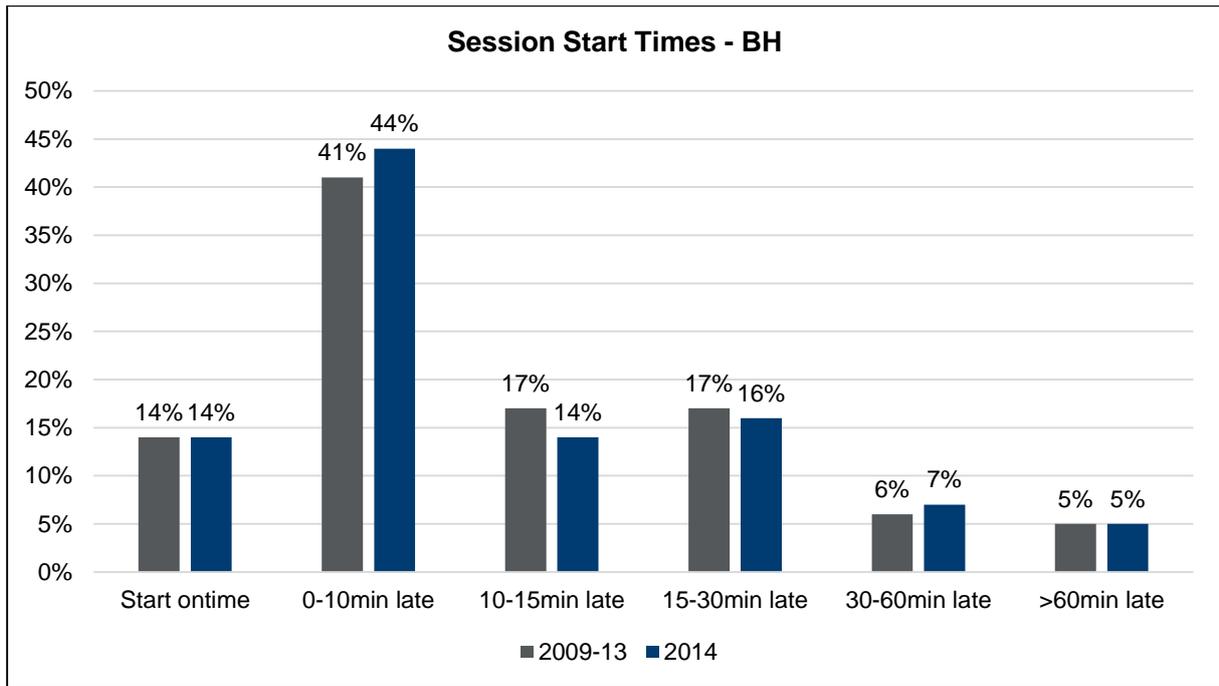
	2009	2010	2011	2012	2013	2014
Elective cases booked in elective sessions	4 625	4 499	4 710	4 988	4 882	4 600
Elective cases cancelled on DOS	279	301	383	430	460	380
Per cent DOS cancellations	6%	7%	8%	9%	9%	8%

Proportion of Day of Surgery Cancellations by Reason

Reasons for DOS Cancellations	2009	2010	2011	2012	2013	2014
Bed availability	3%	1%	1%	0%	3%	5%
Booking error/change	2%	1%	1%	1%	1%	1%
Displaced by more urgent case	27%	28%	28%	31%	28%	15%
Equipment	1%	0%	1%	0%	1%	1%
Medical/clinical	38%	38%	37%	30%	25%	32%
Other/unknown	1%	1%	6%	4%	5%	1%
Patient did not attend	5%	7%	6%	4%	4%	7%
Patient not prepared	3%	3%	3%	4%	3%	2%
Patient request	8%	6%	4%	5%	5%	5%
Patient request - unwell	0%	0%	0%	0%	0%	0%
Procedure done elsewhere	2%	2%	3%	3%	2%	5%
Procedure not required	2%	4%	2%	7%	4%	4%
Session overbooked/overran	4%	6%	6%	8%	17%	19%
Staff availability	4%	3%	2%	3%	2%	3%

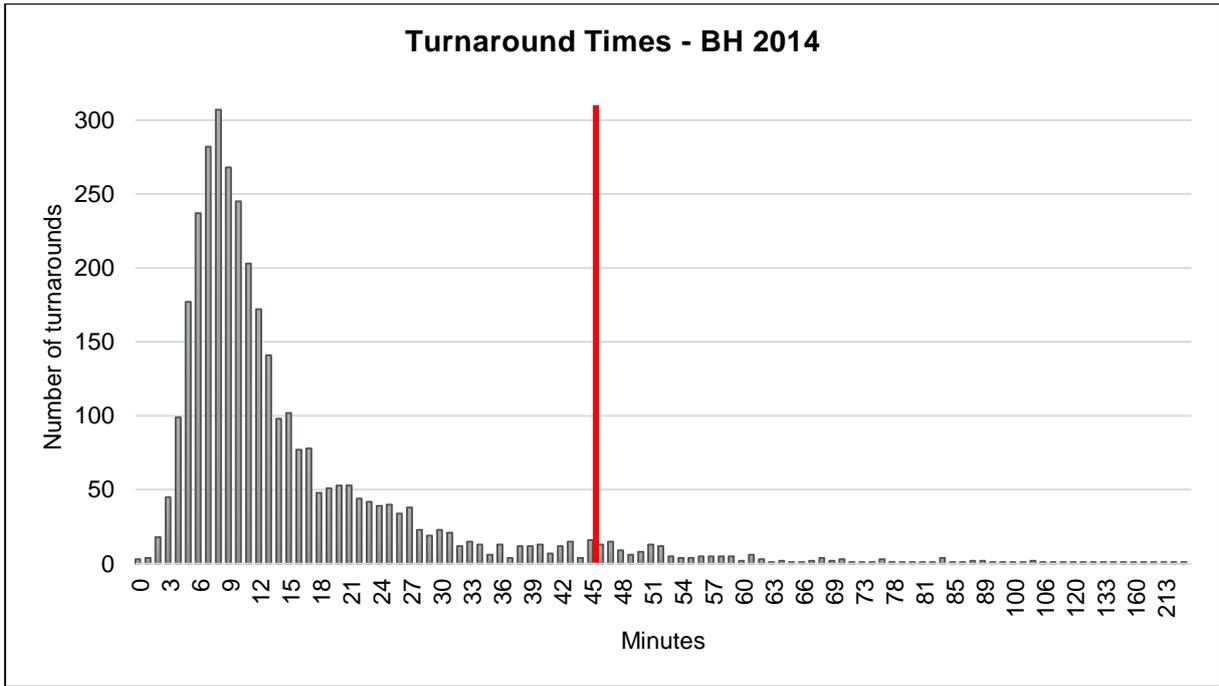
First Case Start on Time

	2009	2010	2011	2012	2013	2014
Number sessions starting >10min late	502	441	537	569	598	515
Per cent sessions starting >10min late	44%	39%	47%	48%	48%	42%
Number sessions starting >30min late	108	116	134	112	139	146
Per cent sessions starting >30min late	9%	10%	12%	9%	11%	12%
Number sessions starting >60min late	62	54	62	45	55	61
Per cent sessions starting >60min late	5%	5%	5%	4%	4%	5%
Hours lost from starting >60min late	133	136	125	102	104	158



