NSW Emergency Surgery Guidelines and Principles for Improvement

Summary The Guidelines support hospitals, Local Health Districts and Specialty Health Networks to plan their emergency surgery services based on a predictable long-term workload

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NSW EMERGENCY SURGERY GUIDELINES AND PRINCIPLES FOR IMPROVEMENT

GUIDELINE SUMMARY

Emergency surgery is an important and significant component of surgical service provision, accounting for up to 45% of surgery delivered in public hospitals each year. NSW hospitals have a long history of delivering high-quality surgical services, and timely access to emergency care is key to supporting optimal outcomes for patients and communities.

This iteration of the NSW Emergency Surgery Guidelines support hospitals, local health districts (Districts) and specialty health networks (SHNs) to plan their emergency surgery services based on a predictable long-term workload. It aims to ensure capacity is sufficient to meet demand, minimise unwarranted variation in care, and facilitate monitoring for improvement to ultimately provide a supportive work environment for staff and a safe, caring service for patients.

A revised framework for prioritisation of clinical urgency, incorporating obstetric emergencies for the first time, is presented to support clinical decision-making.

Category	Priority	Maximum timeframe
A	Life threatening (including obstetric)	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

KEY PRINCIPLES

The key principles supporting a safe, responsive and high-quality emergency surgical service are further articulated.

1. Hospitals are designated for either elective or emergency surgery, or for specific components of each.
2. Emergency surgical workloads are measured and reviewed regularly to maximise predictability.
3. Emergency surgery capacity is matched to service demand, with consideration of caseload, case mix and balance with elective surgery demand.
4. Where clinically appropriate, emergency surgery is scheduled in standard hours.
5. Emergency surgery cases are scheduled based on clinical need, in line with a statewide urgency prioritisation framework and these guidelines.
6. Emergency surgery models of care are consultant-led.

7. Evidence-based protocols are used for the assessment and treatment of common acute surgical presentations.
8. Local escalation plans are established and agreed to facilitate delivery of best practice patient care, communication and conflict resolution.
9. A standardised set of indicators is applied to emergency surgery to facilitate service monitoring and continuous quality improvement.

USE OF THE GUIDELINE

The NSW emergency surgery guidelines and principles for improvement are a resource to support this planning across all specialties, allowing appropriate allocation of the necessary operating theatre time and resources to meet the expected demand. For emergency surgery,
planning should also include immediate access to operating theatres for the most urgent emergency surgery patients; sufficient staffing and equipment for safe patient care; access to data and information to support planning; and effective leadership to foster high-performing surgical services. Future proofing and planning are required to plan for the predictable annual increase in emergency surgery workload.

These guidelines outline the key principles. The examples provided are drawn from surgical specialties where emergency caseloads are generally high (orthopaedics, general surgery, obstetrics and gynaecology and plastic surgery).

However, the principles are equally applicable to those specialties where emergency caseloads are less (neurosurgery, vascular surgery, oral and maxillofacial surgery) or where caseloads are relatively low (urology, cardiothoracic, ophthalmology and otolaryngology).

The guidelines detail each of these principles more fully, guiding hospitals to better align their services with the principles in order to deliver better, safer emergency surgical care to their communities.

REVISION HISTORY

Version	Approved by	Amendment notes
May-2021 (GL2021_007)	Deputy Secretary, Patient Experience and System Performance	Revised prioritisation framework, suggested clinical indications, KPIs, planning resources
June 2009 (GL2009_009)	Director - General	New guidelines

ATTACHMENTS

1. NSW emergency surgery guidelines and principles for improvement

aci.health.nsw.gov.au

NSW emergency surgery guidelines and principles for improvement

FEBRUARY 2021

NSW GOVERNMENT

AGENCY FOR CLINICAL INNOVATION

Surgical Services Taskforce

The information is not a substitute for healthcare providers' professional judgement.

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Summary

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This iteration of the *NSW Emergency Surgery Guidelines* builds on the previous version, published in 2009, to support hospitals, local health districts (LHDs) and specialty health networks (SHNs) to plan their emergency surgery services based on a predictable long-term workload. It aims to ensure capacity is sufficient to meet demand, minimise unwarranted variation in care, and facilitate monitoring for improvement to ultimately provide a supportive work environment for staff and a safe, caring service for patients.

To develop this document, a team of subject matter experts from across NSW was convened, including surgeons, nurse managers, quality improvement specialists and administrators, to incorporate contemporary practices in surgical service management and continuous quality improvement for health systems.

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The following Guideline, and associated Appendices, detail each of these principles more fully, guiding hospitals to better align their services with the principles in order to deliver better, safer emergency surgical care to their communities.

Introduction

Emergency surgical workloads in NSW public hospitals are predictable on an annual basis, with consideration of seasonal variation allowing hospitals to plan services to meet anticipated demands.

The *NSW Emergency Surgery Guidelines* are a resource to support this planning across all specialties, allowing appropriate allocation of the necessary operating theatre time and resources to meet the expected demand. For emergency surgery, planning should also include immediate access to operating theatres for the most urgent emergency surgery patients; sufficient staffing and equipment for safe patient care; access to data and information to support planning; and effective leadership to foster high-performing surgical services. Future proofing and planning are required to plan for the predictable annual increase in emergency surgery workload.

These Guidelines outline the key principles. The examples provided are drawn from surgical specialties where emergency caseloads are generally high (orthopaedics, general surgery, obstetrics and gynaecology and plastic surgery).

However, the principles are equally applicable to those specialties where emergency caseloads are less (neurosurgery, vascular surgery, oral and maxillofacial surgery) or where caseloads are relatively low (urology, cardiothoracic, ophthalmology and otolaryngology).

