CLINICAL PRACTICE GUIDE

Operating theatre efficiency

MAY 2024

NSW GOVERNMENT

AGENCY FOR CLINICAL INNOVATION

Surgical Care Network

The information in this document should not replace a clinician's professional judgement.

Agency for Clinical Innovation

1 Reserve Road St Leonards NSW 2065
Locked Bag 2030, St Leonards NSW 1590

Phone: +61 2 9464 4666 | Email: aci-info@health.nsw.gov.au | Web: aci.health.nsw.gov.au

Further copies of this publication can be obtained from the Agency for Clinical Innovation website at aci.health.nsw.gov.au

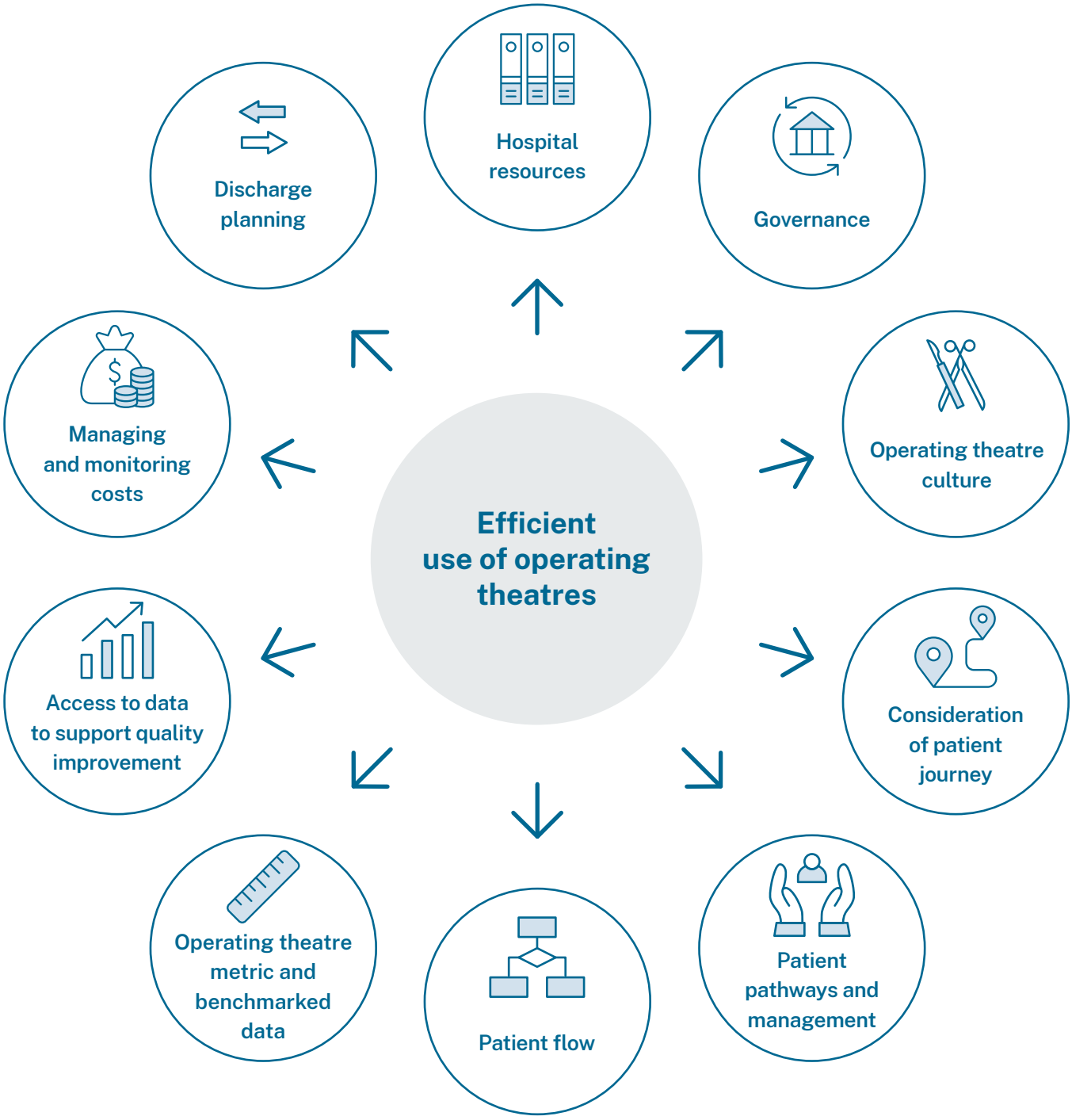
Title	Operating theatre efficiency: Clinical practice guide		
Replaces	Operating theatre efficiency: Clinical practice guide. March 2024		
Revised	May 2024. Correction of a word, page 23.		
Next review	2029		
Produced by	The ACI Surgical Care Network		
Preferred citation	NSW Agency for Clinical Innovation. Operating theatre efficiency: Clinical practice guide. Sydney: ACI; 2024		
Cover image credit	Shutterstock.com		
TRIM ACI/D23/3513	SHPN (ACI) 240094	ISBN 978-1-76023-787-5	ACI_9364 [05/24]

Contents

At a glance

Operating theatre efficiency is affected by several factors. Each has a different impact in different hospitals.[1,2]

The process to transition patients from readiness for surgery to completion of the procedure needs to be standardised as a pathway to improve efficiency. The key is efficient patient flow, discharge planning and considering the whole patient journey.



Purpose

This document is a resource for all staff who deliver surgical services. It aims to support managers and clinicians to increase the efficiency of operating theatres in NSW.

Before the onset of coronavirus (COVID-19), operating theatres (OTs) were under pressure but performing well. After non-urgent or elective surgery was suspended in NSW public hospitals for periods during 2020 and 2022, surgical services faced a backlog of cases across all specialties. Elective surgery was renamed planned surgery. Following a specialist clinical assessment, it can be booked in advance and placed on a planned surgery list.

This document considers all staff who work in surgical services, including those who support the OTs by providing preadmission services and manage waiting lists, bed and patient flow. It also supports managers and clinicians to successfully deliver operational requirements for an efficient OT service. It aims to provide the strategic direction for hospital and local health district (LHD) executives to support service delivery initiatives and opportunities.

Since the original document, the Operating Theatre Efficiency Guidelines (the Guidelines), was published in 2014, the delivery of surgical services has changed.

These changes happened due to the:

- evolution of evidence in literature
- implementation of new clinical practices
- advances in technologies
- updates to policy and guidelines.

The Operating theatre efficiency: Clinical practice guide was developed to incorporate these advances in theatre management and organisational efficiency. See Methodology for details.

Background

The Guidelines were first developed in 2014 by the Agency for Clinical Innovation's (ACI's) Surgical Services Taskforce, now named the Surgical Care Network (SCN). The Guidelines were created in response to a report from the Audit Office of NSW. Three working groups comprised of Surgical Services Taskforce members, clinicians and NSW Health staff were formed to focus on three identified areas – operating theatre metrics, whole of surgery and operating theatre cost. The collective outputs informed the content for the Guidelines.

The Operating theatre efficiency: Clinical practice guide is an updated version of the Guidelines.

What is operating theatre efficiency?

Defining and measuring efficiency and productivity in the health sector is complicated by the varied characteristics of health services. Multiple factors influence OT efficiencies. This guideline addresses key internal and external factors.

Definition of productivity and efficiency in the surgical setting

Efficiency

Efficiency can be considered as the extent to which:

- the same output can be produced using fewer inputs (input-orientated)
- or increased using the same inputs (output-orientated).

Input considerations should reflect case complexity in accordance with a national weighted activity unit (NWAU)* and diagnosis-related group.

In the surgical setting, definitions of efficiency generally focus on time, where reductions in time related to a level of output translates into efficiency.

In the OT, the efficient production of surgical cases requires maximising the use of time and depends on minimising non-productive time and unused time and maximising output for a level of inputs. Efficiency is also reflected in capital of days and hours of operation, in addition to infrastructure and resources.

Capital expenditure on the operating theatres, and the infrastructure required to deliver an efficient surgical service, will influence a hospital's ability to achieve efficiencies.

* The National Weighted Activity Unit (NWAU) is the national unit for counting hospital service activity, based on the complexity of patients and legitimate variations in costs. The 'average' hospital service is equivalent to one NWAU. More intensive and expensive activities are funded by multiples of NWAUs, and simpler and less expensive activities are funded by fractions of an NWAU. (Source: CV App, Glossary)

Productivity

Productivity is the quantity of outputs produced per unit of input. It is calculated by dividing average output per period by the total costs incurred or resources (capital, equipment, labour) consumed in that period.[3]

In the surgical setting, an output would include completed surgery, such as a hip replacement, cataract operation or organ transplant. Productivity can be measured for a single operating room, a theatre suite, a surgical specialty unit or across hospitals. Labour productivity is frequently used in business and is defined as the rate of output per staff member (or a group of staff) per unit of time.

Quality and safety are integral parts of healthcare and should be recognised and taken into account in productivity measurement. Increasing outputs (completed operations) should not be at the expense of increased adverse events for patients or increased numbers of unexpected returns to theatre.

Other factors that affect efficiency

- Integration and coordination with wards and other units, especially post anaesthesia care unit and intensive care unit
- Staff number, availability, professional skills and motivation
- Patient flow and its coordination across the patient journey
- Timely patient preparation prior to admission and patient-focused processes, e.g. preadmission counselling and education or prehabilitation[3]
- Efficient patient admission and reception practices
- Access to data
- Continuous quality improvement processes
- Planning and prioritisation
- Management of equipment and consumables
- Theatre design, patient flow to surgery and infrastructure[4, 5]
- Mix of cases on the same list and in theatres
- Theatre scheduling – full day compared to half days[6]
- Planning of surgical resources to allow sufficient resources for emergency surgery, trauma and caesarean resources to meet historical demands

Each factor has a different impact in different hospitals.[2]

A range of strategies that can be used by hospitals to improve OT efficiency are available in Strategies to improve theatre efficiency.

Methodology

Three main types of data sources were used to inform the development of these guidelines:

- peer reviewed literature
- grey literature
- experiential evidence.