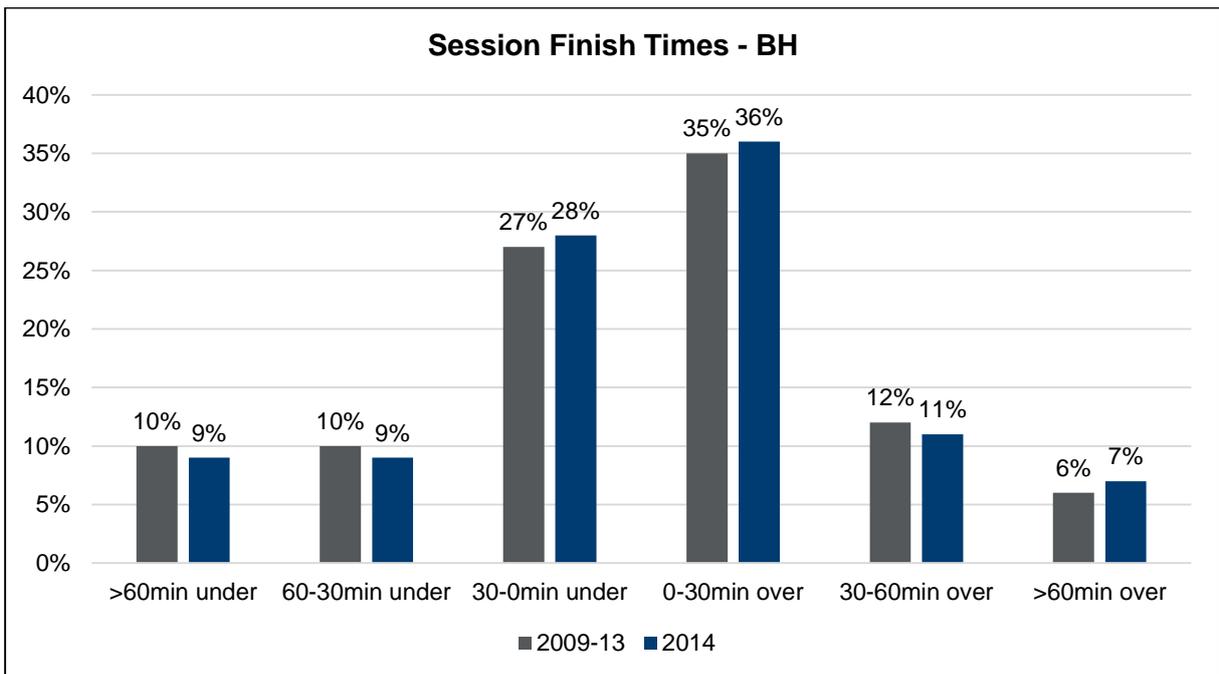
Turnaround Times

	2009	2010	2011	2012	2013	2014
Number of turnarounds	3 318	3 255	3 359	3 502	3 335	3 416
Average turnaround time (minutes)	13	14	15	15	16	16
Number of turnarounds >45min	119	120	147	158	139	178
Per cent turnarounds >45min	3.6%	3.7%	4.4%	4.5%	4.2%	5.2%
Number of turnarounds with change in specialty	81	130	96	88	117	106
Average turnaround time when there is a change in specialty (minutes)	37	26	26	33	33	35



Red line: Health's reporting excludes turnaround time data beyond this point of 45 minutes.

Accuracy of Session Finish Times



Underruns

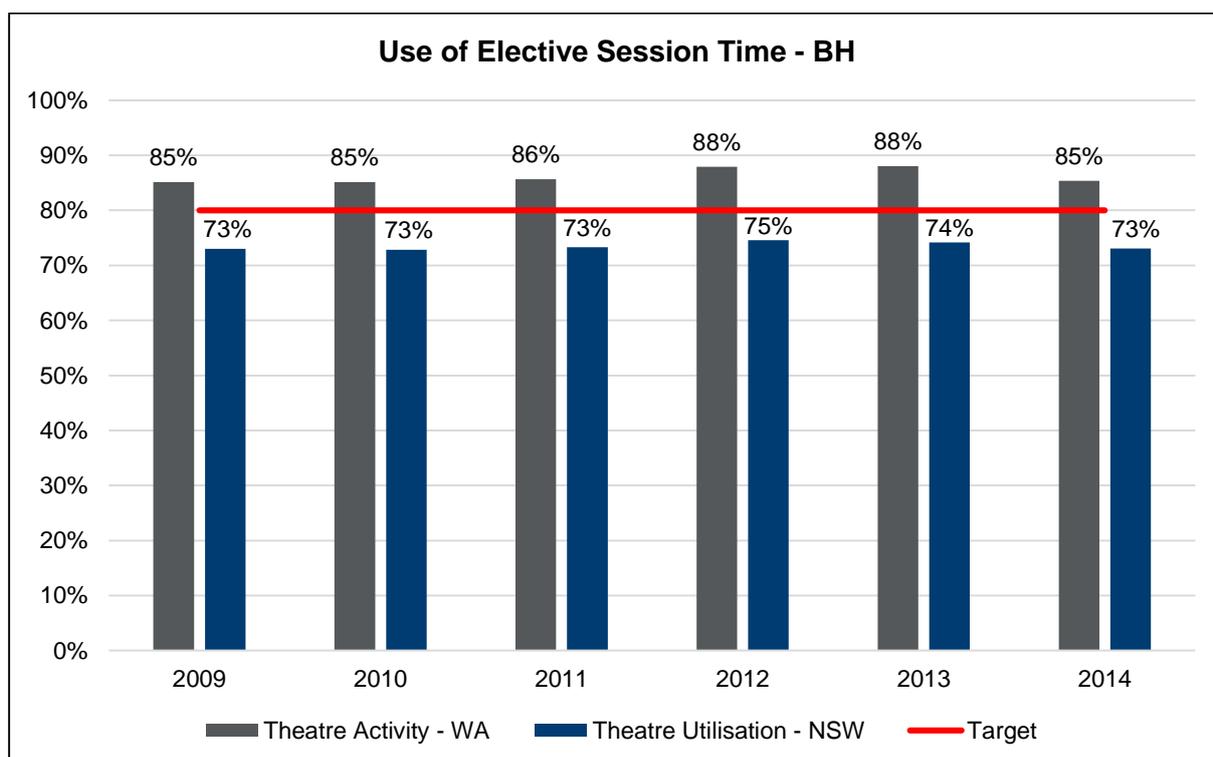
	2009	2010	2011	2012	2013	2014
Number sessions finished >1hr early	125	124	117	88	106	113
Per cent sessions finished >1hr early	11%	11%	10%	7%	9%	9%
Hours lost because finished >1hr early	246	234	226	175	199	206
Hours lost per theatre because sessions finished >1hr early	82	78	75	58	66	69
Proportion of sessions that finished >1hr early that had a DOS cancellation	26%	27%	30%	38%	26%	27%

Overruns

	2009	2010	2011	2012	2013	2014
Number sessions finished >1hr late	39	55	83	78	88	89
Per cent sessions finished >1hr late	3%	5%	7%	7%	7%	7%
Hours overtime because finished >1hr late	72	109	173	156	193	187
Hours overtime per theatre because sessions finished >1hr late	24	36	58	52	64	62

Theatre Activity and Theatre Utilisation

	2009	2010	2011	2012	2013	2014
Theatre Activity – WA Health	85%	85%	86%	88%	88%	85%
Theatre Utilisation – NSW Health	73%	73%	73%	75%	74%	73%



Osborne Park Hospital

Osborne Park Hospital (OPH) is part of the Sir Charles Gairdner Osborne Park Health Care Group. OPH provides rehabilitation and aged care services, surgical services and women's and newborn services. OPH performs five per cent of the State's elective surgery. There are five operating theatres at OPH, however two of these opened in early 2015. Elective surgery sessions run from 8:00am to 4:30pm Monday to Friday, with AM and PM sessions being 3.5 hours long and separated by a 1.5 hour break.

Day of Surgery Cancellations

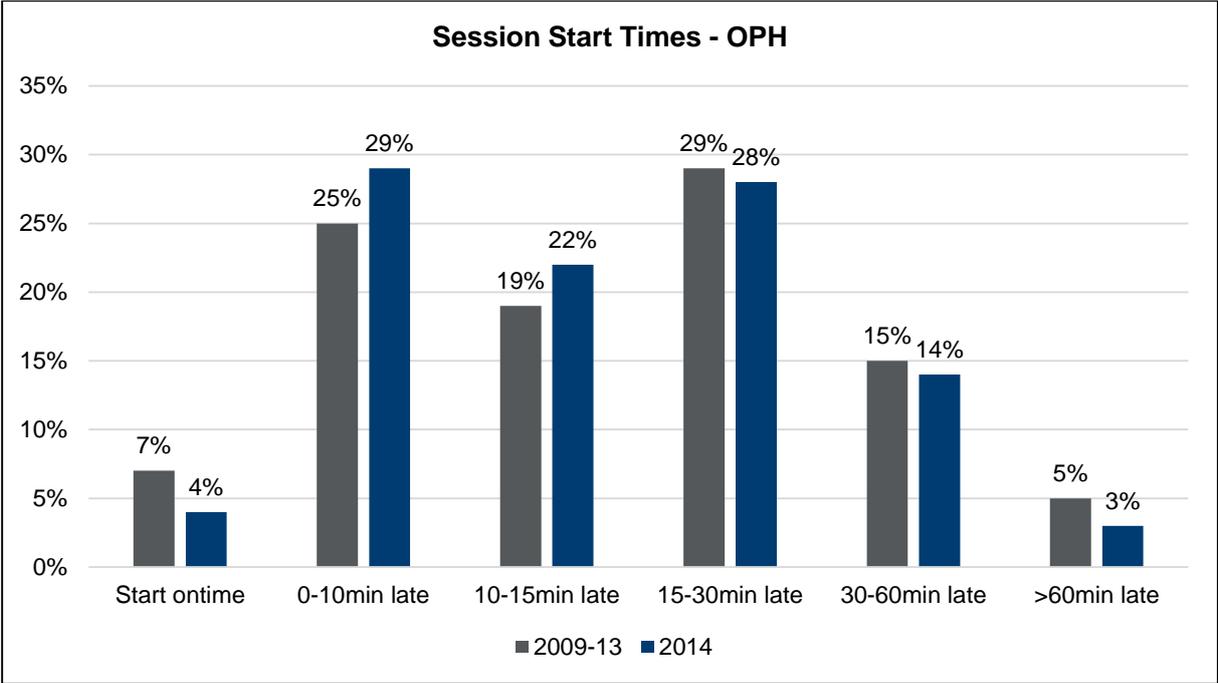
	2009	2010	2011	2012	2013	2014
Elective cases booked in elective sessions	4699	4794	4947	4904	5096	4597
Elective cases cancelled on DOS	186	167	191	182	174	128
Per cent DOS cancellations	4%	3%	4%	4%	3%	3%