The key principles underpinning design and delivery of emergency surgery

1. Hospitals are designated for either elective or emergency surgery, or for specific components of each.
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Key principles of emergency surgery

1. Hospitals are designated for either elective or emergency surgery, or for specific components of each

Not all hospitals have the full complement of available services to meet the needs of every patient presenting for emergency surgery. While patients should receive care as close to their home as possible, transport or travel will sometimes be required to access specialist emergency surgical care.

Emergency surgery sessions are as important as elective surgery sessions, with evidence suggesting separation of these into two discrete streams allows more efficient use of resources, a more effective workforce, and leads to better care and outcomes for patients.[1]

A lack of separation of these work streams, with shared processes, structures and teams for both elective and emergency surgery, can lead to imbalances in resource allocation and competing priorities. As a result, planning for an emergency surgical service is more complex and there is an impact on staff workload and wellbeing. It may also be necessary to perform more emergency cases after hours, which can have significant implications on resource and patient outcomes for hospitals.

Separation of emergency surgery from elective surgery between hospitals and local health districts (LHDs) will require cross-appointment of surgeons to fulfil their elective and emergency contributions.

The separation of elective and emergency surgical services has been successfully implemented in most NSW hospitals, such as orthopaedic, obstetric, trauma and hand surgery. Further application of this principle, alongside regular review and monitoring of resources, workload and outcomes, will support effective load-balancing across elective and emergency surgical streams in the longer term.

2. Emergency surgical workloads are measured and reviewed regularly to maximise predictability

Although emergency surgery is generally predictable in volume, it is to be expected that spikes in activity will often occur.

The assessment of emergency surgery workload should be reviewed every 12 months at a minimum, and capacity for emergency surgery altered accordingly. This should also include consideration of seasonal variation in workload and planning for holiday periods. Although these are often referred to as 'low activity periods', some hospitals report up to 33% increase in demand for theatre access due to population changes over the holiday period and fewer available elective theatre sessions.

Many hospitals experience a consistent annual increase in emergency surgery workload. This expected annual increase must be acknowledged by clinicians and managers and factored into the review process. The increased resources to manage the expected workload should be provided.

A number of data sources exist to facilitate assessment of surgical load at the LHD and facility level. These include:

- local health information and performance units
- the Activity Based Management Portal, including the Clinical Variation App
- Enterprise Data Warehouse for Analysis, Reporting and Decision Support (EDWARD) and reporting application OPERA.[2,3]

These data sources should be reviewed in the context of the corresponding elective surgical load, emergency department activity and availability of associated hospital resources such as intensive care and close observation beds, medical imaging, pathology and allied health services.

3. Emergency surgery capacity is matched to service demand, with consideration of caseload, case mix and balance with elective surgery demand

Measuring and reviewing emergency surgery workloads allows hospitals and networks to be better informed about their historical demands. It also facilitates better planning and allocation of resources to meet anticipated future caseload and mix. LHDs and specialty health networks (SHNs) may wish to consider reviewing and planning specialty demand at the district or network level to design a more cohesive surgical service for their local communities.

Operating theatre resources should be allocated based on expected emergency surgical workload, including appropriate anaesthetic, surgical and intensive care resources for high-risk cases. The service model most suitable for emergency surgery will vary according to a number of factors. In hospitals where:

- emergency surgery caseloads are high, the minor variation in volume should be accommodated through theatre session planning
- emergency surgery caseloads are high in a particular specialty, a specific emergency surgery model for that specialty should be considered (for example, dedicated emergency orthopaedic or obstetric theatre sessions). Dedicated emergency theatres should be considered when:
  - 30% or more emergency cases wait longer than the recommended time for surgery
  - 30% or more emergency theatres run over time (after 10pm)
  - two or more emergency lists are required per day to meet demand[4]
- caseloads are low across a number of specialties, the combined specialty caseload may facilitate adoption of an emergency surgery model to meet these combined needs
- emergency surgery caseloads are so low in a metropolitan hospital that there is no predictability, it may be appropriate to consider whether an emergency surgery service is justifiable, and assess the potential impact of service consolidation. A district-wide approach to emergency surgery services should be considered to ensure appropriate access to care for local communities
- emergency surgery caseloads are high, occasional irregular peaks of activity can occur. An escalation plan should be developed, endorsed by the hospital executive, and communicated to all stakeholders so that these irregular peaks are managed in a coordinated manner.

Hospital, regional and state disaster recovery plans already exist to deal with unpredictable and potentially overwhelming activity spikes. Escalation plans for irregular peaks of emergency surgery activity should be aligned with these plans.

As there is a limited number of operating theatre sessions for caesarean sections, patients are often scheduled for elective caesarean section close to their due date. As a result, many patients go into labour prior to their planned caesarean section, and thus proceed directly to an emergency caesarean, creating vacancies in elective obstetric surgery sessions. This creates opportunity to review theatre utilisation and reorganise elective surgery lists where the efficiency of theatre and procedure suite time may be improved.

Hospitals should also consider incorporating a dedicated operating theatre when building or redesigning delivery suites. This would enable emergency caesarean sections to be undertaken independently of other theatre suites and allow the obstetric team to mitigate the impact of emergency caesarean sections on other surgical specialties. Where this is not possible, the number and allocation of emergency theatres should include a recognition of the needs of emergency caesarean sections.