Peer reviewed literature

A PubMed search was conducted using terms related to operating theatre efficiency on 4 August 2022 using the search terms outlined below:

- operating room
- operating theatre
- efficiency
- productivity.

The search string "Operating Rooms"[MeSH Major Topic] AND (("efficiency*"[Title/Abstract] OR "productivity"[Title/Abstract]) AND ("operating theatre*"[Title/Abstract] OR "operating theater"[Title/Abstract] OR "operating room*"[Title/Abstract]) AND "humans"[MeSH Terms] AND "english"[Language] AND 2015/01/01:2022/12/31[Date - Publication]) resulted in 257 results.

Studies were limited to those published in English since the publication of the original Operating Theatre Efficiency Guidelines in 2014.

Criteria applied

- Population: operating theatre staff and management
- Intervention: strategies or interventions to improve efficiency or productivity
- Comparison: usual practice or other strategies
- Outcomes: efficiency, productivity, or other performance measures or indicators

Accepted study types

- Review studies with systematic search strategy and methods
- Randomised or non-randomised clinical trials
- Before and after studies, time series studies with or without a comparison group
- Retrospective chart review studies
- Evaluative studies with quantitative or qualitative assessment of outcomes with or without a comparison group
- Grey literature such as guidelines and consensus statements

Studies not meeting these criteria were excluded. A total of 257 articles were identified for further screening. There were 147 identified as irrelevant and a further 10 excluded on full text review. A total of 100 articles were reviewed in full to inform this document.

Grey literature

Internet searches using key terms identified through thematic analysis of peer reviewed literature were undertaken using search engine Google between 10 August 2022 and 20 November 2022. Key search terms [‘operating theatre governance’; ‘surgical leadership’; ‘efficiency surgery schedule’; and ‘rationalise surgery equipment’] were applied, alongside focused searches of key websites including Queensland Health, Victoria Health and the National Health Service (United Kingdom).

To ensure alignment of this guide with current NSW publications, these key documents were also reviewed:

- NSW Emergency Surgery Guidelines and Principles for Improvement (GL2021_007)[7]
- Value Based Surgery (2022)[8]
- The Enhanced Recovery After Surgery key principles for colorectal surgery (2022)[3]
- The Perioperative Toolkit (GL2016)[9]
- The High Volume Short Stay Toolkit (GL2005_076])[10]
- The Extended Day Only Admission Model (GL2020_023)[11]
- Elective Surgery Access (PD2022_001)[12]

Experiential evidence

The development of this resource has been supported by a working group including 13 expert surgical, nursing and management representatives from metropolitan and regional NSW LHDs. The working group met four times as a group, for one hour. Each member met individually with the project team to share their insights, recommendations and experience by videoconference. Consensus was reached on all recommendations included in this guideline and member experiences have informed relevant case studies.

Following compilation of relevant data, thematic analysis was undertaken to classify resources. Eleven discrete concepts relating to OT efficiency were identified:

- Emergency surgery
- Consultant-led models
- Turnover time
- Culture and teamwork
- Equipment management
- Equipment tray rationalisation
- First case on time start
- Patient preparation
- Opportunities for non-operative spaces
- Registrar training
- Registrar versus consultant efficiencies

The Clinical Procedure Safety policy directive provides important information on theatre efficiency.[13]

These concepts have been further grouped into the four: cultural influences on OT efficiency, OT metrics, OT costing and efficiency opportunities in surgery. This format provided a working framework to update this clinical practice guide.

The final document has been endorsed by the ACI's SCN.

Principles for operating theatre efficiency

To improve efficiency in the OT, it is important to standardise the process and steps in the pathways to transition patients from readiness for surgery to completion of the procedure. Efficient patient flow, discharge planning and considering the whole patient journey ensures efficient use of theatres.

The overarching principles should be considered holistically and by all levels of management and staff working in theatres, including hospital executives. These principles should be considered in a hospital's overarching strategy and planning of their theatres. The key principles also apply to theatre planning and day-to-day running of theatres. All staff involved in OT efficiency should use the principles throughout their roles concurrently with the overarching principles.

Overarching principles

The overarching principles should be considered holistically and by all levels of management and staff working in theatres, including hospital executives. Reflect on these principles when planning a hospital's overarching strategy and theatres.

Strong clinical governance

Strong leadership and clear governance is the foundation for effective teamwork[14] Establishing the right committees with the right people will support leadership and guide strategic and operational decisions.[15]

Standardising service delivery

It is important to document, review and standardise the processes, equipment and steps involved in transitioning patients from readiness for surgery to completion of the procedure.[16] This will help streamline the process and make it as efficient as possible.

Measure, monitor, benchmark and act

Measure it to improve it. Identify appropriate metrics, set realistic targets and plan to improve and exceed targets.[17]

Key principles

The key principles should be considered for theatre planning and day-to-day running of theatres. All staff involved in OT efficiency should use these principles, along with the overarching principles.

Culture

A strong, positive culture, working relationships and communication are instrumental to an efficient operating theatre.[18, 19]

Leadership

Strong leadership provides direction, models a high standard of clinical care and considers the needs of individual team members. This enables an efficient operating theatre.[20] Clinical and hospital leadership work collaboratively to support staff to use efficient practices. There should also be leadership within the theatres with more experienced team members focusing on shared ownership for efficiency.[21]

Metrics

Use metrics to support quality improvement and understand the theatres' performance. The collection of metrics should be implemented with human resources practices, e.g. communication, clinical leadership and accountability for staff.

Allocation of theatre time

Theatre time should be aligned to service demand with the aim of creating greater equity for patients in relation to waiting times for surgery.[22] Theatre scheduling requires day-to-day scheduling while the broader theatre template looks at weekly, fortnightly or monthly scheduling between disciplines. The allocation of theatre time to surgeons or specialties should be reviewed regularly.[21, 22]

Costing of theatres

Managing costing of theatres supports theatre efficiency.[6] Reporting tools such as the Clinical Variation Application (CV App), used in conjunction with other tools and reporting mechanisms, will assist managers to understand the cost drivers. The total cost of an OT activity will incorporate both direct, indirect, fixed and variable costs.

Waitlist management

This is a key component of OT efficiency.[5] Undertake weekly clerical audits of planned surgery waitlists to ensure accuracy of clinical priority category. Also check for duplication of bookings and identify patients approaching or exceeding clinically recommended treatment timeframes.

Patient pathways and programs

There is a range of patient pathways and programs that can support the patient journey and efficient patient flow to, and within, theatre.[23] These programs support efficient functioning of an OT suite by:[7]

- facilitating better patient preparation
- reducing length of stay by accelerating recovery
- reducing postoperative complications
- streamlining waitlists through regular review
- using waiting time effectively.

Preparing patients for surgery

Preparing patients for surgery will support smoother OT flow.[18, 19, 24] Properly preparing patients in a timely, effective and thorough manner, while adhering to full completion of preoperative checklists, is key to ensuring patient safety and comfort. It leads to increased efficiency of the department and ensures success of the procedure. It also reduces theatre delays and cancellations.

Use other options to manage demand

Endoscopy suites, procedure rooms and anaesthetic bays can be used to manage demand for operating theatres.[25, 26] Anaesthetic bays can be used to save time by inducing anaesthesia while surgery is being completed on the previous patient. The endoscopy suite provides an aseptic environment in which to carry out endoscopic procedures under sedation or general anaesthetic. Locating procedure rooms with operating theatres provides a controlled environment and facilities for procedures that do not require the full facilities of the operating suite.

Sustainable practices

Undertaking sustainable practices in theatres can support efficiencies in time and money and reduce a hospital's carbon footprint.[23, 27] Using custom packs, reusable instruments and equipment and correctly disposing of waste products supports sustainability.

Hospital resources

To improve efficiency in the OT, it is important to standardise the process and steps involved in transitioning patients from readiness for surgery to completion of the procedure as a general pathway. This will help streamline the process and make it as efficient as possible.

Optimal planning is facilitated by defining the operation as a standard pathway where all variables are taken into account, e.g. timing and resource involvement.[16] Focusing on standardising processes and improving communication can result in improved outcomes and lower costs for the health system and patient.[22]

Efficient use of OT time depends on:

- scheduling of cases
- allocation and availability of staff with appropriate skillsets (including clinical and non-clinical)
- equipment
- time required for preparation
- induction of anaesthesia performance of surgery
- recovery from anaesthesia
- preparation of the OT for the next patient[16, 21, 22]
- access to ancillary services including radiology and pathology services
- postoperative bed allocation (including ICU access).

Scheduling errors can lead to delays in first starts, unexpectedly long cases and prolonged turnovers.[21] There are several performance parameters for OT use that should be considered. Accurate case-duration estimates should be monitored by measuring the percentage of cases where patient-in-room duration is within 15 minutes of the estimated in-room duration. Inadequate prescreening may be responsible for a proportion of cancellations or delayed starts.

Patient-in-to-incision time that includes the time for induction of anaesthesia, positioning, and surgical preparation is another key performance indicator that should be monitored.[28] Premature and delayed patients can cause issues that affect efficiency for theatres. Needless staff movement and the need for large onsite storage areas and inventory costs are additional considerations of wastages that can affect efficiency.

Mid and end-of-day gaps in cases and closed theatres have been found to contribute the most hours to OT underuse, whereas turnover time and 'patient in the room' contributed the least. The contributors to OT underuse are complex. Many OT staff and OT administrators may not have a shared understanding about which factors contribute most to inefficiency. Developing a shared awareness of how various factors contribute to OT underuse can pave the way for goal-directed changes on a systems-based level to improve efficiency in the OT by decreasing underuse.[29]

The tactics used to address each of these types of waste include multiskilling staff, levelling production and implementing just-in-time principles.[30]

Theatre list scheduling

There are two primary components to list scheduling. The construction of individual lists on a day-to-day basis and the broader theatre template that determines the theatre cycle. Weekly, fortnightly or monthly are the most common cycles in NSW. Important elements for both are identified below.