Proportion of Day of Surgery Cancellations by Reason

Reasons for DOS Cancellations	2009	2010	2011	2012	2013	2014
Bed availability	0%	0%	0%	0%	0%	0%
Booking error/change	9%	5%	7%	5%	5%	5%
Displaced by more urgent case	8%	4%	3%	8%	5%	13%
Equipment	0%	1%	2%	1%	3%	1%
Medical/clinical	24%	27%	27%	24%	21%	15%
Other/unknown	0%	0%	1%	2%	1%	0%
Patient did not attend	14%	22%	14%	20%	22%	31%
Patient not prepared	6%	3%	4%	2%	2%	1%
Patient request	9%	11%	9%	8%	10%	10%
Patient request – unwell	4%	4%	6%	7%	6%	7%
Procedure done elsewhere	3%	2%	5%	3%	2%	0%
Procedure not required	4%	6%	4%	5%	5%	5%
Session overbooked/overran	14%	13%	14%	14%	11%	9%
Staff availability	5%	2%	4%	1%	7%	3%

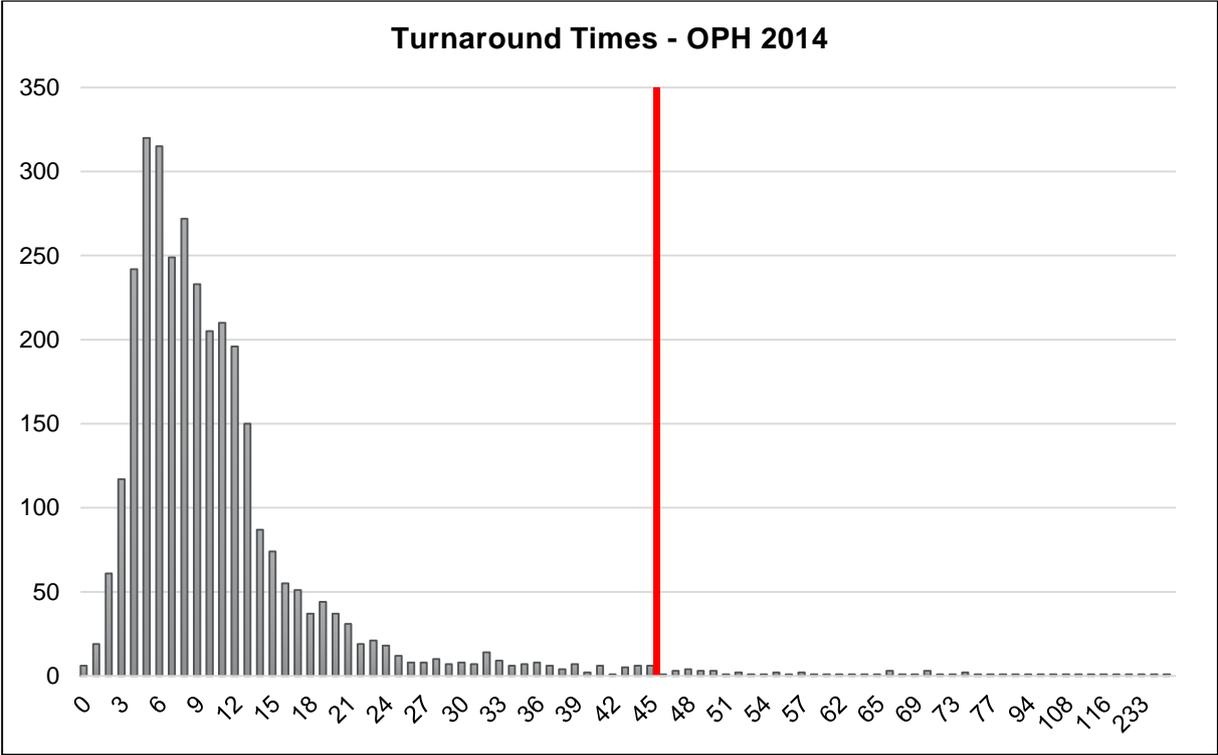
First Case Start on Time

	2009	2010	2011	2012	2013	2014
Number sessions starting >10min late	887	911	952	932	874	731
Per cent sessions starting >10min late	67%	70%	69%	68%	69%	67%
Number sessions starting >30min late	268	281	308	292	227	185
Per cent sessions starting >30min late	20%	21%	22%	21%	18%	17%
Number sessions starting >60min late	73	75	87	78	58	37
Per cent sessions starting >60min late	6%	6%	6%	6%	5%	3%
Hours lost from starting >60min late	114	134	158	119	100	59



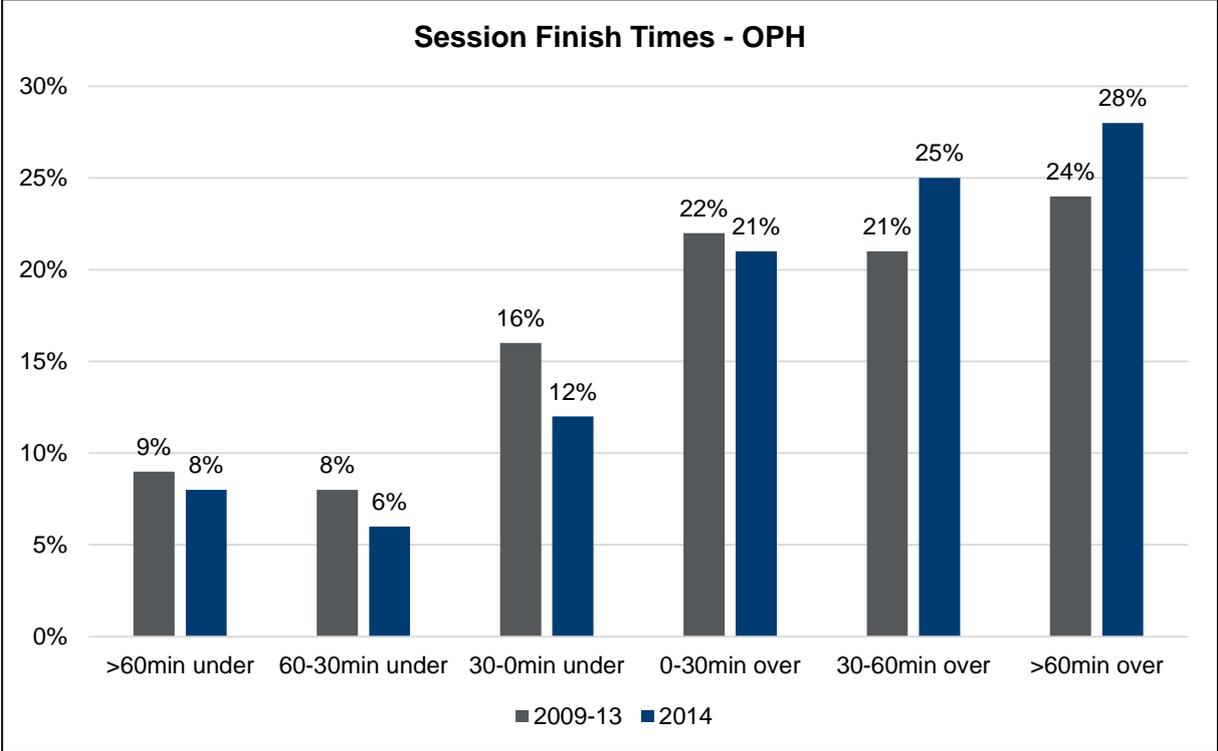
Turnaround Times

	2009	2010	2011	2012	2013	2014
Number of turnarounds	2 967	3 041	3 200	3 165	3 511	3 274
Average turnaround time (minutes)	10	11	11	12	12	11
Number of turnarounds >45min	41	52	52	71	91	58
Per cent turnarounds >45min	1.4%	1.7%	1.6%	2.2%	2.6%	1.8%
Number of turnarounds with change in specialty	65	58	90	91	123	131
Average turnaround time when there is a change in specialty (minutes)	24	30	34	22	26	29



Red line: Health's reporting excludes turnaround time data beyond this point of 45 minutes.