4. Where clinically appropriate, emergency surgery is scheduled in standard hours

A key determinant in emergency surgery is to identify the surgery that should be performed urgently, that is, life- and limb-threatening conditions. Adequate theatre access must always be available to enable this small proportion of emergency surgical work to be performed without delay or compromise.

The time of day, or day of the week, should present no limitation to care provision in hospitals designated to provide 24-hour access to emergency surgery. All other surgery, elective and emergency, where it is clinically appropriate, should be scheduled to occur in standard hours, generally between 8am and 5pm, across a seven-day work week.

Scheduling emergency surgery in standard hours:

- enhances predictability for patients and families with respect to scheduled operating theatre time
- improves predictability for surgeons and surgical teams
- increases consultant-led emergency surgery management
- increases registrar or junior staff supervision
- increases access to fully staffed radiology, pathology and allied health services
- reduces number of call backs and after-hours operating for surgeons, anaesthetists and their teams
- reduces elective case cancellations and elective list interruption, as dedicated emergency time within the theatre suite is available
- improves outcomes for patients
- increases predictability for staff rostering and budgets.

The decision to operate outside of standard hours should be underpinned by a comprehensive risk assessment to determine if the patient will be clinically compromised if they do not receive an urgent operation. It should not be determined by perceived or actual limitations of standard-hours access to operating theatre sessions.

The availability of surgeons to undertake the standard-hours emergency surgery will generally require adjustments to their rostering arrangements

Table 1. Prioritisation framework for urgency of emergency surgery

Category	Priority	Definition	Maximum timeframe
A	Life threatening (including obstetric)	Mother or fetus in immediate risk of loss of life	1 hour
B	Highly Critical (including organ / limb threatening)	Life threatening cases requiring urgent access to the next available theatre	2 hours
C	Critical	Requires the next available theatre Patient or fetus is physiologically stable, but at significant risk of deterioration, systemic decompensation or risk to organ survival	4 hours
D	Urgent	Patient is physiologically stable, but at risk of deterioration	8 hours
E	Semi-urgent	Patient is stable, with low or negligible risk of deterioration	24 hours
F	Non-urgent	Patient is stable, but not suitable for discharge	72 hours

for emergency surgery and their allocated elective surgery sessions. Similarly, realignment of elective and emergency surgery sessions may necessitate reorganisation of standard-hours sessions to accommodate emergency surgery appropriately.

In some hospitals and specialties, standard hours may be extended on some days of the week to incorporate a 'twilight' theatre session (up to 10pm), or include routine weekend daytime and evening sessions for scheduled emergency surgery. For example, emergency orthopaedic surgery at John Hunter and Nepean Hospitals is planned from 8am to 10pm, seven days a week. These strategies help to create sufficient theatre capacity to complete emergency surgery cases within clinically recommended timeframes and minimise adverse patient outcomes due to delayed surgery.

Where standard-hours emergency surgery sessions are insufficient to meet demand, a number of options can be explored.

- Opening unused standard-hours theatre sessions.
- Improving use of available standard-hours time through redesign of session start processes, improving turnaround time, trainee supervision, monitoring sessions overruns.
- Redistributing elective surgery to other hospitals within the LHD or SHN.
- Removing non-surgical procedures from being undertaken in operating theatres, for example, colonoscopy, cystoscopy, hysteroscopy.
- Reallocating a portion of after-hours resources to supplement standard-hours resources.

5. Emergency surgery cases are scheduled based on clinical need, in line with a statewide urgency prioritisation framework and these guidelines

Emergency surgery cases should be scheduled based on clinical priority. These patients are often critically unwell and clinically complex. As such, where clinically indicated, emergency surgery patients should be prioritised ahead of elective surgical cases.

Patients requiring emergency surgery must be assigned a clinical priority category to allow differentiation of urgency and prioritisation of theatre access. Assessment of clinical priority should take into consideration:

- the patient's presenting clinical condition
- comorbidities and overall physiological condition
- urgency of the surgical intervention
- potential risk should the surgical intervention be delayed.

The prioritisation framework in Table 1 differentiates urgency of emergency surgery, and should be applied to all patients requiring emergency surgery. This framework provides a guide to prioritisation, dependent on the needs of the individual patient and decision-making by their treating clinicians.

Priority categories should be assigned by senior medical staff or consultants where possible, when the decision to have surgery is made and the patient is listed on the theatre booking system. Where a registrar is uncertain of the most appropriate prioritisation category for a patient's clinical condition or there is a conflict, they must discuss with the relevant specialist surgeon, obstetrician or gynaecologist and anaesthetist.

These categories represent the maximum timeframe in which a patient should receive emergency surgery, with every effort made to minimise waiting times and facilitate access to theatres as soon as possible.

Category A and B cases may also involve activating a local clinical emergency risk system to minimise delays.

An example of this is the trauma 'Code Crimson' pathway; for trauma patients who are bleeding despite pre-hospital resuscitation by medical teams and require time-critical life-saving intervention.

Criteria for activation of the Code Crimson pathway is persistent haemodynamic instability despite standard trauma care, assessed as being secondary to ongoing haemorrhage in blunt or penetrating trauma.

Where patients are not medically fit for the proposed intervention, they are not ready for care and should not be allocated an emergency priority category or added to the emergency surgery waiting list.

Patients who are clinically assessed as not requiring surgery within 72 hours, but who still require a surgical intervention, are categorised for an elective surgical procedure, in line with the NSW Health *Waiting Time and Elective Surgery Policy (PD2012_011)*.[5]

Patients with hip fracture should be assigned Priority E or more urgent to facilitate surgical intervention within 24 hours from the time of presentation to the treating hospital, unless there is a medical contraindication requiring management prior to surgery. In cases where transfer from another facility is required, the patient should receive surgery within 48 hours from the time of arrival at the presenting hospital.