Individual list scheduling

The way lists are booked at each facility should be determined by that facility. All public hospitals must follow the Elective Surgery Access Policy Directive.[12] It is a hospital's responsibility to identify dates for surgery for patients.[12]

The Ministry of Health has identified examples of how hospitals can remain aligned to the Elective Surgery Access Policy Directive and the principle of 'treating in turn' while acknowledging some limitations exist in relation to procedure duration, reducing turnaround time, bed availability and the use of standby lists.[12] In hospital which have implemented high-volume, short-stay service, lists would need to optimise access to this service.

Specific rules may be identified to assist in booking cases. Some examples include:

- a patient's specific medical history, e.g. malignant hyperthermia or diabetes may have list order priority
- children may have list order priority
- bed priorities that dictate the order of the list
- unless clinically indicated, day cases should be promoted on the list to facilitate same-date discharge
- different facilities may prefer how they manage patients with known infections. These patients may be placed last on the list to minimise infection risk to other patients[25]
- patients requiring extended anaesthetic set-up time should be considered when the list order is finalised. The presence or absence of anaesthetic bays may influence where in the list order they are booked[25]
- where available, anaesthetic bays and staff should be used to prepare the next patient while the previous case is being operated on.

Patients requiring specific equipment or prosthetics may also have list priority. This should be confirmed with the appropriate theatre personnel prior to finalising the list. Patients having the same or similar procedures and requiring the same theatre equipment may need to be alternately booked between different cases so that the equipment can be cleaned and sterilised. There are different process considerations between on site or offsite sterilisation that can affect efficiency. Hospitals should manage accordingly, based on their available resources and staffing. Some procedures have a clinical need to be done within specific timeframes, such as receiving chemotherapy or second stage cell growth procedures or pathology requirements.

Hospital theatre template

Public hospitals in NSW generally have a list schedule that follows a pre-determined pattern or cycle. This may be weekly or fortnightly. But it is common for a cycle to span four weeks. Surgeons working in these cycles usually have dedicated theatre time on a weekly, fortnightly or monthly basis, aligned to the hospital's cycle. There can be combinations within this. Often the allocation of theatre time to a specific surgeon is based on history, or what has been allocated previously. Other variations of list or cycles include allocation of lists to specialties and if different surgeons from the nominated specialty can take up the theatre time.

The allocation of theatre time to surgeons or specialties should be reviewed regularly. The allocation should be aligned to the demand for that service, with the aim of creating greater equity of access to patients in relation to their waiting times. The theatre allocation template should also consider demands on the resources in the rest of the hospital. This includes ICU bed demands, inpatient bed demands, paediatric bed demands, and specialised staff demands, e.g. radiographers.

Case study 1: Northern Sydney Local Health District waitlist clearing list

After the initial restrictions to non-urgent elective surgery were lifted across NSW (2020), Northern Sydney Local Health District (NSLHD) wanted to implement a more district-wide collaborative approach in how elective surgery was managed. But it also wanted to focus on reducing the overdue elective surgery cases on its waiting list. Therefore, NSLHD developed waitlist clearing lists for patients who were overdue or about to become due.

NSLHD waitlist sessions were incorporated across the LHD, focusing on overdue patients. These lists were managed and coordinated by the LHD surgical access manager, in conjunction with treating surgeons that matched the criteria. Initially these sessions were only available to surgeons and specialties with overdue patients. But they were pivotal in allowing NSLHD to again achieve 000 for surgical key performance indicator (KPI) results. After three years, these lists remain embedded into the theatre activity template and are still primarily used for overdue patients.

New lists were not created. Lists were reallocated based on specialties that had capacity for their cases and lists. These decisions were based on which specialties could give up time for elective requirements while still meeting their KPIs. Specialties that require additional time for their waitlist used the list, then the list returned to the district for allocation.

Case study 2: Northern Sydney Local Health District inpatient clearing list

Inpatient clearing lists were introduced at the Northern Sydney Local Health District to assist with alleviating general emergency list pressures and cancellations on elective lists by ensuring bed availability on the wards. Complex cases were often included on the inpatient clearing list as they may be all day surgeries or use significant resources (OT time and surgical specialist teams).

These lists occur weekly and are targeted at inpatients who are not necessarily ‘emergency cases’ but who can’t be discharged without surgery. Before these lists were introduced, this cohort of patients would be added to the general emergency list. Then they would usually be delayed due to more urgent cases requiring surgery or surgeons adding them their next elective list instead. This resulted in delayed elective cases and often patients waited in hospital longer than necessary.

The inpatient clearing lists cannot be ‘pre-booked’ by clinicians for emergency patients or inpatients any earlier than 72 hours before the list session. The list is only allocated 72 hours in advance. Teams can request access during this time for inpatient clearing surgeries. Inpatient clearing lists prevent elective lists having to be used for inpatient surgeries. These lists free up elective lists. If the inpatient clearing list is not requested, it is offered as an overdue elective cases list.

For example, an inpatient needs a Whipple procedure that can take 8-10 hours. But the general surgery elective list is full for the next few weeks. Rather than cancelling a list, the surgery would be put on the inpatient clearing list. This prevents the patient waiting for weeks or the full list being cancelled.

Equity of access should apply across specialties to achieve waitlist equalisation, especially for non-urgent cases. Service delivery isn't equitable if some category three patients receive surgery within six months of being listed in one specialty when wait times for a different specialty in the same category exceed 12 months. This scenario suggests the balance of the schedule does not equal the demand for all services at that hospital.

There may be some opportunities to balance the lists and wait times within each specialty. If one or two surgeons have significantly shorter wait times than their colleagues, moving appropriate patients between surgeons may be an option. If this strategy is to be used, it should be done in consultation with the clinicians.

If patient reallocation to different surgeons or 'list pooling' is not possible, the schedule should be examined to identify other opportunities to balance the demand to the OT resource. This may necessitate reducing the time that a surgeon has traditionally been allocated. This may be a temporary change to achieve a balance in wait times across all specialties. Or it could become the new template. However, regular review of the theatre template is required to maintain a balance in what is now a fluid health environment.

Also consider surgeon and anaesthetic commitments outside the hospital because it is unrealistic to expect a theatre allocation to change with short notice. This should be a planned and collaborative process. The assessment of emergency surgery demand (as mentioned in Emergency surgery targets) will further inform the volume and distribution of theatre time required to meet demand for unplanned surgical activity.[24] At a minimum, this should be reviewed on an annual basis to ensure sufficient resourcing is available to meet service demands.

Procurement

Procurement of consumables and equipment are key components of managing theatres. It can be optimised for time and costs by adhering to the NSW Health Procurement Policy Directive.[31] The policy directive provides advice on procurement of items on contract and items which are not on contract.[31] An important factor of efficient procurement management is to plan early, based on the hospital's forecasted activity and common surgeries.[31]

Theatre staff should refer to the NSW Health procurement contracts to source equipment and consumables. LHDs are mandated to use Standing Offer Agreements when selecting suppliers to procure equipment, consumables and prostheses.

HealthShare NSW is responsible for establishing the statewide agreements and managing the contractual arrangements with suppliers. There is a range of consumables available for clinicians' use which can be provided by multiple suppliers. This can prevent hospitals from paying more than the amount specified in contracts already managed by NSW Health Procurement. Using these options will ease the administrative burden of procurement for hospitals. It also ensures the hospital receives the best rate for its consumables and equipment.

The specific costs of equipment and consumables and devices used in OT, endoscopy and sterilising departments are made available through the Master Catalogue Information Systems (MCIS) and Portt Discover platforms.

To access MCIS to obtain price information for products, an application can be processed by emailing hsnsw-catalogueservices@health.nsw.gov.au.

To access Portt Discover, an FM PROcure Access Request Form is available via SARA and submitted to HSNSW-SC-Tenders@health.nsw.gov.au.

Staff can also use the One Link Warehouse for theatre equipment and specify smaller quantities for specific items which can reduce amounts that have to be ordered.

For procurement of prostheses, NSW Health Procurement recommends that theatre staff use state agreements for suppliers. Theatre staff can also engage with HealthShare NSW to understand how to optimise protheses for their hospital. State contracts and pricing are in place for prostheses used in cardiovascular, orthopaedic hips and knees, general surgical, orthopaedic trauma and craniomaxillofacial surgeries.

The Prostheses State Contracts use the market share model, where in return for market share commitment, LHDs have access to more favourable pricing or discounts. Alternative offers are also available underneath these arrangements where discounted equipment, e.g. robotics approved on the State agreement, can be made available to the LHD.

Standardising equipment, packs and trays

Having the right equipment at the right time impacts OT processes, staff workflow and the ability to deliver a safe and reliable clinical service. As well as improving patient care and staff experience, good management of equipment and consumables can deliver savings through waste reduction.

Ordering equipment and consumables just in time for a procedure or intervention reduces waste by preventing overordering and waste. Efficiency is improved as unnecessary inventory is removed and less storage space is required. Stock is less prone to damage or expiry. It is also easier to locate when needed. Ordering theatre equipment and consumables as required reduces inventory costs. This is because fewer financial resources are held in stored stock and less labour is required for manage equipment. However, this may not be appropriate for certain hospitals, for example regional or rural sites. Or for certain equipment due to longer delivery times. Not having equipment available can reduce efficiency, cause cancellations and decrease patient safety.

Many specialised and complex OT equipment and consumables are only available from international suppliers. Timeframes for delivering equipment and consumables must be considered in advance when planning hospital lists. Delivery lead times may be many weeks or months.

Custom packs for procedures save time in retrieval, opening and set up of equipment and consumables, reduce packaging and assist with infection control practices. However, care should be taken to ensure the items included in custom packs are appropriate to the procedure. Theatre management committees should encourage regular review of contents. This needs to be in consultation with surgeons so that redesigned packs include only the necessary items. Standardisation is the key to reliable accessibility. This includes eliminating hospital specific agreements with vendors and using NSW Health Standing Offer Agreements for all procurement.