Accuracy of Session Finish Times



Underruns

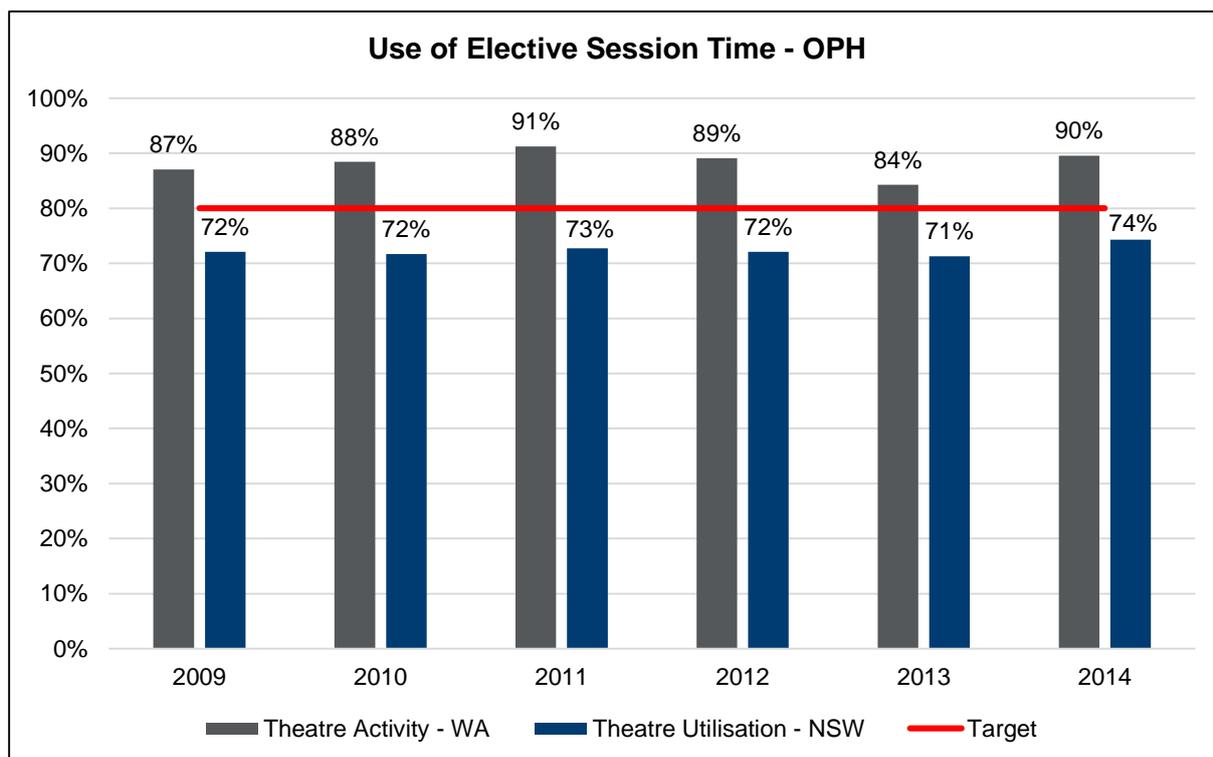
	2009	2010	2011	2012	2013	2014
Number sessions finished >1hr early	132	116	106	123	144	84
Per cent sessions finished >1hr early	10%	9%	8%	9%	11%	8%
Hours lost because finished >1hr early	221	184	174	193	236	135
Hours lost per theatre because sessions finished >1hr early	74	61	58	64	79	45
Proportion of sessions that finished >1hr early that had a DOS cancellation	25%	18%	21%	27%	26%	19%

Overruns

	2009	2010	2011	2012	2013	2014
Number sessions finished >1hr late	258	316	370	331	278	308
Per cent sessions finished >1hr late	20%	24%	27%	24%	22%	28%
Hours overtime because finished >1hr late	434	541	663	545	429	486
Hours overtime per theatre because sessions finished >1hr late	145	180	221	182	143	162

Theatre Activity and Theatre Utilisation

	2009	2010	2011	2012	2013	2014
Theatre Activity – WA Health	87%	88%	91%	89%	84%	90%
Theatre Utilisation – NSW Health	72%	72%	73%	72%	71%	74%



Sir Charles Gairdner Hospital

Sir Charles Gairdner Hospital (SCGH) is a tertiary teaching hospital providing a range of services, and is the State's principal hospital for neurosurgery and liver transplants. SCGH has 13 operating theatres and currently performs 12 per cent of the State's elective surgery. Elective surgery sessions run from 8:30am to 5:30pm Monday to Friday, with AM and PM sessions separated by a one hour break.

Day of Surgery Cancellations

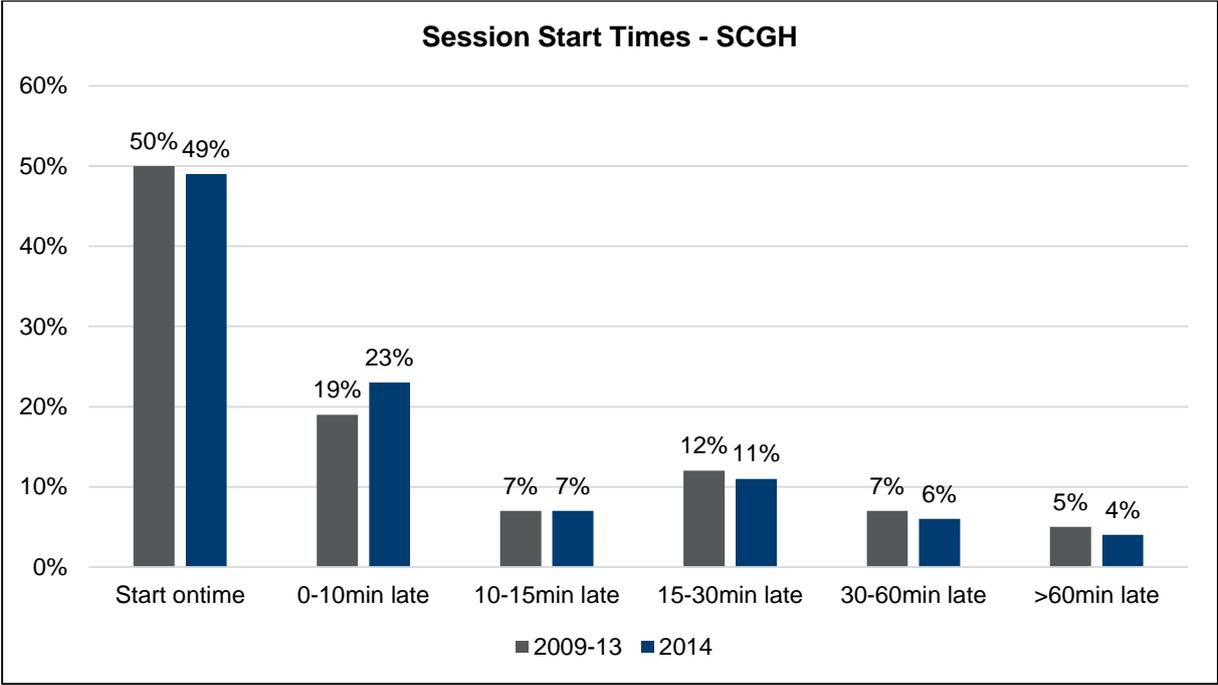
	2009	2010	2011	2012	2013	2014
Total elective cases booked	7 223	6 982	8 098	8 436	8 755	8 441
Number elective cases cancelled on DOS	497	372	546	533	562	496
Per cent DOS cancellations	7%	5%	7%	6%	6%	6%

Proportion of Day of Surgery Cancellations by Reason

Reasons for DOS Cancellations	2009	2010	2011	2012	2013	2014
Bed availability	5%	4%	13%	3%	3%	3%
Booking error/change	4%	4%	3%	4%	5%	4%
Displaced by more urgent case	13%	12%	8%	12%	10%	18%
Equipment	0%	2%	1%	1%	2%	1%
Medical/clinical	34%	25%	36%	25%	24%	25%
Other/unknown	3%	3%	1%	1%	7%	1%
Patient did not attend	9%	8%	10%	9%	7%	8%
Patient not prepared	3%	5%	4%	5%	5%	6%
Patient request	6%	5%	5%	9%	7%	6%
Patient request – unwell	0%	0%	0%	0%	0%	0%
Procedure done elsewhere	2%	1%	2%	2%	2%	2%
Procedure not required	5%	5%	4%	8%	5%	4%
Session overbooked/overran	14%	22%	10%	19%	21%	17%
Staff availability	2%	4%	3%	2%	2%	5%