6. Emergency surgery models of care are consultant-led

Consultant-led surgical care models have been shown to facilitate accurate diagnosis and rapid decision-making, improved clinical outcomes and more efficient use of health resources. They also facilitate standardised patient handover and comprehensive supervision of surgical staff in training.[6,7]

Lack of involvement of consultants in emergency surgical patient care is associated with increased patient morbidity and mortality, increased average time to surgery, increased length of stay and higher rates of surgery cancellation.[7]

A number of consultant-led care models are established in NSW hospitals and across other jurisdictions.

Hospitals with a dedicated emergency surgery team should not reallocate team members to support delivery of elective surgery activity unless agreed to by the emergency surgery consultant for that day. The circumstances necessitating this change should be documented as part of ongoing emergency surgical workload monitoring and review processes.

Examples and additional detail regarding consultant-led models for emergency surgery, including the acute surgical unit model, are described in the Appendices of this Guideline.

7. Evidence-based protocols are used for the assessment and treatment of common acute surgical presentations

Variation in assessment and treatment of common patient presentations is one of the main causes of variation in outcomes for patients requiring emergency surgical intervention. All hospitals should assess and treat presenting patients using best practice protocols and care pathways based on contemporary, relevant evidence.

While these may require a degree of adaptation to make them suitable for the local clinical environment, the principles underpinning assessment and treatment should be consistent with the available evidence for best practice care.

Implementation of event-driven protocols and condition-specific care pathways will improve predictability of patient journeys, facilitate training and education opportunities, and provide a framework for discharge planning. They provide comprehensive guidance for medical, nursing, surgical and allied health services, identifying the agreed clinical leadership decisions of the involved specialists.

Pathways and protocols encourage continuity of care and enhance integration of management by registrars, medical officers and case managers when individuals are transferring care. They also provide an effective mechanism by which hospitals can monitor and review variation in care, review conformity with agreed protocols, compare outcomes and take action to improve patient care.

8. Local escalation plans are established and agreed to facilitate delivery of best practice patient care, communication and conflict resolution

All hospitals providing emergency surgery should have escalation processes in place to support timely decision-making, coordinated responses and accountability with respect to managing demand, including:

- organisational capacity
- patient prioritisation
- cancellations and delays
- patient transfer decision-making and coordination
- training and supervision
- conflict resolution.

LHDs are responsible for meeting the care needs of patients within the district, including establishing robust processes and communication pathways for patient transfer between facilities to enable access to clinically appropriate care, and providing appropriate treatment prior to transfer and upon return. Where a patient cannot be safely or effectively managed within their current hospital, they must be transferred to a facility that can adequately manage their condition. Delays to patient transfer negatively impact patient outcomes and contribute to inefficient resource application and hospital bed block.[8,9]

Patient transfer protocols must be aligned with relevant NSW Health policy directives, including:

- Critical Care Tertiary Referral Networks and Transfer of Care (Adults) (PD2018_011)
- Critical Care Tertiary Referral Networks (Paediatrics) (PD2010_030)
- Children and Adolescents – Inter-facility Transfers (PD2010_031)

- Children and Adolescents – Guidelines for Care in Acute Care Settings (PD2010_034)
- Neonatal Consultation, Referral and Transfer Arrangements in Collaboration with NETS (IB2020_015)
- NSW Inter-hospital Major Trauma Transfer Interim Guideline
- Children and Adolescents – Admission to Service Designated Level 1-3 Paediatric Medicine & Surgery (PD2010_032).[10-16]

The decision to transfer must be based on the patient's current clinical condition and prevailing local facility conditions. It must be made in consultation with relevant clinicians, including surgeons and anaesthetists, at the referring and receiving hospitals. Transparent and timely communication between clinicians is vital, however, the final authority for decision-making rests with the referring clinician.

For most emergency surgery patients, transfer to a tertiary hospital within the same LHD will be suitable to meet their clinical needs. Where an LHD does not have a tertiary level facility, or a particular surgical specialty is not established, limitations of care available within the district should be documented. For each such specialty service, a designated responsible hospital or specialty unit must be agreed. For identified limitations within a district, the Critical Care Referral Networks apply, as per *NSW Critical Care Tertiary Referral Networks and Transfer of Care (Adults) PD2018_011*.[10]

Responsibilities under these referral networks must be explicitly identified. To assist timely patient transfer, an agreed referral plan should be established for each specialty in the receiving hospital, and patient transfers facilitated without delay.

Where a nominated hospital is unable to accommodate the patient requiring transfer, the agreed escalation plan should be initiated.

9. A standardised set of indicators is applied to emergency surgery to facilitate service monitoring and continuous quality improvement

Regular monitoring and review of emergency surgery performance is important to ensure quality of care, patient outcomes and organisational efficiency are measured.

Key performance measures relate to the overall achievement of specific surgical performance targets and are reportable through local governance channels to the NSW Ministry of Health.

Additional measures, such as demand, capacity and process measures, also help to define the context of a surgical service, tracking improvements, informing service redesign and evaluating improvement initiatives.

A standardised set of emergency surgery indicators for NSW Health, reviewed on a regular basis, is recommended to facilitate service monitoring and continuous improvement. Table 2 outlines the factors that should be incorporated into the minimum standardised indicator set.