Sustainable operating theatre

Operating theatres contribute at least two thirds of hospital waste.[27] 70% of waste from the NSW public hospital system goes directly into landfill.[27] There are a range of opportunities to make theatres more sustainable. This also supports efficiencies in time and money. Some options to improve theatre sustainability include:

- custom packs
- reusable light handles instead of disposable light handles
- reusable instead of disposable laparoscopic instruments, noting that some items will be need to be single use due to cleaning difficulty

- reusable instead of disposable surgical linen, e.g. gowns, covers, drapes, where feasible
- washable, reusable head caps instead of single-use unrecyclable viscose caps
- diathermy leads – collect single use diathermy leads for recyclable copper and convert to the reusable diathermy lead (these can be used repeatedly for 12 months). Or convert to reusable patient return electrodes (pad and electrode stay in place for 24 months)
- a trolley for bins to wheel in and wheel out (protecting space in theatres and making sure correct bins are available for waste)
- preoperative patient screening for infective status to correctly allocate appropriate personal protective equipment (PPE) to avoid wastage.

Theatre staff can refer to the Intercollegiate Green Theatre Checklist.[23] It refers to options regarding anaesthetic care, preparation for surgery, intra-operative practice and postoperative measures.[23]

Clinical waste disposal costs three to nine times more than general waste. Waste segregation is valuable in reducing costs for theatres and supporting sustainability. Hospitals should review clinical and general waste practices because when staff are unsure, it is common for general waste to be put in clinical waste. Clinical waste includes blood, suctioned fluids and incontinence pads and disposable nappies that come from infectious patients. Sanitary pads and tampons with blood on them can be disposed of via sanitary bins rather than being put in clinical waste. Non-infectious faeces and urine, and all other normal body excretions can be disposed of in general waste.[34] PPE is general waste, unless contaminated by blood or infected body fluids.

Waitlist audit and monitoring

NSW Health Elective Surgery Access policy directive[12] (PD2022_001) requires a weekly clerical audit of planned surgery waitlists with monthly reporting and quarterly evaluation. This is to ensure accuracy of the clinical priority category, check for duplication of bookings and identify patients approaching or exceeding clinically recommended treatment timeframes.[12]

This audit also provides an opportunity to identify high-risk patients who may benefit from review by a multidisciplinary team; those referred for potentially low-value interventions; and identifying patients potentially suitable for optimisation pathways while on the waitlist.[12] Waitlist audits support patients being treated in turn and ensure the management of the planned surgery list is fair, clinically appropriate and transparent. Please refer to the Elective Surgery Access Policy, Treat in Turn Principle in Practice.[26]

Use of anaesthetic bays

Many facilities have access to anaesthetic bays with direct access to the OT. These bays are used for the induction of anaesthesia. They can reduce patient anxiety by avoiding the sights and sounds of the OT, particularly for children. Time is saved by inducing anaesthesia while surgery is being completed on the previous patient. This is particularly useful if preparation is prolonged, e.g. performance of local anaesthetic blocks or establishing cardiovascular monitoring. But it is only safe if at least two anaesthetists are present, alongside sufficient support staff. The additional space can also be used to store equipment required for anaesthesia. This makes items easier to locate than the anaesthesia trolley used for anaesthetic equipment and medication within the OT.

However, some anaesthetic bays can mean anaesthetic and monitoring equipment must be duplicated or moved to the theatre with the patient. This usually requires temporary disconnection from electrical or gas supplies. There are risks involved in transferring an unconscious patient from a trolley to the operating table. Construction and maintenance of these spaces is expensive, requiring additional space within the footprint of the theatre.

Endoscopy suite versus procedure room

Endoscopy suite

Where available the endoscopy suite should be used as the preferred site for planned endoscopic procedures rather than the operating suite. The endoscopy suite provides an aseptic environment in which to carry out endoscopic procedures under sedation or general anaesthetic. The minimum size of an endoscopy suite is 45m^2.[5] An endoscopy suite is used for diagnostic and therapeutic interventions such as bronchoscopy, colonoscopy, gastroscopy, endoscopic ultrasound, gastrointestinal stenting, endoscopic retrograde cholangiopancreatography, polypectomy and placement of endoscopic feeding tubes. It may be designed as:

- a dedicated fully self-contained unit within a hospital
- collocated with the operating unit with shared facilities
- collocated with a specialist clinical service such as gastroenterology or respiratory medicine, within a hospital.

Dedicated spaces for endoscopy procedures have advantages to the facility and the patient, including:

- reduced demand on operating rooms and theatre time
- procedures are less invasive, resulting in quick recovery time and rapid discharge.

Procedure room

Collocating procedure rooms with operating theatres provides a controlled environment and facilities for carrying out procedures that do not require the full facilities of the operating suite. This may include suturing of wounds, complex dressings, lumbar punctures, catheterisations, administration of local anaesthesia and use of medical gases in connection with the procedures being performed.

Given the ongoing demand and cost of operating theatres, it is good practice to consider what available spaces are most suitable for procedural and interventional activities. However, thought needs to be given to patient preparation, equipment and staffing requirements, infection control and prevention, need for patient transfer and the availability of theatres in the event a transfer is needed.

It is important that procedures not requiring a full OT (planned endoscopy and local anaesthetic cases) are not performed routinely in an OT if an alternative exists, such as endoscopy or procedure rooms. However, not all facilities will have access to an endoscopy suite or anaesthesia bays and that will affect efficiency and patient flow.

Patient pathways and management

A key strategy to support effective waitlist management and improve postoperative outcomes is to optimise a patient's condition while they wait for surgery.[25] Local guidelines should align to the The Perioperative Toolkit.[9] It advises that all patients require a pre-admission review, however not all patients need to attend pre-admission clinic.

The time spent on a waiting list is an opportunity to comprehensively assess patient readiness for surgery. It can also be used to implement strategies to improve nutritional status, physical and psychological condition and manage comorbidities, or modifiable risk factor behaviours, such as diabetes or smoking.

These programs support efficient functioning of an OT suite by:[25]

- facilitating better patient preparation
- reducing length of stay by accelerating recovery
- reducing postoperative complications
- streamlining waitlists through regular review
- using waiting time effectively.

Prehabilitation

Prehabilitation, or preoperative rehabilitation, aims to enhance a patient's physical and psychological function to support them through surgery by facilitating faster recovery, better patient experience and outcomes.[18] A multimodal prehabilitation program includes exercise, psychology, education and nutrition elements to support patient wellbeing. It can be tailored to best fit the time available depending on patient clinical urgency category.[18] Prehabilitation: Key principles for preparing patients for surgery provides more information.[18]

Patient preparation

Patient preparedness for the OT is complex and multifaceted. Properly preparing patients in a timely, effective and thorough manner – while adhering to full completion of preoperative checklists – is key to ensuring patient safety and comfort. It also leads to increased efficiency of the department and ensures success of the procedure.[19, 24] Full completion of the preoperative checklist is important for proper preparation of patients before they enter the OT. It is also critical for patient safety and successful outcomes.

Increased preparedness can also be associated with postoperative improvement, increased staff and patient satisfaction and improved quality of life. Despite the proven benefits of checklist completion, literature has shown that adherence to and completion of checklist guidelines are often inconsistent and lacking.[19] Relationships between departments and culture contribute significantly to patient preparedness. Understanding various departments' workflows, expectations and workload can lead to increased preoperative checklist completion, establish respect between departments and support collaboration.[19]

Timely patient preparation is a key factor for OT efficiency. Ensuring optimum patient preparedness for theatre reduces theatre delays and cancellations. Preoperative clinics can facilitate patient preparation for surgery. The Perioperative Toolkit is a valuable resource which provides further guidance around best practice perioperative care.[9]

Enhanced recovery after surgery

Enhanced recovery after surgery is a multimodal perioperative care pathway with pre-, intra- and postoperative elements. These are designed to achieve early recovery after surgery through maintaining preoperative organ function and minimising the stress response generated by surgery.[3] Pathways are designed for specific surgical specialties. However, all aim to engage patients in making decisions about their care, reduce length of stay without compromising morbidity and optimise use of health system resources. More information is available through the Enhanced recovery after surgery: key principles for implementation of models.[3]

High-risk perioperative clinics

Clinics for high-risk surgical patients allow patients and their families to meet with the surgeon, anaesthetist, intensivist and geriatrician, as required, to decide on the most appropriate treatment pathway. Open discussion around risk, goals and limits of care, short-term and long-term outcomes may identify surgery as an appropriate care pathway.[33] Clinics identify high-risk patients from the waiting list using set criteria and connect the patient and their family with the clinic team before a surgical admission date is set.[34]

Non-surgical care pathways

Alternative care pathways can be implemented for patients who are potential candidates for surgery. This can reduce the severity of a presenting condition or, in some cases, resolve the underlying condition. For example, the Osteoarthritis Chronic Care Program delivers a conservative management model for patients with osteoarthritis, reducing or preventing the need for joint replacement.[35] Similarly, hand therapy programs led by occupational therapists demonstrate significant improvement in chronic hand conditions. It can enable up to 30% of patients to be removed from planned surgery waiting lists following clinical review.[36]

Value-based care

Not all patient cohorts may benefit from a particular procedure. The value of surgery for certain patients should be decided with clinicians. Identifying groups that do not benefit from a procedure will improve value and efficiency. It will also decrease risks and complications, resulting in better patient outcomes overall.[8] Value-based healthcare means continually striving to deliver care that improves:[8]

- health outcomes that matter to patients
- experiences of receiving care
- experiences of providing care
- effectiveness and efficiency of care.

Clinicians should reflect on whether they are providing surgical interventions that deliver outcomes and experiences that matter most to the patient.[8] Value-based surgery focuses on getting the most value from surgery which involves patients having the right procedures, for the right reasons, at the right time. The Value-Based Surgery Clinical Practice Guide aims to enable more clinically appropriate procedures to be performed in public hospitals.[8]

Criteria-led discharge

A patient's transfer of care (discharge) from hospital can be delayed for many reasons and patients can wait unnecessarily for discharge once they are medically cleared to leave the hospital.[37] Criteria led discharge (CLD) is a process to ensure patients can return home from hospital as safely and quickly as possible. It also supports efficiency across the hospital and frees up beds.

The goals of CLD are:

- improved patient and staff experience
- improved communication
  - better informed patients
  - transparency on the discharge plan for the entire team
- improved efficiency
  - early decisions leading to smooth discharge
  - reduced length of stay
  - increased weekend transfers (discharge) of care
  - no increase in readmission rates.