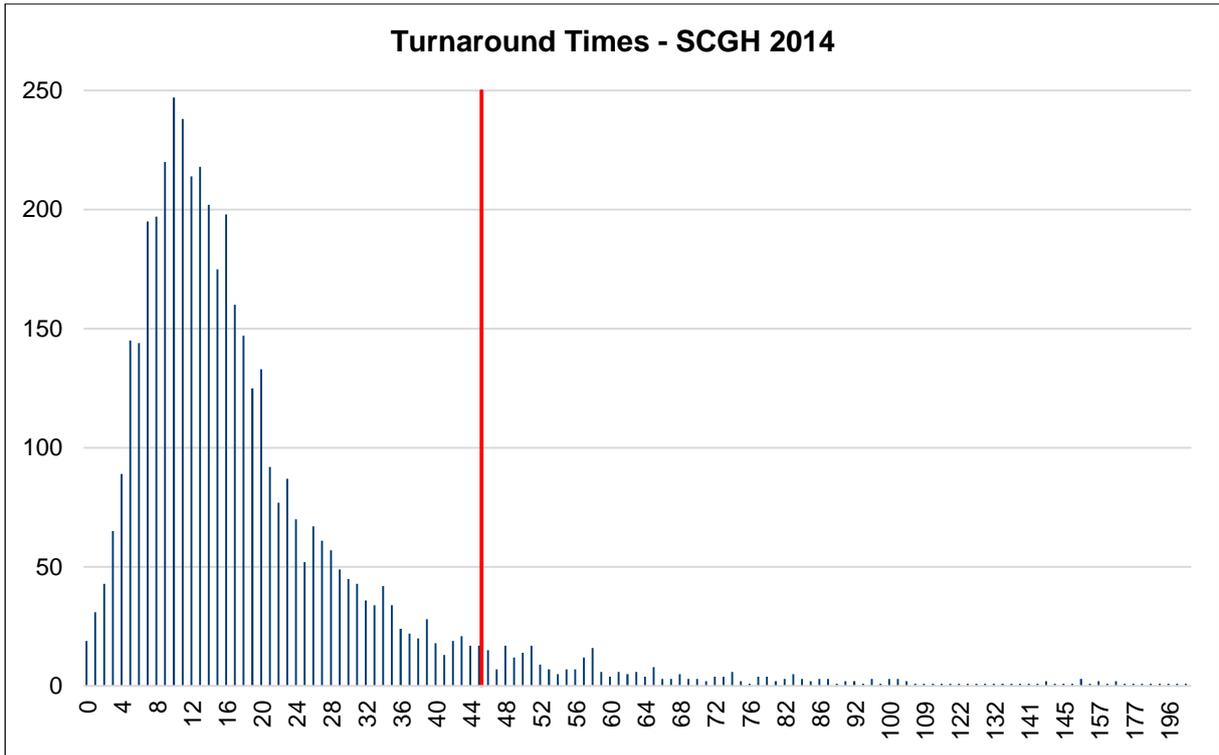
First Case Start on Time

	2009	2010	2011	2012	2013	2014
Number sessions starting >10min late	1 101	519	1 013	1 237	1 320	1 055
Per cent sessions starting >10min late	35%	21%	31%	34%	35%	28%
Number sessions starting >30min late	479	213	388	454	523	394
Per cent sessions starting >30min late	15%	8%	12%	12%	14%	10%
Number sessions starting >60min late	223	87	147	175	181	155
Per cent sessions starting >60min late	7%	3%	4%	5%	5%	4%
Hours lost from starting >60min late	487	208	317	365	352	304



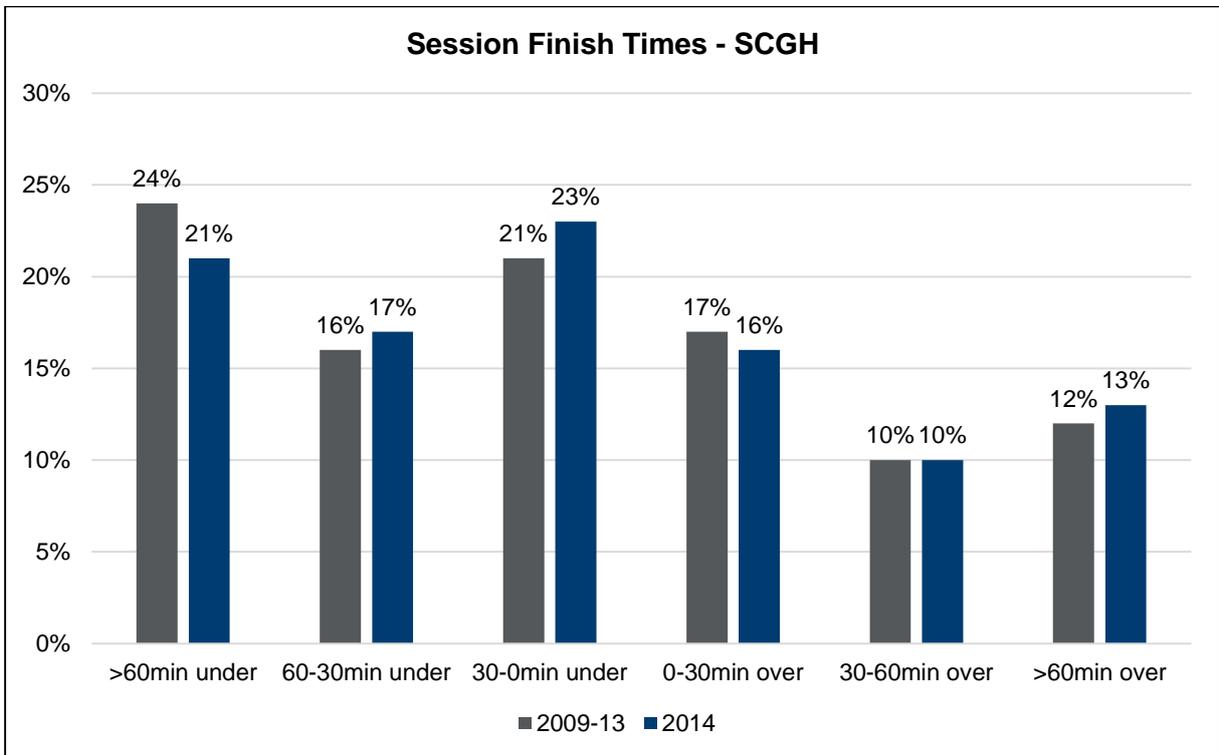
Turnaround Times

	2009	2010	2011	2012	2013	2014
Number of turnarounds	3 956	2 759	3 936	4 667	4 795	4 554
Average turnaround time (minutes)	20	16	18	19	19	20
Number of turnarounds >45min	345	147	295	340	332	304
Per cent turnarounds >45min	8.7%	5.3%	7.5%	7.3%	6.9%	6.7%
Number of turnarounds with change in specialty	431	139	197	213	257	244
Average turnaround time when there is a change in specialty (minutes)	44	44	48	54	51	45



Red line: Health's reporting excludes turnaround time data beyond this point of 45 minutes.

Accuracy of Session Finish Times



Underruns

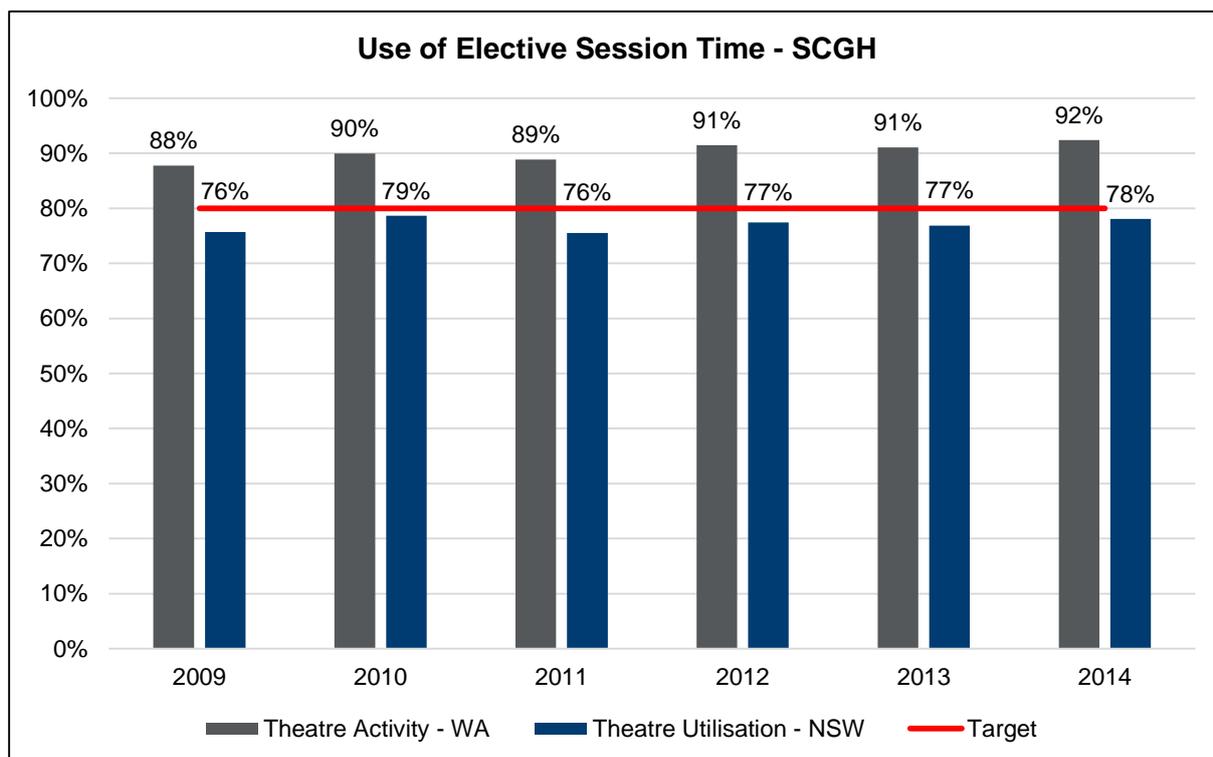
	2009	2010	2011	2012	2013	2014
Number sessions finished >1hr early	788	645	920	814	857	774
Per cent sessions finished >1hr early	25%	26%	28%	22%	23%	21%
Hours lost because finished >1hr early	1618	1311	1872	1568	1693	1536
Hours lost per theatre because sessions finished >1hr early	124	101	144	121	130	118
Proportion of sessions that finished >1hr early that had a DOS cancellation	19%	17%	20%	18%	17%	18%

Overruns

	2009	2010	2011	2012	2013	2014
Number sessions finished >1hr late	444	290	370	409	489	486
Per cent sessions finished >1hr late	14%	11%	11%	11%	13%	13%
Hours overtime because finished >1hr late	1000	549	699	752	989	983
Hours overtime per theatre because sessions finished >1hr late	77	42	54	58	76	76

Theatre Activity and Theatre Utilisation

	2009	2010	2011	2012	2013	2014
Theatre Activity – WA Health	88%	90%	89%	91%	91%	92%
Theatre Utilisation – NSW Health	76%	79%	76%	77%	77%	78%



Swan District Hospital

Swan District Hospital (SDH) has four operating theatres and currently performs five per cent of the State's elective surgery. Elective surgery sessions run from 8:30am to 4:30pm Monday to Friday, with AM and PM sessions being 3.5 hours long and separated by a one hour break. This hospital will close in November 2015.