Table 2. Minimum standardised indicator set – emergency surgery

Indicator	Metric
Emergency surgery load-balancing	Proportion of theatre hours dedicated to emergency surgery
Performance according to emergency surgery prioritisation framework	Proportion of patients treated within the clinically indicated timeframe, in each urgency category
Supervision of registrars	Proportion of theatre sessions in which the consultant surgeon is in the operating suite
Average length of stay for index conditions	Mean length of stay for emergency cholecystectomy, fractured neck of femur, acute appendicitis
Out-of-hours surgery	Proportion and number of emergency surgery cases undertaken between 10pm and 6am
Postponement of emergency surgery cases	Number of emergency surgery patients postponed
Average time to surgery for index conditions	Mean time from arrival to entry to operating theatre for fractured neck of femur, emergency caesarean section, appendicectomy, cholecystectomy
Distribution of emergency surgery demand	Proportion of emergency surgery demand across days of the week, hours of the day, months of the year
Unplanned re-admissions following emergency surgery	Proportion of patients re-admitted without prior planning within 30 days of an emergency surgical intervention, by specialty or by procedure
Appropriateness and safety of patient transfers	Number of patients transferred to or from another facility for emergency surgery, with specific focus on paediatric and geriatric transfers Monitoring patient transfers between facilities for appropriateness, safety and efficiency is important to ensure the most appropriate care is provided in the most appropriate location Transfers should also be reviewed and monitored regularly

Operational model

Surgical procedures requiring urgent management

These examples, listed by specialty, may be applied for both adult and paediatric patients where appropriate.

Colorectal

- Impending ischaemia
- Inflammatory bowel disease with toxic colon
- Large bowel obstruction – in the frail patient with comorbidities
- Major retroperitoneal trauma
- Peritonitis – ruptured diverticulum
- Septicaemia with radiologically undrainable abscess
- Some cases of perianal abscess

Dental or faciomaxillary

- Haemorrhage or mid-face bleeding
- Risk of inhalation (tooth or fragment)
- Trauma associated with any of the above

Ear, nose and throat (ENT)

- Airway obstruction or airway compromise
- Caustic and lye ingestion and some cases of smoke inhalation
- Diminishing visual acuity following endoscopic transeptal transsphenoidal surgery or endoscopic sinus surgery
- Haematoma or infection causing reconstructive flap compromise following major head and neck resections
- Large cervical haematoma following surgery
- Nasal or mid-facial fractures with uncontrollable haemorrhage or cerebrospinal fluid leak
- Neck or deep space abscesses
- Penetrating injuries, crush injury or gunshot wounds affecting neck, larynx or airway
- Periorbital abscess associated with severe proptosis or loss of visual acuity
- Quinsy
- Some cases of ingestion of foreign bodies

General surgery

- Acute abdomen
- Gunshot and some cases of knife wounds
- Haemorrhage
- Intra-abdominal bleeding
- Necrotising fasciitis (first presentation or deteriorating patient)
- Perforated viscus including oesophagus, stomach, duodenum, small bowel, large bowel, appendix and gall bladder
- Peritonitis
- Return to theatre due to bleeding, especially intra-abdominal
- Ruptured tumours
- Severe necrotising infections
- Severe soft tissue infection causing sepsis
- Severe or major intra-abdominal infection causing sepsis
- Suspected ischaemic bowel

Gynaecology

- Returns to theatre for bleeding
- Ectopic pregnancy with vascular instability
- Incomplete miscarriage with ongoing haemorrhage

Hands

- Amputations for reimplantation or revascularisation

Neurosurgery

- Burr hole for insertion of extraventricular drain
- Craniotomy for spontaneous intracerebral haematoma or any other intracranial conditions with imminent risk of 'coning'
- Craniotomy for tumours that are causing critical raised intracranial pressure
- Craniotomy to drain cerebral abscess
- Trauma craniotomy for acute extradural, subdural and intracerebral haematoma or penetrating injuries and skull fractures
- Decompressive laminectomy or other spinal operations for cord or cauda equina compression, caused by trauma, large disc herniations or infection

Obstetrics

- Prolapsed cord
- Ruptured uterus
- Caesarean sections
- Major obstetrics tear +/- 4th degree tear
- Postpartum haemorrhage
- Trial of forceps

Ophthalmology

- Acute glaucoma (very high intraocular pressure) not adequately controlled by medical treatment
- Penetrating eye injuries requiring exploration
- Repair of eyelid and periocular facial or orbit injuries and fractures (compound especially)
- Retinal detachment repair (including vitrectomy) required for impending or recent 'macular off' retinal detachment
- Vitrectomy for severe cases of infective endophthalmitis
- Orbital exploration or abscess drainage for orbital cellulitis

Orthopaedics

- Hip, femural, tibial, fibular, ankle and humeral fracture
- Compartment syndrome
- Contaminated wounds
- Dislocations
- Skin under tension
- Vascular compromise

Paediatric

- Severe gastrointestinal bleeding
- Abscess with systemic sepsis
- Exsanguinating haemorrhage
- Necrotising enterocolitis
- Necrotising fasciitis
- Penetrating trauma
- Perforated hollow viscus
- Return to theatre for transplants with bleeding or vascular occlusion
- Severe blunt trauma
- Torsion of testis
- Peritonitis
- Trauma associated with haemorrhage – vascular instability despite 50% blood volume replacement (crystalloid or colloid) in first two hours, or after whole blood +50% blood volume of crystalloid or colloid
- Ureteric avulsion
- Urethral rupture

Plastics

- Free flaps requiring return to theatre
- Impending nerve compromise due to fracture dislocation