Under CLD the decision for discharge is made and documented by the senior medical clinician, e.g. senior consultant, medical fellow, visiting medical officer. Additional criteria may be added by the interdisciplinary team members.

For appropriate patients, CLD competent staff (nursing, allied health, junior medical officer) can facilitate the discharge of a patient according to documented criteria. The CLD competent staff member is responsible for monitoring that the CLD criteria have been met.

Best practice for criteria led discharge

- Identify a patient who may be eligible for CLD on admission (or pre-admission for planned admissions).
- Continue to review patients every day by the medical team and update the set criteria, if required.
- Agree the criteria and subsequent plan for discharge in partnership with the entire health care team, including the patient and their carer.
- The CLD competent staff member to monitor and record if the patient has met the criteria. This does not substitute for clinical judgement and if a patient does not meet the criteria a medical review is necessary.
- A transfer of care (discharge) checklist to be completed for all patients. This should include a section on patient education that has been provided.

For more information on planning and implementation, use Queensland Health guidelines, Criteria Led Discharge,[37] National Health Service, Criteria-led discharge[38] and Clinical Excellence Queensland, Criteria Led Discharge Model of Care[39].

Operating theatre culture

Culture

The OT, like other departments in a hospital such as, intensive care or the emergency department, has its own distinct culture and ways of working. Culture is determined by formal and informal leaders whose role it is to provide leadership, model appropriate activities, attitudes and actions. The role of a leader is also to reinforce new desirable behaviour while discouraging undesirable or inappropriate behaviour.

The culture of the OT is complex due to the dynamic environment with many concurrent activities occurring throughout the days, evenings, and nights. OT teams work together to bring patients in and out of the OT, manage important equipment, maintain a sterile environment, anaesthetise and operate on patients, and coordinate postoperative care.

Strategies that aim to improve communication and identify key activities have been proven to increase efficiency and reduce errors.[40]

Advantages of introducing a huddle

Definition of huddle

This process brings teams together daily or identifies activities that bring the team together. Introducing individual theatre huddles at the beginning of the list will enhance trust within the team, lead to better planning of resources and reduce possible complications.

A 'huddle' is a good example of how to increase awareness of activities for the day and communication. A huddle can occur at different times, but a key time is at the start of a shift. It enables all staff to focus on the activities required for the patients' care.[41] Teams can also use theatre briefings prior to the theatre list starting. The time it can take to have a huddle (one minute) has been shown to decrease interruptions to workflows and delays in the OT.[3]

Some facilities participate in a planning huddle one week before the surgery list. This ensures the list is appropriately booked. The list order is reviewed for equipment needs and infection requirements. These huddles can include theatre managers, waiting list managers, patient flow and bed managers and sterilising services and the theatre team.

Good professional relationships among all team members are essential to efficiently use theatres. A team approach to managing theatres is necessary for best outcomes for patients and theatre efficiency. Teams should focus on collaboration and problem solving, as well as engaging in a shared responsibility for KPIs. There should be a shared responsibility for meeting metrics. This should be reiterated in huddles and meetings. For example, all staff should share responsibility for starting on time and cancelations on day of surgery. This supports better patient experiences and outcomes.

Motivation and team familiarity

Motivation and team familiarity were identified as the major factors behind efficiently run OTs, supporting the use of regular operating teams and maintenance of a highly motivated workforce.[1]

Effective communication channels for sharing information between different divisions (surgical, anaesthetics, bed management, patient flow and admission) will streamline the patient journey.

Promote a culture of continuous improvement

Foster a culture where all team members are encouraged to suggest process improvements and provide feedback. Conduct regular multidisciplinary meetings to discuss challenges and implement innovative ideas. Encourage a culture of learning, adaptation and continuous improvement to drive efficiency gains.

Leadership

Strong leadership provides direction, models a high standard of clinical care and considers the needs of individual team members. All of this enables an efficient operating theatre. A leadership role should be identified in the OT to manage efficiency and lead staff in quality improvement initiatives. This role can develop strategies in partnership with team members to manage internal and external influences in the perioperative environment and optimise efficient work practices.

Active leadership involving anaesthetists, clinicians or nursing staff all taking visible and active responsibility for aspects of OT management and efficiency is a key driver to building team engagement.[39] Active leadership should involve building teams that are stable and teaching newer staff members clear processes.

Leadership roles should be assigned to experienced members with a focus on shared ownership for efficiency. This role could go to any senior member of the theatre team, as long it is communicated to all staff. Leadership by a determined leader may facilitate a timely start. A structured leadership approach and careful supervision of less experienced staff can have a positive outcome in patient changeover times, even in a teaching environment. Good communication and briefings have also been shown to improve motivation and team cohesion and have a positive impact on theatre efficiency.[42]

An overview of the key nursing and medical leadership roles involved in the management of an efficient OT is outlined in Roles and responsibilities in theatre management.

Values-based leadership instils a common set of values in all employees. It improves their cohesiveness and willingness to work together. A clear value structure should be communicated.[20] NSW Health staff should align their team values through the CORE values of collaboration, openness, respect and empowerment by using the NSW Health Workplace Culture Framework.[43]

Knowing that a leader or manager has similar beliefs often encourages employees to follow their instruction. This enhances engagement, performance, and staff retention.[14] Leaders who undertake values-based leadership focus on self-reflection, balance in understanding different viewpoints, humility, authenticity and continuous improvement. This leadership style involves having more meaningful conversations with people, building trust and hearing unique perspectives. The practice emphasises collaboration, democratic problem solving, diversity and inclusion. It fosters a mentality of all voices are heard and valued.[14]

Additional considerations for leadership roles

- Early consultant surgeon presence in the OT shortens time to incision.[15]
- A duty anaesthetist should be a more senior staff member to support collaboration with surgeons and nursing staff.
- Supernumerary floor managers for hospitals with more than one operating room can be vital to efficient processes.
- Support staff including administration, porters and store persons are vital to supporting patient flow in and out of theatres, waitlist management and theatre list planning.

Strong leadership and clear governance are the foundation for effective teamwork. Management of an OT should be guided by two multidisciplinary committees:

- Operational operating theatre committee
- Strategic operating theatre committee

These committees should have defined roles, clearly articulated objectives and standard structures to ensure equal representation. Examples of surgical governance models can be found in Operating theatre governance models.

Case study: Northern Sydney Local Health District culture project

Improving teamwork and communication within surgical teams is critical to reducing perioperative harm. Royal North Shore Hospital (RNSH) undertook a survey of teamwork and communication in operating rooms in early 2018. The results of the survey were very positive overall.

It was interesting to note that 30% of respondents said they did not know the names of all the team members working inside the theatre. When staff were asked about how to improve the current level of communication in the OT, most thought that a pre-surgical huddle would be extremely beneficial.

The feedback from the survey resulted in a culture project. The aim of this project was to optimise teamwork, communication and culture within the RNSH operating suite by introducing team huddles and names on hats. The changes included implementing huddles, names and roles on whiteboards, names and roles on hats and marketing with poster and education. The huddles involved a five-minute meeting before the list starts for the day. All the theatre team attended to clarify patient surgical and anaesthetic needs for the whole list. The huddles were initiated by a nursing team member and lead by the most senior operating surgeon.

Another goal was for staff to write their names and roles on the whiteboards in the OT before the start of the list. Everyone knew who was working that day, including the surgical, anaesthetic and teams, operational assistants and other personal required for the day.

Names on hats was a non-compulsory component of the project which was part of a patient safety initiative. Names and roles on theatre caps prevent the possibility of mix-ups if staff have the same first name and facilitate handover of patients. Names on hats improves camaraderie and collaboration in the operating theatre.

Training opportunities

The training of less experienced or new surgical and anaesthetic staff has a strong impact on theatre efficiency. It influences surgical case time, equipment and consumable requirements and overall surgical productivity. Training is a core role of NSW public hospitals. However. this must be balanced by the service responsibilities to provide timely high-value care to patients.

To ensure theatre efficiency while supporting training opportunities consider:

- staff numbers, professional skill level, motivation, teaching or training requirements
- staffing and skill mix allocated to each session should meet each session's requirements
- staff support for new practitioners
- supervision of staff by appropriate discipline (medical and nursing)
- team cohesiveness and morale.

To balance providing training opportunities for less experienced or new surgical staff and managing waitlists, theatres should consider which sessions in their theatre template are available for training and which are planned as consultant-led sessions. This allows management of overdue waitlists and reduction of waitlists overall, while still considering urgency levels within categories. Balancing registrar-led and consultant-led sessions will provide training opportunities while also allocating time to optimise OT efficiency. In training hospitals, consider including 95% of surgical cases that have registrar involvement and 5% that are consultant-led sessions, focused on high turnover.

During training sessions, the list of the cases completed can be reviewed halfway through the day by the consultant. Depending on the number of cases that have been completed, the consultant may take over to complete the list by close of theatres. OTs face the challenge of being used for teaching and research while still being clinically productive. Certain surgeries also require additional specialised personnel in anaesthesia, surgery and nursing.[44]

Clinical procedure safety

- NSW Health has implemented three safety checklists for clinical procedures of varying complexity and risk. Requirements for Level 1, 2 and 3 procedures are outlined in the Clinical Procedure Safety policy directive.[13]
- Surgical interventions are classified as Level 3 procedures, where written consent is required, at least one proceduralist is required and sedation or anaesthesia is involved.
- The Safety Checklist for Level 3 procedures start before induction of anaesthesia or sedation.[45] It introduces a team time out prior to procedure commencement and a team sign out before the patient leaves the theatre or procedure room.[13]

Operating theatre metrics

Metrics should not be used in siloes. Multiple metrics should be looked at together to better understand a hospital's context and patterns, for example, use in context of specialty and theatre throughput.

It is essential that the metrics collected are relevant to clinicians, patients and carers and the clinician's performance. The metrics also need to be realistic measures of overall theatre performance. The clinicians must be assured that the metrics are reliable, valid measurements. Standardised data definitions are key to ensuring the metrics are being measured consistently and reliably. Variation in data definitions is destructive to benchmarking performance measurement.