Day of Surgery Cancellations

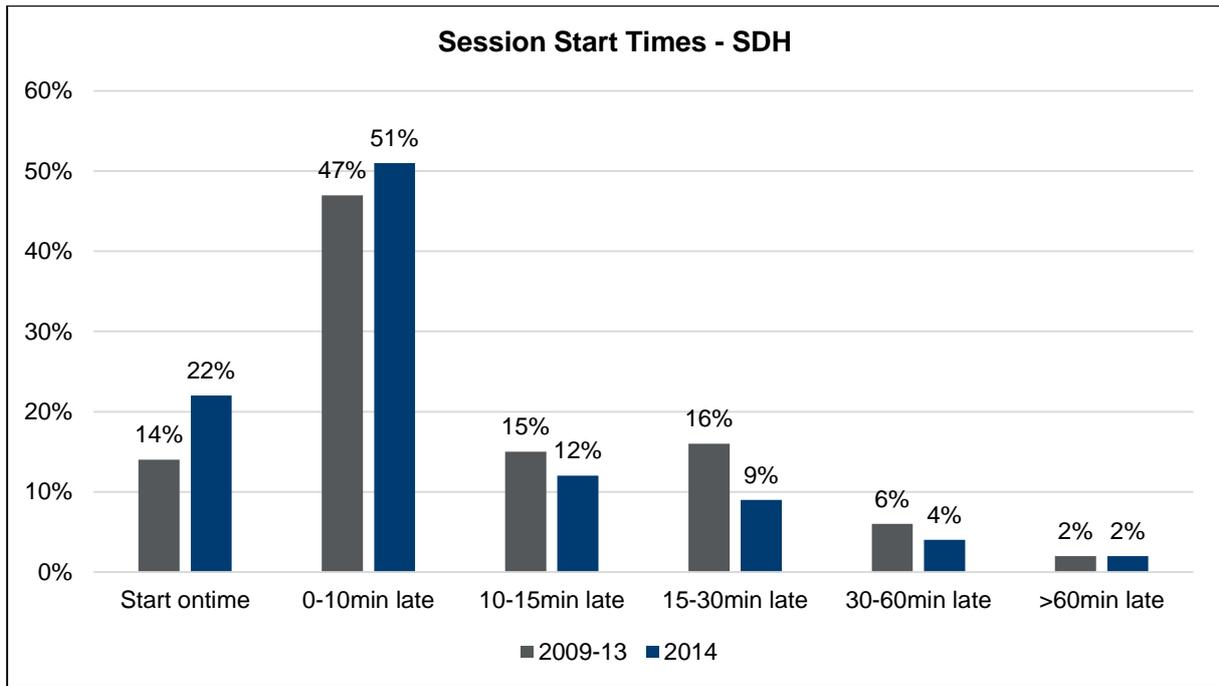
	2009	2010	2011	2012	2013	2014
Total Elective Cases Booked	4 224	4 521	4 481	4 421	4 269	4 551
Number Elective Cases Cancelled on DOS	123	183	158	117	173	177
Per cent DOS Cancellations	3%	4%	4%	3%	4%	4%

Proportion of Day of Surgery Cancellations by Reason

Reasons for DOS Cancellations	2009	2010	2011	2012	2013	2014
Bed Availability	1%	2%	0%	2%	0%	7%
Booking error/change	1%	3%	1%	4%	4%	2%
Displaced by more urgent case	18%	20%	25%	8%	1%	1%
Equipment	1%	20%	1%	3%	1%	1%
Medical/clinical	24%	12%	21%	28%	24%	17%
Other/unknown	0%	0%	0%	0%	18%	0%
Patient did not attend	32%	20%	16%	32%	30%	49%
Patient not prepared	0%	4%	4%	3%	4%	4%
Patient request	6%	6%	21%	3%	1%	3%
Patient request – unwell	0%	0%	0%	0%	0%	0%
Procedure done elsewhere	1%	0%	1%	1%	1%	2%
Procedure not required	8%	10%	9%	11%	7%	8%
Session overbooked/overran	2%	1%	1%	3%	3%	2%
Staff availability	6%	2%	0%	2%	6%	4%

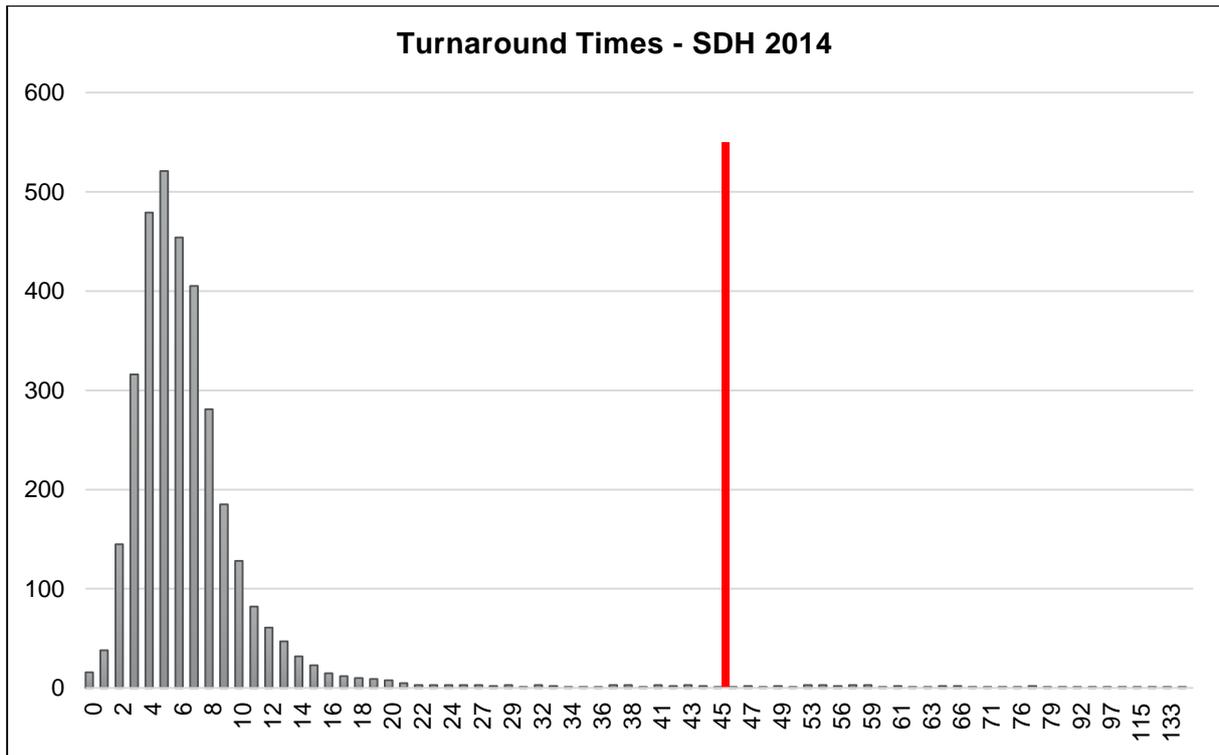
First Case Start on Time

	2009	2010	2011	2012	2013	2014
Number sessions starting >10min late	497	509	437	308	297	283
Per cent sessions starting >10min late	50%	47%	40%	29%	30%	27%
Number sessions starting >30min late	118	122	89	41	49	60
Per cent sessions starting >30min late	12%	11%	8%	4%	5%	6%
Number sessions starting >60min late	23	33	19	9	8	17
Per cent sessions starting >60min late	2%	3%	2%	1%	1%	2%
Hours lost from starting >60min late	33	52	34	17	12	27