Urology

- Complete anuria due to ureteric obstruction
- Complications arising from laparoscopic urological surgery to upper or lower urinary tract or genital tract
- Exsanguinating renal injuries
- Fournier's gangrene
- Gunshot wounds or penetrating injuries involving the urinary tract
- Injury to urinary tract in conjunction with other intra-abdominal trauma
- Intraperitoneal bladder rupture
- Rupture of membranous urethra in conjunction with pelvic fracture
- Severe clot retention in the bladder
- Testicular torsion
- Ureteric avulsion

Vascular

- Abdominal aortic aneurysm
- Grafts requiring revascularisation
- Haemorrhage (including returns to theatre and other specialty operations requiring vascular assistance)
- Organ donation and harvest
- Some cases of fistula formation

Application of the urgency prioritisation framework to common emergency general surgical presentations

The tables in this section outline recommended urgency prioritisation categories for common emergency general and obstetric surgery presentations. These recommendations should be used as guide only, for consideration alongside clinical judgement and individualised risk assessment.

Table 3. Recommended urgency prioritisation categories for common emergency general surgical presentations

	Clinical priority				
Clinical condition	Life threatening (including obstetric) (<1hr)	Highly Critical (including organ / limb threatening) (<2hr)	Critical (<4hrs)	Urgent (<8hrs)	Semi-urgent (<24hrs)
Abscess			Proven or clinically suspected necrotising soft tissue (including Fournier's gangrene) infection, with hypotension, impaired renal function	Advanced local infection without septic shock Abscess with surrounding cellulitis in a diabetic or immunocompromised patient	Uncomplicated abscess
Appendicitis			Perforation with peritonitis, hypotensive Patients with septic shock* that require source control	Perforation clinically or radiologically, tachycardic, elevated C-reactive protein, but normotensive Clinical appendicitis with peritonism localised to right iliac fossa	Clinically suspected or radiologically proven without tachycardia
Cholecystitis			Cholecystitis with perforated gall bladder and biliary peritonitis, or severe sepsis* with shock	Severe sepsis, or suspected necrosis, with tachycardia, fever Cholecystitis with right upper quadrant pain, localised peritonism, or diabetic or immunocompromised without hypotension	Clinical cholecystitis confirmed on radiology imaging, systemically well

* Sepsis and septic shock in line with qSOFA criteria; low blood pressure, high respiratory rate and altered mental status.[17]

Clinical condition	Clinical priority				
	Life threatening (including obstetric) (<1hr)	Highly Critical (including organ / limb threatening) (<2hr)	Critical (<4hrs)	Urgent (<8hrs)	Semi-urgent (<24hrs)
Diverticulitis			Severe shock with free perforation, hypotensive	Free perforation with at least localised peritonitis but no haemodynamic instability	Rising C-reactive protein, fever in a patient with mesenteric air who is not responding to antibiotics Diverticular phlegmon on CT failing to improve on antibiotics, normotensive
Fracture				Compound fracture	Hip fracture
Hernia			Irreducible hernia involving bowel with evidence of perforation or necrosis	Irreducible hernia involving bowel, including obstruction but no evidence of perforation or skin cellulitis	Irreducible hernia without bowel involvement
Obstetric emergencies	Sustained fetal bradycardia, cord prolapse, uterine rupture, postpartum haemorrhage, retained placenta, abnormal scalp pH (<7.2) or lactate	Bleeding placenta previa with stable maternal and fetal observations, other non-immediately life threatening maternal and fetal concerns	Spontaneous rupture of membranes (not in labour), breech presentation in early labour, fulminating pre-eclampsia		
Small bowel adhesions		Exsanguinating gastrointestinal haemorrhage	Small bowel obstruction with perforation, and hypotension	Small bowel obstruction with closed loop obstruction or suspected ischaemic bowel, without haemodynamic compromise	Small bowel obstruction with persisting abdominal pain, haemodynamically stable Small bowel obstruction persisting after a period of non-operative treatment
Soft tissue infection			Necrotising fasciitis		
Vascular		Ruptured abdominal aortic aneurysm Critically ischaemic leg			

Redesigning clinical services

Emergency surgery management requires appropriate planning for workload, workforce and resources. It takes into account the unique threats to life, limb and organ function faced by patients, with risk of these threats increasing in the event of delays to treatment.

Redesigning emergency surgery services requires an active partnership between clinicians and managers, with time and commitment needed from surgeons, operating theatre staff, surgical heads of department and hospital or district executive leaders.

Effective redesign of emergency surgery services comprises three discrete phases.

1. Operational reconfiguration to optimise theatre scheduling; elective and emergency workload balance; designation of hospitals for elective or emergency surgery or components of each; allocation of theatre resources matched to workload; and reallocation of resources to match designated hospital role delineations.
2. Specific clinical models for emergency surgery management are selected to best suit the hospital and its emergency surgery volume.
3. Evidence-based protocols are identified and implemented for the assessment and treatment of common emergency surgery presentations.

Redesigning emergency surgery services results in enhanced clinical performance, effective service management and improved resource utilisation. Consultant-led models of care are associated with reduced patient morbidity and mortality, while improved predictability of access to surgery improves both patient and staff satisfaction, as well as enhanced oversight by senior clinicians.

Alignment of resources and theatre session planning are also associated with improved theatre utilisation, a reduction in elective surgery cancellations, and increased access to standard hours theatre sessions.

Improved theatre planning also positively impacts other hospital resources such as intensive care, radiology and pathology services. The use of agreed protocols and pathways standardises requests for diagnostic tools and facilitates better planning of critical care resources.

Process of designing and delivering emergency surgery in NSW hospitals

Assess surgical load

- Review the demand for emergency surgery in the LHD.
- Assess emergency surgery demand by hospital and by specialty.