The Surgery Dashboard Indicators is a companion document that supports the implementation of this clinical practice guide. The dashboard indicators provides standard definitions and reporting guidance for the theatre metrics listed in the clinical practice guide. It is intended to support the monitoring, reporting, implementation and interpretation of efficiency data collected in the theatre suite.

Regardless of the selection of appropriate metrics, improvement in performance will only occur if the collection is implemented with human resource management practices, such as:

- selection of relevant and realistic metrics to measure clinician performance
- transparent collection and analysis of metrics for fair and accurate comparison
- support for surgical leadership.
- involving OT clinicians in identifying problems and designing solutions
- consistent communication with staff
- auditing behaviours and providing performance feedback
- holding staff accountable for process changes.

Using metrics to focus on theatre efficiency enables greater use of existing surgical resources. It allows more surgery to be delivered within constrained existing resources, in particular planned surgery. OT managers need adequate metrics to ensure they can monitor and manage OT efficiency. Metrics on clinical indicators also supports the hospital to understand its efficiency and performance.

Useful operating theatre efficiency measures

- Theatre use
- First case on-time start
- Cancellation on the day of surgery
- Turnover time
- Underrun (time unused) and overrun time
- Knife-to-skin time for each OT
- Patient waiting time (this is a key element in enhancing patient satisfaction)

All these measures should be reported to everyone involved in the OT process. The NSW Ministry of Health monitors the metrics treated 'on time' and 'overdue'. All other metrics are on the SCN dashboard.

Table 1: Surgery definitions

Type of surgery	Definition
Planned	Any form of surgery that is deemed necessary by a patient's doctor but can be delayed by at least 24 hours.
Emergency	Any form of surgery being performed on a patient whose clinical acuity is assessed by the clinician as requiring the surgery within 24 hours, or in less than 72 hours, where the patient is not physiologically stable enough to be discharged from hospital before the required surgery.
Non-surgical procedure	Any simple procedure that could otherwise be undertaken in a procedure room, such as endoscopy. It should be noted that procedure rooms may not always be recommended for non-surgical procedures if there are concerns about patient safety or in smaller hospitals where procedure rooms do not exist.

The number of metrics and measures available to OT managers is almost endless. With the introduction of electronic booking systems for scheduling and the day-to-day management of OT suites, many points in the workflow can be time stamped and a measurement recorded.

Access to regular and bespoke reports using this data gives managers the ability to record, benchmark and monitor multiple points in the patient's OT journey on a day-to-day basis or over a longitudinal time period.

Statewide perspective

NSW Health, through the service level agreements with LHDs, identifies several surgical indicators that the LHDs are contracted to deliver for NSW residents.

These indicators are:

- Planned Surgery Overdues (Category 1, 2 and 3)
- Planned Surgery Access Performance (percentage treated on time for Category 1, 2 and 3).

These indicators are regularly reported to the NSW Ministry of Health.

LHDs are encouraged to identify additional metrics and indicators that assist the delivery of efficient surgical services. There is no definitive list that is universally endorsed as the most important or accurate combination of measures. However, literature supports consideration be given to consistency of reliable and actionable items to identify good performance and opportunities for improvement.

NSW Health has consistently recommended measures that are meaningful to clinicians, managers and patients. It is also widely recognised that a single metric does not provide a reliable indicator of improving or deteriorating OT efficiency. A suite of indicators is the favored approach to managing any surgical service.

The primary principles for selecting performance metrics are availability, relevance and actionable.

Table 2: Metrics principles

Is it available?	Data should be already available in the system and not require further manual entry. There should be a quality check to ensure the data are accurate.
Is it relevant?	Data should reflect the desired measure and also be clinically relevant and understandable. The measure should have meaning for the clinician and manager.
Is it actionable?	There is no point in having a measure that does not support remedial actions or is so far removed from the core problem that there is no clear action.

NSW Health and ACI's SCN have promoted and monitor measures that can indicate challenges or achievements in delivering an efficient service for planned and emergency surgery. The SCN dashboard is distributed monthly to all LHDs with data being provided by all hospitals and districts to promote transparency in relation to performance and efficiency.

The SCN Dashboard includes measures for:

- activity and (separations and attendances)
- access related measures (waiting list and emergency surgery).

The dashboard also includes process measures:

- cancellations on the day of surgery
- theatre utilisation and
- day of surgery admission % and same day and day only % targets.

Local health district and hospital perspective

Statewide reportable indicators are important measures of efficiency. At an LHD or hospital level these measures can provide 'early indicators' of declining or improving performance.

It is also important to be aware of the apathy that may emerge when hospital staff work hard to achieve a metric that does not resonate with all staff delivering the service, or data is not shared and acted upon. This situation can mean staff disregard the validity of that indicator or measure.

SMART metrics

A common framework for defining useful metrics is that they should be SMART – specific, measurable, achievable, relevant and time bound.

Local indicators should be developed considering these features and adopted and agreed by the sites and LHDs. They should identify any caveats and acceptable tolerances associated with the metrics. These should be documented and communicated.

Flexibility should exist at the local level to identify 'specialty specific' adaptations of the agreed metrics. Flexibility is required because comparison of like services is more meaningful than comparing disparate services.

Examples of specialty specific metrics

First case on time start

This metric refers to the percentage of theatre sessions where the first case undertaken in the session is started at (or before) the session start time. The numerator for the definition is the number of theatre sessions where the 'patient in room (OT or operating room (OR)) time' for the first case is equal to or before the scheduled start time for the session. Patient in room time starts when the patient physically enters the OT or OR assigned to the session. This applies even when an anaesthetic or other procedure began before the patient entered the OT or OR. The denominator for the metric is the total number of theatre sessions for the period. Several caveats could be considered when monitoring and assessing its significance as an indicator of theatre efficiency.

A failure to start on time by one minute currently carries the same punitive failure rate as a case starting 15 minutes after the schedule start time. Local flexibility to determine a tolerance in start time would provide sites with the ability to focus on consistent and truly delayed theatre starts, rather than managing by exception the occasional lapse in 'on-time start'.

Operating theatre use

Use is a measure of how much allocated theatre time is used to undertake surgical procedures. It is limited to the proportion of time in which surgical cases are actively performed. It identifies non-surgical time as unused theatre time.

As with first case on-time start, it is important to understand how the metric is calculated and to not discourage efficient services in the interest of maximising use rates.

Theatres that have multiple shorter cases scheduled, will have a lower use when compared to a theatre with a single long case or theatres with a smaller volume of cases. A larger volume of cases will have additional instances of 'turnover time', which is not included in calculating use. The more instances of turnover time will appropriately result in more stoppages to clean and prepare the theatre for the next case. For example, a neurosurgery case may take multiple hours and have a higher use than multiple cataract surgeries due to more turnover time. But both lists may be efficient. When applying use as a metric, it is important to consider:

- valuable information is identified when 'like-for-like' sessions are compared against each other, either within an organisation or across similar sized or delineated facilities
- use has greater relevance for higher turnover theatres, with the understanding that 100% use is not achievable.

Cancellation on the day of surgery

This metric is divided into hospital and patient-related reasons.

- At the hospital and LHD level, there is an opportunity to review processes that occur prior to a patient arriving on the day of surgery that may affect or contribute to a patient's likelihood of cancelling. These include hospital triage or review process, timeframes between operation date allocation and preadmission clinic appointment availability and opportunities for specialty reviews and investigations.
- Hospital-related reasons may identify opportunities to improve booking practices for patients requiring ICU beds, overbooking of OT lists or other process-related reasons.

Turnover time

Turnover time refers to the time from the patient exiting the theatre to the succeeding patient entering the theatre – essentially, 'wheels out to wheels in'. Turnover time is a key process indicator for hospital business management.[46, 47] Turnover time is a valuable metric to be used at hospital level to determine efficiencies. It is recommended that this metric be used to assess and monitor. It is important to consider these points when using turnover time as a metric.

- Hospitals should consider the effects of staffing, type of cases and case complexity on turnover time. The main types of cases for each specialty should be assigned turnover time limits.
- To ensure the turnover time metric is most valuable, hospitals should determine measurements internally that are consistent within their facilities.
- To determine what is best performance, consider process mapping what needs to take place between cases and the barriers to this.
- Optimising turnover time will depend on the size of facilities and available resources.

The use rate in any OT suite will comprise both short and long surgical sessions. The sessions where the procedures require less time will have more cases per session and a higher amount of turnover time between cases than those sessions with longer surgeries. The use rate for sessions with short surgical procedures may not be as high as those for sessions with longer cases and less turnover time. However, combined use rate of all the OT rooms will generally even out these varying rates in most hospitals.

Time unused

Central Coast Local Health District – Sigma 6 project

This six-month project focused on preventing delays in theatre with an aim to get one extra case done per list. Staff were interviewed, process mapping was undertaken and accurate timing for patients to get from the ward to the OT was documented.

This process found equipment issues and patient transport to theatre caused delays and high turnover time. For example, sourcing intravenous (IV) poles was a consistent issue so 10 IV poles were tagged for theatre-use only. When ward education identified how long transport from each ward took and new equipment was bought, delays were significantly reduced in vascular theatres and theatre use was enhanced.

Time unused is a valuable metric to assess and monitor use at a local level. It is important to review time used and determine what is an appropriate amount for each facility.

Some facilities classify time unused as late starts, excessive turnaround time or early finishes. All can provide valuable indicators for efficiency related issues. Underruns can be a large source of wastage. While undertaking assessment and monitoring, it is useful to review if late starts are causing late finishes (overruns) or cancellations later. Overruns can lead to unfunded sessions or time which can affect full-time equivalent and cost budgets over time as well as affecting culture.

There may be unused time due to early finishes on planned lists. However, this time can be used for emergency surgery cases. Using a dashboard to see progress of daily cases allows review of capacity and provides opportunities for additional cases each day. It is essential that sufficient emergency or urgent time is available. Don't simply expect that one theatre will finish early as this can lead to deliberate under booking of lists (see below in emergency surgery targets).