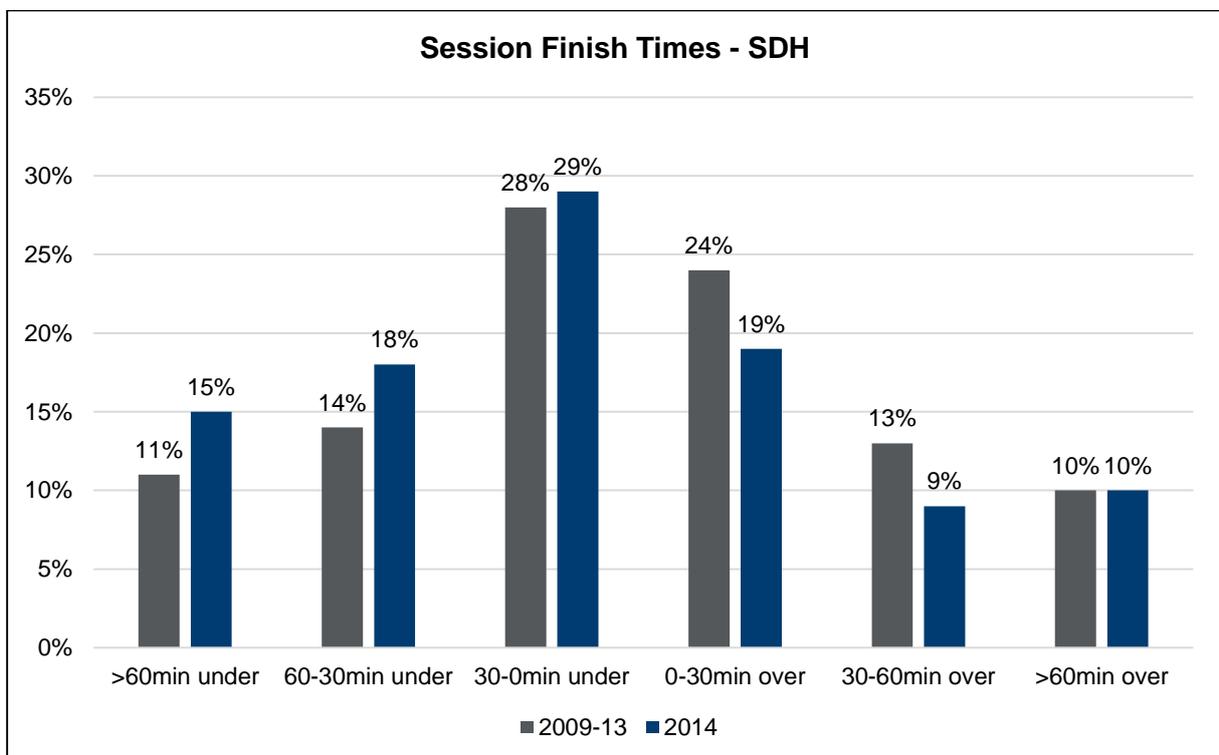
Turnaround Times

	2009	2010	2011	2012	2013	2014
Number of turnarounds	3 185	3 326	3 215	3 335	3 159	3 365
Average turnaround time (minutes)	8	8	8	8	7	8
Number of turnarounds >45min	41	34	47	47	37	46
Per cent turnarounds >45min	1.3%	1.0%	1.5%	1.4%	1.2%	1.4%
Number of turnarounds with change in specialty	29	41	45	25	9	20
Average turnaround time when there is a change in specialty (minutes)	29	23	30	23	33	32



Red line: Health's reporting excludes turnaround time data beyond this point of 45 minutes.

Accuracy of Session Finish Times



Underruns

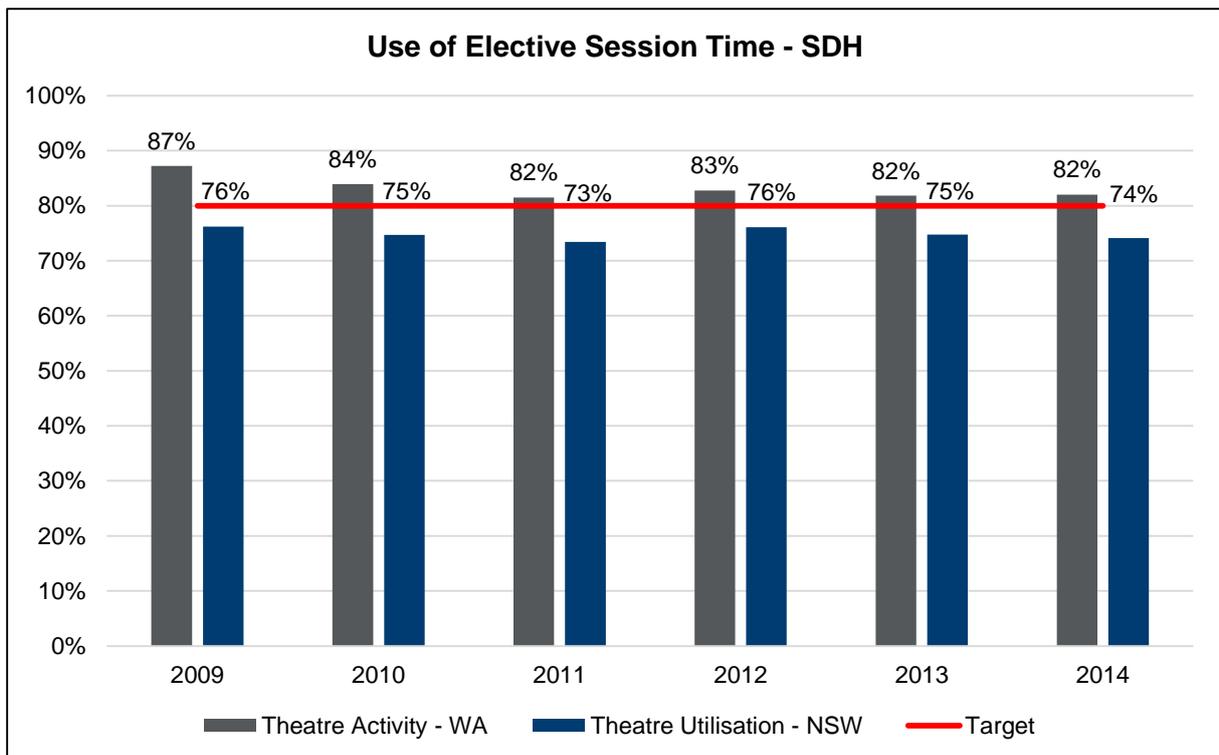
	2009	2010	2011	2012	2013	2014
Number sessions finished >1hr early	83	114	131	116	138	159
Per cent sessions finished >1hr early	8%	10%	12%	11%	14%	15%
Hours lost because finished >1hr early	140	184	234	187	219	249
Hours lost per theatre because sessions finished >1hr early	35	46	58	47	55	62
Proportion of sessions that finished >1hr early that had a DOS cancellation	25%	21%	25%	20%	33%	31%

Overruns

	2009	2010	2011	2012	2013	2014
Number sessions finished >1hr late	144	119	92	82	77	105
Per cent sessions finished >1hr late	14%	11%	8%	8%	8%	10%
Hours overtime because finished >1hr late	236	198	176	143	148	185
Hours overtime per theatre because sessions finished >1hr late	59	49	44	36	37	46

Theatre Activity and Theatre Utilisation

	2009	2010	2011	2012	2013	2014
Theatre Activity – WA Health	87%	84%	82%	83%	82%	82%
Theatre Utilisation – NSW Health	76%	75%	73%	76%	75%	74%



Appendix 4: Potential Time

Usage of Potential Operating Theatre Time

Potential operating theatre time takes the approach of planning for theatres to be used as all-day sessions for every work day during the year. This time may be used for both elective and emergency surgery.

Planning for theatres to be used as all-day sessions means that there is no set break between the morning and afternoon sessions. Our subject expert advised that the most efficient operating theatres do not break over the lunch period. The operating theatres are staffed in a way that allows for nurses and theatre staff, such as orderlies, to be on a roster for lunch, allowing the operating theatres to be used for as much time as possible.

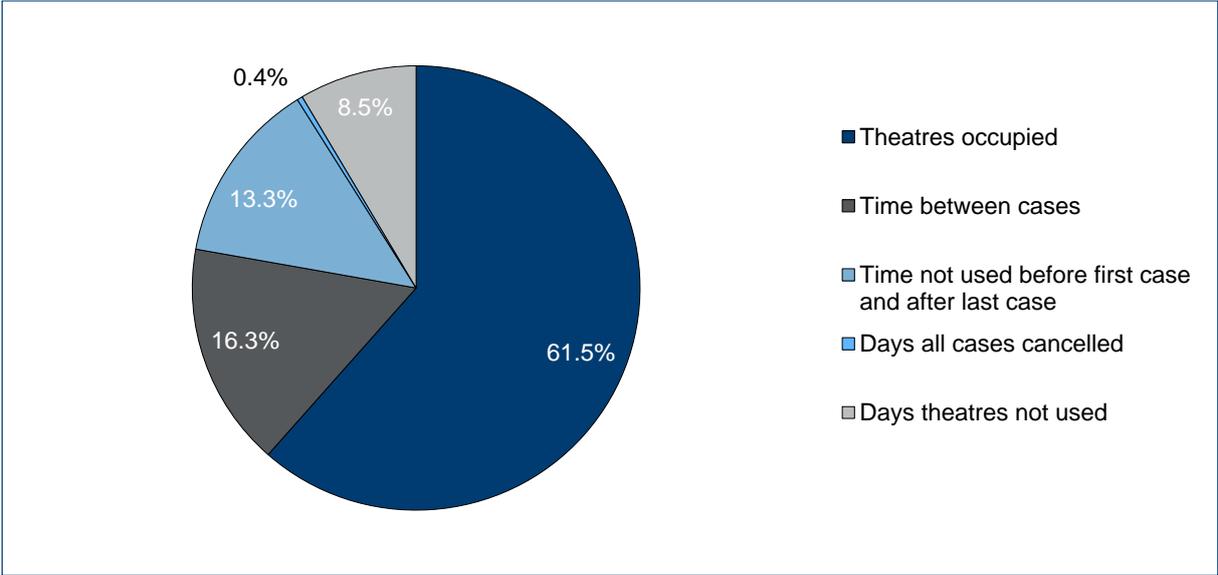
We have calculated the potential operating theatre time available for use at each of the hospitals based on:

- the number of hours between the planned start and finish for operating theatres on normal work days at each hospital, to give the potential number of hours available per day
- the number of operating theatres at each hospital
- 251 work days in 2014 (being Monday to Friday with the exclusion of public holidays).