Calculate session requirements

- Estimate the number of theatre sessions, or theatre minutes, required to meet emergency surgery demand in standard operating hours. Input from surgeons and hospital managers will be needed to determine this.
- Calculate the standard-hours theatre sessions, by specialty, required for the emergency surgery load.
- Recognise that a small proportion of emergency surgery load will likely be undertaken out of standard operating hours.

Role delineation of hospitals

- Review the *Guide to the Role Delineation of Clinical Services (2019)*.[18]
- Define the appropriate level of surgical complexity in each facility.
- Designate hospitals within the LHD as undertaking elective surgery, emergency surgery or both.

Select the appropriate model of care

- Select a model of care for emergency surgery, taking into account the hospital role, surgical load and complexity.
- Determine the surgical conditions and procedures, by specialty, that can safely wait to be performed in standard-hours.

Align elective and emergency loads

- Allocate the required theatre sessions or theatre minutes to meet the hospital demand for emergency surgery, in standard operating hours.
- Offset elective and non-emergency theatre sessions to accommodate emergency surgery in standard hours.

Reallocate resources

- Ensure resources are reallocated, if required, to accommodate the designated emergency surgery sessions. This includes equipment, staff and technology.
- Determine consultant surgeon roster pattern, procedure for roster changes and cover for planned and unplanned leave.

Establish patient transfer protocols

- Establish local protocols to manage patient transfers between hospitals, in line with statewide policies and local procedures.

Implement evidence-based protocols and pathways

- Determine processes for emergency surgery case management, including:
  - patient management pathways for common emergency surgery presentations
  - processes for handover of patient care
  - options for continuing ongoing care after on-call period
  - process for managing inpatient consultations
  - patient follow-up after discharge.

Communication planning

- Communicate care models, processes and protocols for emergency surgery management to:
  - district and hospital staff
  - the local community and patients
  - general practices and aged care providers
  - NSW Ambulance.

Models of emergency surgery care

Acute surgical unit

Much of the recent published literature has focused on the effectiveness of acute surgical unit (ASU), particularly when compared with the 'traditional' model of care, whereby emergency surgery is managed as cases arise on an ad hoc basis. The ASU is often applied in general surgery, but warrants consideration by other surgical specialties, in particular, orthopaedic surgery. It is consultant-led, with surgeons limiting or relinquishing all competing commitments during their on-call period, including private sector operating and consulting. Additionally, there are dedicated emergency surgery theatre sessions scheduled to enable rapid access for ASU patients.

While ASUs may be organised in a variety of ways, the literature identifies three key features:

- a 24-hour service for acute surgical conditions
- a consultant onsite dedicated to emergency surgery management
- separated emergency and elective surgery lists.

The on-call consultant:

- is onsite during standard-hours
- is rostered on for a period of at least 24 hours
- oversees case priority for these sessions
- is present, teaching and supervising when surgery is being performed
- conducts daily rounds of the patients in the ASU
- provides consultation services for inpatients requiring emergency surgical review and assessment.

The ASU:

- is generally assigned a dedicated registrar or fellow, resident medical officer(s) and clinical nurse consultant
- ideally comprises designated beds or wards for patient assessment and management
- includes a minimum of daily multidisciplinary team rounding
- has formalised handover processes between incoming and outgoing on-call consultant surgeons, with information based on a standard set of key principles
- ideally has a consistent team and functions seven days per week
- provides priority outpatient access for emergency surgery patient assessments
- has agreed clinical guidelines in place for common emergency general surgery presentations
- has a formalised process for follow-up of ASU patients.

A review of literature relating to ASUs and similar models of care internationally have found implementing such units reduces:

- length of stay
- time from presentation to operation
- the number of surgeries performed after hours
- complication rates.[19-22]

These benefits are attributable to increased consultant supervision and a reduced number of

surgeries occurring outside of regular hours. Reduced waiting times and reduced surgery outside of regular hours also increases availability of surgeons, given a consultant is allocated to focus on emergency surgery. Reduced waiting time also contributes to a reduced length of stay.

The ASU model ensures availability of a consultant surgeon, increasing senior clinician involvement in patient management and treatment decisions, and facilitates consultant-to-consultant case review. Surgeons' conflicting priorities are minimised and junior staff have greater learning opportunities. Patient outcomes are improved through standardised patient handover and follow-up, increased surgical resident and registrar supervision, reduced after-hours operating time and opportunity to appoint appropriately skilled surgeons who make substantial contributions to emergency surgical services.

Sub-specialty model

The focus of this model is to have emergency surgery patients managed by consultants from the relevant subspecialty. This is different from the ASU model, where the consultant is often a general surgeon.

Under the subspecialty model, patients are admitted under the relevant subspecialty team. While limited evidence to support this model is published, preliminary results indicate that streamlined access to specialist care may lead to reduced length of stay (as fewer open procedures are undertaken) and reduced post-operative complications due to enhanced access to specialist expertise.

Specialist centralisation model

Under this model, certain specialty services for a district are consolidated at a single facility. Concentrating resources in one facility within the district or geographic location means increased availability of specialist surgeons at that facility. This means they are better equipped to deal with emergency presentations.

This model operates under a volume-outcome assumption, whereby an increase in the volumes of emergency procedures undertaken correlates to improved patient outcomes for the cohort. However, it is important to note that volume is one of many factors influencing outcomes.

While network arrangements for service delivery can enhance collaboration between facilities and increase efficiency, fragmentation of care and decreased workforce capabilities may also arise.