Emergency surgery targets

Emergency surgery is an important and significant component of surgical service provision. It accounts for up to 45% of surgery delivered in public hospitals each year. The NSW Emergency Surgery Guidelines and Principles for Improvement support hospitals to plan their emergency surgery services based on a predictable long-term workload.[7] It aims to ensure capacity is sufficient to meet demand, minimise unwarranted variation in care and facilitate monitoring for improvement. Ultimately, these changes will provide a supportive work environment for staff and a safe, caring service for patients.[7] The NSW Emergency Surgery Guidelines and Principles for Improvement should be used to support OT efficiency and theatre planning.[7] These guidelines provide a minimum standardised indicator set for emergency surgery.

Further local review of the distribution of emergency surgery across days of the week, hours of the day (including standard hours, after hours, after 10pm and weekends) may also be valuable. This information can be used to support a business case for the management of emergency surgery.

There are many options for delivering an efficient emergency surgery service. One example identified in the emergency surgery guidelines is the establishment of an acute surgical unit. This is a consultant-led model with surgeons limiting or relinquishing all competing commitments during their on-call period, including private sector operating and consulting.[7] Additionally, there are dedicated emergency surgery theatre sessions scheduled to enable rapid access for acute surgical unit patients.

Table 3: Recommended framework for prioritising clinical urgency, incorporating obstetric emergencies

Category	Priority	Maximum timeframe
A	Life threatening (including obstetrics)	1 hour
B	Highly critical (including organ/limb threatening)	2 hours
C	Critical	4 hours
D	Urgent	8 hours
E	Semi-urgent	24 hours
F	Non-urgent	72 hours

Data capturing tools

Hospitals can use a range of data capturing tools to monitor performance and manage quality improvement initiatives. Data should be shared with staff to support quality improvement projects. Sharing data and engaging management and clinicians to make quality improvements is vital to improving efficiency and patient care.

The National Surgical Quality Improvement Program (NSQIP) is a data capturing tool which supports hospitals to capture the necessary data to track and analyse surgical complications. Without the ability to analyse this data, it is difficult to address problem areas. NSQIP data enhances a hospital's ability to identify preventable complications, using validated, risk-adjusted clinical and administrative data. Capturing these data points and applying benchmarked performance results to drive quality improvement initiatives ensures safer patient care. It also improves health outcomes and improves theatre efficiency.[48]

NSQIP assesses a hospital's surgical outcomes against local and international peers in one of the largest international outcome databases ever created.[48] These results enable targeted quality improvement initiatives to be developed to enhance the quality of surgical care. It also reduces complications and costs which has an significant impact on efficiency.[48]

Understanding surgical demand and available theatre capacity enables hospitals and districts to better plan and manage the core business of their service.[17] The NSW Ministry of Health is developing a dashboard to illustrate local demand and capacity, and enable informed operational decisions to be made. The dashboard combines data from several sources to compare the available theatre capacity against predicted demand. It also highlights areas where the demand is expected to exceed capacity.

The objective of this dashboard is to provide a consistent and consolidated view of planned surgery demand and capacity at a state, LHD and facility level. This enables users across all areas to better manage and plan for surgery. The solution will display demand and capacity in both hours and planned case numbers up to 12 months ahead.

The dashboard is a predictive tool to monitor and assist in making escalation decisions earlier and helps identify demand peaks and capacity gaps. The tool enables management of workload and activities across the week. It helps to determine options to use capacity when there is an unscheduled drop in demand.[17] For more information, please contact the surgical services team at the Ministry at MOH-SPB@health.nsw.gov.au.

Managing and monitoring cost in the operating theatre

Guidelines and documents have identified the equipment, furniture, fittings and room sizes required to commission OTs in Australia. However, there is a lack of comprehensive evidence to identify costs associated with running an OT and less on how much opening an additional session will cost.[5]

Historically, the way in which costs have been allocated to OTs hasn't been consistent across NSW. But since activity-based management was introduced there has been changes in the way costs have been managed and some standardisation across NSW hospitals on attributing cost to OT budgets and cost centres.

The total cost of an OT activity will incorporate direct and indirect and fixed and variable costs. It is likely that the direct costs will have a greater variable component than the indirect costs.

Based on information provided by performance dashboards such as the demand and capacity dashboard, OT managers may wish to drill down onto costs drivers in response to particular performance signals. Managers have access to reporting tools such as the CV App that allows this. These tools and reporting mechanisms are regularly being reviewed and improved to support sites with the suite of metrics to inform decisions about OT efficiency.

Clinical Variation Application

The CV App was developed by the Activity Based Management (ABM) Team and includes OT metrics and costs. Metrics from the CV App, when combined with a relevant suite of existing OT metrics, are expected to inform key drivers of OT efficiency. It also supports the development of strategies, including re-allocation of resources to address identified inefficiency.

The CV App is an interactive web-based analysis tool that compliments the ABM portal. It allows users to identify where clinical variation occurs by comparing data between similar discharge specialties, facilities and districts. This enables services to identify underlying causes of variation and leads to improvement strategies which address variations. The app allows users to perform analysis of hospital activity from different activity streams such as the ED, admitted patient, non-admitted patient, imaging, theatre and sub- and non-acute patient.

The app can also identify clinical variation by providing insights related to patient case mix and interventions delivered. The insights support the investigation of clinical variation related to processes, workforce, or consumables. The app allows unwarranted variation to be attributed to processes, workforce or consumable costs, rather than the patient's condition.

The app enables users to investigate several OT cost drivers and activity parameters. These include procedure duration, average cost of procedures, total theatre cost, time to theatre, recovery duration and waiting list. These metrics can be queried using multiple filters to benchmark with similar hospitals, analyse by specialty activity, or assess trends over time. However, care needs to be taken in interpreting the NWAU. While NWAU value captures complexity of patients and legitimate variations in costs, the values reported in the app represent the whole episode and does not report NWAU separately for activity exclusively performed in the OT.

References

1. Wallace L, Muir M, Romano L, et al. Assessing operating theatre efficiency: a prospective cohort study to identify intervention targets to improve efficiency. ANZ J Surg. Nov 2021;91(11):2382-8. DOI: 10.1111/ans.16991
2. Marjamaa R, Vakkuri A, Kirvelä O. Operating room management: why, how and by whom? Acta Anaesthesiol Scand. May 2008;52(5):596-600. DOI: 10.1111/j.1399-6576.2008.01618.x
3. NSW Agency for Clinical Innovation. Enhanced recovery after surgery: key principles for colorectal surgery. Sydney: ACI; 2022 [cited 12 Nov 2022]. Available from: https://aci.health.nsw.gov.au/__data/assets/pdf_file/0003/736617/ERAS-Key-principles-for-colorectal-surgery.pdf
4. Brusalis CM, Shah AS, Luan X, et al. A Dedicated Orthopaedic Trauma Operating Room Improves Efficiency at a Pediatric Center. J Bone Joint Surg Am. Jan 2017;99(1):42-7. DOI: 10.2106/jbjs.16.00640
5. Australasian Health Infrastructure Alliance. Operating Room – General, ORGN. Sydney: AusHFG; 2018 [cited 6 Mar 2022]. Available from: https://healthfacilityguidelines.com.au/component/operating-room-general
6. Nagendran ST, Siah WF, Litwin A, et al. How can we maximize the use of our operating lists? An analysis of factors influencing theatre efficiency in oculoplastic day surgery. Orbit. Dec 2016;35(6):309-12. DOI: 10.1080/01676830.2016.1193534
7. NSW Agency for Clinical Innovation. NSW Emergency Surgery Guidelines and Principles for Improvement. Sydney: ACI; 2021 [cited 10 Nov 2022]. Available from: https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/GL2021_007.pdf.
8. NSW Agency for Clinical Innovation. Value-based surgery. Sydney: ACI; 2022 [cited Nov 2022]. Available from: https://aci.health.nsw.gov.au/__data/assets/pdf_file/0007/808504/ACI-Value-based-surgery-CPG.pdf
9. NSW Agency for Clinical Innovation. The Perioperative Toolkit. Sydney: ACI; 2022 [cited 12 Nov 2022]. Available from: https://aci.health.nsw.gov.au/__data/assets/pdf_file/0010/342685/The_Perioperative_Toolkit.pdf
10. NSW Ministry of Health. High Volume Short Stay Surgical Model Toolkit. Sydney: NSW Ministry of Health; 2012 [cited 21 Feb 2024]. Available from: https://www.health.nsw.gov.au/Performance/Publications/hi-vol-short-stay-surgery.pdf
11. NSW Agency for Clinical Innovation. Extended Day Only Admission Model. Sydney: ACI; 2020 [cited 21 Feb 2024]. Available from: https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/GL2020_023.pdf
12. NSW System Purchasing, Ministry of Health. Elective Surgery Access. Sydney: NSW Ministry of Health; 2022 [cited 10 Nov 2022]. Available from: https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/PD2022_001.pdf
13. NSW Clinical Excellence Commission. Clinical Procedure Safety. Sydney: CEC; 2023 [cited 8 Feb 2023]. Available from: https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/PD2017_032.pdf
14. Gleeson B. 5 Attributes (And Benefits) Of Values-Based Leadership. Forbes. 19 Jul 2021 [cited Feb 2023]. Available from: https://www.forbes.com/sites/brentgleeson/2021/07/19/5-attributes-and-benefits-of-values-based-leadership/?sh=6563f1d33d21

15. Clark A, Dackiw AP, White WD, et al. Early endocrine attending surgeon presence increases operating room efficiency. J Surg Res. Oct 2016;205(2):272-8. DOI: 10.1016/j.jss.2016.06.093

16. Barbagallo S, Corradi L, de Ville de Goyet J, et al. Optimization and planning of operating theatre activities: an original definition of pathways and process modeling. BMC Med Inform Decis Mak. May 2015;15:38. DOI: 10.1186/s12911-015-0161-7

17. NSW System Purchasing, Ministry of Health. Demand and Capacity Planning. Sydney: NSW Ministry of Health; 2015 [cited 5 May 2023]. Available from: https://www.health.nsw.gov.au/pfs/Pages/demandandcapacity.aspx

18. NSW Agency for Clinical Innovation. Prehabilitation: Key principles for preparing patients for surgery. Sydney: ACI; 2022 [cited 4 Feb 2022]. Available from: https://aci.health.nsw.gov.au/__data/assets/pdf_file/0005/743360/ACI-Prehabilitation-key-principles-for-preparing-patients-for-surgery.pdf