The table below identifies the potential operating theatre time at each hospital in 2014.

	SCGH	OPH	SDH	BH	AH	TOTAL
Planned hours	8:30am-5:30pm	8:00am-4:30pm	8:30am-4:30pm	8:00am-5:00pm	8:15am-5:15pm	
Potential hours per day	9	8.5	8	9	9	
Number of operating theatres	13	3	4	3	3	26
Potential operating theatre time (hours)	29 367	6 401	8 032	6 777	6 777	57 354

Using TMS data, we then calculated how this potential operating theatre time was used. The following chart shows that the theatres were occupied by patients (both elective and emergency cases) for 61.5 per cent of the potential operating theatre time. This indicates there is additional capacity that could be used to treat patients.



*Note: A proportion of the **days theatres not used** was due to a refurbishment at OPH, which resulted in one theatre being unavailable for 126 work days.*

Appendix 5: Comparison of Theatre Activity and Theatre Utilisation

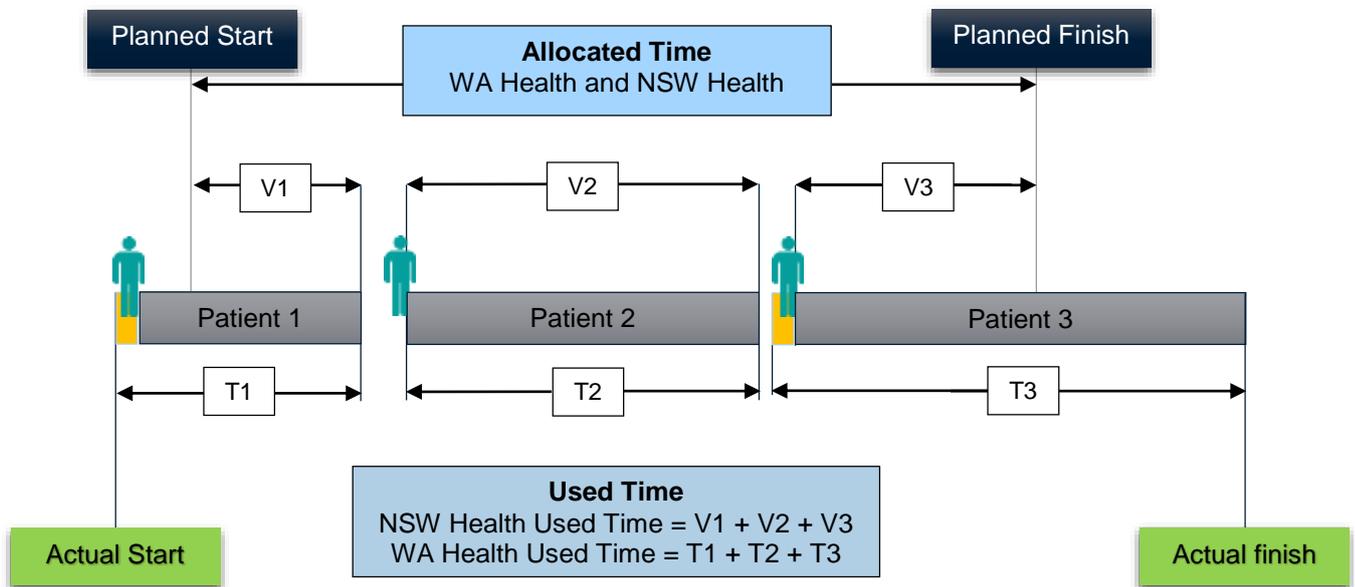
Theatre Activity (WA Health): proportion of used theatre hours (used time) to total allocated theatre hours (allocated time). Used time is the sum of the time patients were in the theatre in the allocated session, taken from the earliest of the patient entering the theatre or the time anaesthesia is commenced. This includes time before the scheduled session's start and time after the scheduled session's end. Allocated time is from the scheduled session's start time to the scheduled session's finish time.

Theatre Utilisation (NSW Health): proportion of time allocated to elective theatre sessions where the theatre was occupied. Used time is the sum of the time patients were in the theatre within the allocated session, excluding surgery performed outside of elective surgery sessions and periods of anaesthesia that occurred outside the operating room. Used time excludes time the theatre is occupied before the planned start and after the planned finish. Allocated time is from the planned session start to the planned session end.

The key differences are:

- WA includes anaesthetic time outside of the theatre in the used time and NSW does not.
- The numerator (used time) is very different. WA uses the sum of the time each patient is in the theatre. NSW uses the time each patient is in the theatre, but only includes time in the theatre that is within the planned session time.

The denominator (allocated time) is the same for both WA and NSW, with allocated time being the planned session length for the session. The time shown in orange represents anaesthetic care time outside of the theatre.



This image was adapted from: Audit Commission UK. 2003. Operating Theatres: Review of national findings. Schematic diagram of a scheduled and used theatre session, p.8

<<http://archive.audit-commission.gov.uk/auditcommission/sitecollectiondocuments/AuditCommissionReports/NationalStudies/TheatresAHP.pdf>>

Case example – Difference between Health and NSW approaches to calculate operating theatre use

The different results achieved by using Health's calculation are demonstrated in this example of an afternoon session at SDH. Health's calculation results in **125 per cent** Theatre Activity whereas the NSW approach produces Theatre Utilisation of **64 per cent**.

A PM session was scheduled to run from 13:00 to 16:30, a total of 210 minutes. The first patient arrived in theatre at 14:04 and the last patient left at 19:35. Health counts this session as being occupied from the arrival of the first patient at 14:04 until 19:35, which minus turnaround time is 262 minutes.

This produces 125 per cent Theatre Activity.

$$\begin{aligned} \text{Health's Theatre Activity} &= \frac{\text{total time theatre occupied (minutes)}}{\text{planned session length (minutes)}} \times 100 \\ &= \frac{262}{210} \times 100 \\ &= 125\% \end{aligned}$$

NSW's approach counts only the time the theatre was occupied within the scheduled session. The first patient arrived at 14:04 and the session was supposed to end at 16:30. NSW counts this session as being occupied from the arrival of the first patient at 14:04 to the planned end of the session at 16:30, which minus turnaround time is 134 minutes.

This produces 64 per cent Theatre Utilisation.

$$\begin{aligned} \text{NSW's Theatre Utilisation} &= \frac{\text{time theatre occupied within}}{\text{planned session length (minutes)}} \times 100 \\ &= \frac{134}{210} \times 100 \\ &= 64\% \end{aligned}$$

Auditor General's Reports

Report Number	Reports	Date Tabled
24	Audit Results Report – Annual 2014-15 Financial Audits	11 November 2015
23	Information Systems Audit Report	5 November 2015
22	Safe and Viable Cycling in the Perth Metropolitan Area	14 October 2015
21	Opinions on Ministerial Notifications	8 October 2015
20	Agency Gift Registers	8 October 2015
19	Opinions on Ministerial Notifications	27 August 2015
18	Controls Over Employee Terminations	27 August 2015
17	Support and Preparedness of Fire and Emergency Services Volunteers	20 August 2015
16	Follow-On: Managing Student Attendance in Western Australian Public Schools	19 August 2015
15	Pilbara Underground Power Project	12 August 2015
14	Management of Pesticides in Western Australia	30 June 2015
13	Managing the Accuracy of Leave Records	30 June 2015
12	Opinions on Ministerial Notifications	25 June 2015
11	Regulation of Training Organisations	24 June 2015
10	Management of Adults on Bail	10 June 2015
9	Opinions on Ministerial Notifications	4 June 2015
8	Delivering Essential Services to Remote Aboriginal Communities	6 May 2015
7	Audit Results Report – Annual 2014 Financial Audits	6 May 2015
6	Managing and Monitoring Motor Vehicle Usage	29 April 2015
5	Official Public Sector Air Travel	29 April 2015
4	SIHI: District Medical Workforce Investment Program	23 April 2015
3	Asbestos Management in Public Sector Agencies	22 April 2015
2	Main Roads Projects to Address Traffic Congestion	25 March 2015
1	Regulation of Real Estate and Settlement Agents	18 February 2015

Office of the Auditor General Western Australia

7th Floor Albert Facey House
469 Wellington Street, Perth

Mail to:
Perth BC, PO Box 8489
PERTH WA 6849

T: 08 6557 7500

F: 08 6557 7600

E: info@audit.wa.gov.au

W: www.audit.wa.gov.au



Follow us on Twitter @OAG_WA



Download QR Code Scanner app and
scan code to access more information
about our Office