Surgical assessment unit

A surgical assessment unit (SAU) is a specialised unit that provides a fast track route for the assessment of acute adult surgical patients. The SAU reviews and/or admits stable patients from the emergency department, direct admissions from outpatients and visiting medical officers rooms, inter-hospital transfers, and weekend and public holiday presentations.

The SAU provides a focal point for emergency surgical admissions in the hospital, providing rapid assessments by senior medical staff followed by prompt investigations and treatment or discharge.

The service enables all surgical specialties (excluding obstetrics and gynaecology, neurosurgery and cardiothoracic) to be assessed and admitted or discharged as appropriate.

Operating theatre session planning

Options for scheduling theatre sessions are influenced by a number of factors, including the availability of surgical time, staff and anticipated emergency surgical load. The options listed in this section are not exhaustive, and alternative session models may be found more suitable for local conditions.

Mixed emergency and elective sessions

Suitable where emergency load and case complexity are low. Sessions must be planned to accommodate the expected emergency cases, and any variation in workload could be covered by short notice elective cases. This is particularly suitable for planning of emergency caesarean sections into gynaecology lists.

Advantages

- Increased utilisation of elective session capacity
- Increased flexibility for emergency management

Disadvantages

- Reduced access to specialist consultant surgeons
- Increased potential for competition between elective and emergency surgery priorities

Designated emergency surgery sessions, single specialty (full day or partial day)

Suitable for sufficient surgical load. This requires availability of the appropriate surgeon to fully utilise the session. This is particularly suitable for emergency general and orthopaedics surgery.

Advantages

- Evidence for reduced waiting time, length of stay and improved patient outcomes
- Training opportunities and professional development capability
- Certainty of rostering for staff

Disadvantages

- Reduced flexibility compared to mixed sessions (elective, emergency or mixed specialty)
- Dependant on emergency surgery workload and case mix

Designated emergency surgery sessions with mixed specialties (full day or partial day)

Suitable where emergency load and case complexity are low. Emergency surgery is allocated a set amount of time across a day or weekly schedule, allowing patients to be booked according to clinical urgency without disruption to elective lists.

Advantages

- Evidence for reduced waiting time, length of stay and improved patient outcomes
- Creation of 'Emergency Surgery Team' with enhanced supervision and training opportunities
- Builds general surgical capabilities

Disadvantages

- Staff mix or allocation can be challenging to meet individual patient needs
- Reduced access to specialist surgeons
- Can be difficult to implement due to requirement to coordinate multiple consultants

Designated emergency twilight sessions (after 5pm hours)

Provides the option for emergency surgery outside of traditional operating hours (8am-5pm), facilitating patient preparation during the day and increased surgeon availability from late afternoon.

Advantages

- Increased capacity for standard-hours surgery
- Increased capacity for consultant-led sessions
- Flexibility for demand management with quarantined resources

Disadvantages

- Can create delays in time to theatre where no morning sessions for emergency surgery are available
- Support services (imaging, pathology) are not always available during twilight hours

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Glossary

Consultant	A registered medical professional who has been assessed by an Australian Medical Council-accredited specialist college as having the necessary qualifications in the approved specialty to be included on the Specialist Register.
Elective surgery	Elective care is care that, in the opinion of the treating clinician, is necessary and admission for which can be delayed for at least 24 hours. Elective surgery patients are generally booked onto the elective surgery waiting list and their surgical requirements provided on a completed Recommendation for Admission form. These patients may also be described as planned or booked patients.
Emergency surgery	Surgery to treat trauma or acute illness subsequent to an emergency presentation. The patient may require immediate surgery or present for surgery at a later time following this unplanned presentation. This includes where the patient leaves hospital and returns for a subsequent admission. Emergency surgery includes unplanned surgery for admitted patients and unplanned surgery for patients already awaiting an elective surgery procedure (for example, in cases of acute deterioration of an existing condition).
Handover	The transfer of professional responsibility and accountability for some or all aspects of care for a patient from one person or professional group to another, on a temporary or permanent basis.
Obstetric emergencies	The definitions applied to caesarean sections in obstetrics differs from other definitions of surgical emergencies as follows. An elective caesarean is a section in a non-labouring woman. An elective caesarean may be urgent. An emergency caesarean is a section in a labouring woman. An emergency caesarean section is sometimes non-urgent.
Out-of-hours	The period of time outside of the hospital's defined standard hours. During this time, many hospital services are closed, operating on minimal staffing levels or on a call-back system.
Receiving hospital	The hospital to which a patient is transferred, generally to receive a higher level of care than can be provided by the referring hospital.
Referring hospital	A hospital from which a patient needs to be referred and transferred in order to access a higher level of care.
Standard hours	The period in daylight hours in which most hospitals have the maximum number of services operational and have the highest staffing levels. This is often 8am-5pm Monday to Friday, however, weekend and twilight (up to 10pm) standard hours are becoming more common. The majority of surgical operations are scheduled in standard hours.

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The NSW *Emergency Surgery Guidelines* were originally developed in 2009 by a subgroup of the Surgical Services Taskforce led by Professor Stephen Deane.

Acknowledging the complexity and volume of emergency surgery undertaken across all surgical specialties, the guidelines encouraged hospitals to plan ahead for the predictable emergency surgical workload. The guidelines also assisted hospitals to review their past workloads, assess anticipated future demands and allocate appropriate resources.

In 2018-19, a working group was established to revise the NSW *Emergency Surgery Guidelines*. This multidisciplinary group included significant clinical and managerial expertise across surgery, anaesthesia, nursing, paediatrics and obstetrics.

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

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