19. Gazarin M, Mulligan E, Davey M, et al. Improving patient preparedness for the operating room: A quality improvement study in Winchester District Memorial Hospital - A rural hospital in Ontario. Can J Rural Med. Apr-Jun 2019;24(2):44-51. DOI: 10.4103/cjrm.Cjrm_27_18

20. Mackin, B. Values Based Leadership-Transforming Cultures. Business News. Perth: 2021 [cited 7 Feb 2023]. Available from: https://www.businessnews.com.au/article/Values-Based-Leadership-Transforming-Cultures

21. Pariser JJ, Diamond AJ, Christianson LW, et al. Operating Room Inefficiencies Attributable to Errors in Surgical Case Scheduling and Surgeon Procedure Heterogeneity. Am J Med Qual. Nov 2016;31(6):584-8. DOI: 10.1177/1062860615606517

22. Lee DJ, Ding J, Guzzo TJ. Improving Operating Room Efficiency. Curr Urol Rep. Apr 2019;20(6):28. DOI: 10.1007/s11934-019-0895-3

23. The Royal College Of Surgeons Of Edinburgh. Green Theatre Checklist. Edinburgh: RCSEd; 2022 [cited 7 Feb 2023]. Available from: https://www.rcsed.ac.uk/professional-support-development-resources/environmental-sustainability-and-surgery/green-theatre-checklist

24. Milone MT, Hacquebord H, Catalano LW, et al. Preparatory Time-Related Hand Surgery Operating Room Inefficiency: A Systems Analysis. Hand (N Y). Sep 2020;15(5):659-65. DOI: 10.1177/1558944719831333

25. NSW System Purchasing, Ministry of Health. Building Resilience for Surgical Services in NSW. Sydney: NSW Ministry of Health; 2023 [cited 10 Mar 2023]. Available from: https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/IB2023_004.pdf

26. NSW Ministry of Health. Elective Surgery Access Policy, Treat in Turn Principle in Practice. Sydney: NSW Ministry of Health: 2022 [cited 26 Jul 2023]. Available from: https://www.health.nsw.gov.au/Performance/Factsheets/treat-in-turn-pp.pdf

27. Albert MG, Rothkopf DM. Operating room waste reduction in plastic and hand surgery. Plast Surg (Oakv). Winter 2015;23(4):235-8. DOI: 10.4172/plastic-surgery.1000941

28. Divatia JV, Ranganathan P. Can we improve operating room efficiency? J Postgrad Med. Jan-Mar 2015;61(1):1-2. DOI: 10.4103/0022-3859.147000

29. Tankard K, Acciavatti TD, Vacanti JC, et al. Contributors to Operating Room Underutilization and Implications for Hospital Administrators. Health Care Manag (Frederick). Apr/Jun 2018;37(2):118-28. DOI: 10.1097/hcm.0000000000000214

30. Mahmoud Z, Angelé-Halgand N, Churruca K, et al. Access to surgical care as an efficiency issue: using lean management in French and Australian operating theatres. J Health Organ Manag. May 2021;ahead-of-print(ahead-of-print). DOI: 10.1108/jhom-08-2020-0347

31. NSW Strategic Procurement, NSW Ministry of Health. NSW Health Procurement (Goods and Services) Policy. Sydney: NSW Ministry of Health; 2023 [cited 21 Feb 2024]. Available from: https://www1.health.nsw.gov.au/pds/Pages/doc.aspx?dn=PD2023_028

32. NSW Ministry of Health. Clinical and Related Waste Management for Health Services. Sydney: NSW Ministry of Health; 2020 [cited 31 Jul 2023]. Available from: https://www1.health.nsw.gov.au/PDS/ActivePDSDocuments/PD2020_049.pdf

33. Fullbrook AI, Redman EP, Michaels K, et al. A multidisciplinary perioperative medicine clinic to improve high-risk patient outcomes: A service evaluation audit. Anaesth Intensive Care. May 2022;50(3):227-33. DOI: 10.1177/0310057x211017150

34. NSW Agency for Clinical Innovation. Integrated Surgical Care for Older People. Sydney: ACI; 2018 [cited 10 Feb 2023]. Available from: https://aci.health.nsw.gov.au/__data/assets/pdf_file/0015/450303/ACI-Guide_Integrated_Surgical_Care_for_Older_People.pdf

35. NSW Agency for Clinical Innovation. Osteoarthritis Chronic Care Program. Sydney: ACI; 2012 [cited 20 Feb 2023]. Available from: https://aci.health.nsw.gov.au/statewide-programs/lbvc/osteoarthritis-chronic-care-program

36. Cox R, Laracy S, Glasgow C, et al. Evaluation of occupational therapy-led advanced practice hand therapy clinics for patients on surgical outpatient waiting lists at eight Australian public hospitals. J Hand Ther. Jul-Sep 2020;33(3):320-8. DOI: 10.1016/j.jht.2019.01.004

37. Queensland Health. Criteria Led Discharge. Brisbane: Queensland Government; 2023 [cited March 2024]. Available from: https://www.health.qld.gov.au/system-governance/policies-standards/guidelines/criteria-led-discharge

38. National Health Service. Criteria-led discharge. England: NHS; 2020 [cited March 2024]. Available from: https://www.england.nhs.uk/urgent-emergency-care/improving-hospital-discharge/criteria-led-discharge/

39. Clinical Excellence Queensland. Criteria Led Discharge. Brisbane: Queensland Government; 2024 [cited March 2024]. Available from: https://clinicalexcellence.qld.gov.au/improvement-exchange/criteria-led-discharge

40. Tyerman Z, Mehaffey JH, Hawkins RB, et al. Nightly Preoperative Huddle Email Improves Perioperative Efficiency. Ann Thorac Surg. Feb 2020;109(2):445-51. DOI: 10.1016/j.athoracsur.2019.05.086

41. Jain AL, Jones KC, Simon J, et al. The impact of a daily pre-operative surgical huddle on interruptions, delays, and surgeon satisfaction in an orthopedic operating room: a prospective study. Patient Saf Surg. 2015;9:8. DOI: 10.1186/s13037-015-0057-6

42. Mizumoto R, Cristaudo AT, Hendahewa R. A surgeon-led model to improve operating theatre change-over time and overall efficiency: A randomised controlled trial. Int J Surg. Jun 2016;30:83-9. DOI: 10.1016/j.ijsu.2016.04.033

43. NSW Workforce Planning and Talent Development, Ministry of Health. Workplace Culture Framework. Sydney: NSW Ministry of Health; 2011 [cited 10 February 2023]. Available from: https://www.health.nsw.gov.au/workforce/Pages/workplace-culture-framework.aspx

44. Kaye AD, McDowell JL, Diaz JH, et al. Effective strategies in improving operating room case delays and cancellations at an academic medical center. J Med Pract Manage. Mar-Apr 2015;30(6 Spec No):24-9.

45. South Eastern Sydney Local Health District, Sydney Children's Hospital Randwick. Clinical Procedure Safety Checklist Level 3 (NSW State Health Form). Sydney: NSW Government.

46. Scagliarini M, Apreda M, Wienand U, et al. Monitoring operating room turnaround time: a retrospective analysis. Int J Health Care Qual Assur. Apr 2016;29(3):351-9. DOI: 10.1108/ijhcqa-08-2015-0105

47. Cerfolio RJ, Ferrari-Light D, Ren-Fielding C, et al. Improving Operating Room Turnover Time in a New York City Academic Hospital via Lean. Ann Thorac Surg. Apr 2019;107(4):1011-6. DOI: 10.1016/j.athoracsur.2018.11.071

48. NSW Agency for Clinical Innovation. National Surgical Quality Improvement Program (NSQIP). Sydney: 2022 [cited 11 Feb 2023]. Available from: https://aci.health.nsw.gov.au/resources/surgical-services/efficiency/nsqip

Glossary

Acronym	Meaning
ABM	Activity based management
CLD	Criteria led discharge
CV App	Clinical variation application
IV	Intravenous
KPIs	Key performance indicators
LHD	Local health district
MCIS	Master Catalogue Information Systems
NSLHD	Northern Sydney Local Health District
NSQIP	National Surgical Quality Improvement Program
NSW	New South Wales
NWAU	National weighted acuity unit
OR	Operating room
OT	Operating theatre
PD	Policy directive
RNSH	Royal North Shore Hospital
SCN	Surgical Care Network
SMART	Specific, measurable, achievable, relevant and time-bound

Acknowledgements

Deb Burrows	District Clinical Nurse Consultant Perioperative Services, Southern NSW LHD
Scott Collins	Surgical Access Manager, Hunter New England LHD
Linda Furness	Operation Manager, Division of Surgery, Northern Sydney LHD
Belinda Garvey	Surgical Services Project Manager, Mid North Coast LHD
Angela Hardy	Surgical Access Manager, Northern Sydney LHD
Mark Horsley	Deputy Clinical Director Neurosciences, Sydney LHD
Tracy Kerle	Theatre manager, Central Coast LHD
Gavin Meredith	Principal, GMC Consulting
Neil Merrett	Chair, Surgical Care Network, ACI
Vincent Salomon	Surgical Access Manager, South Western Sydney LHD

The Agency for Clinical Innovation (ACI) is the lead agency for innovation in clinical care.

We bring consumers, clinicians and health-care managers together to support the design, assessment and implementation of clinical innovations across the NSW public health system to change the way that care is delivered.

The ACI's clinical networks, institutes and taskforces are chaired by senior clinicians and consumers who have a keen interest and track record in innovative clinical care.

We also work closely with the Ministry of Health and the four other pillars of NSW Health to pilot, scale and spread solutions to healthcare system-wide challenges. We seek to improve the care and outcomes for patients by re-designing and transforming the NSW public health system.

Our innovations are:

- person-centred
- clinically-led
- evidence-based
- value-driven.

aci.health.nsw.gov.au

NSW GOVERNMENT

AGENCY FOR CLINICAL INNOVATION

Our vision is to create the future of healthcare, and healthier futures for the people of NSW.