Queensland Health

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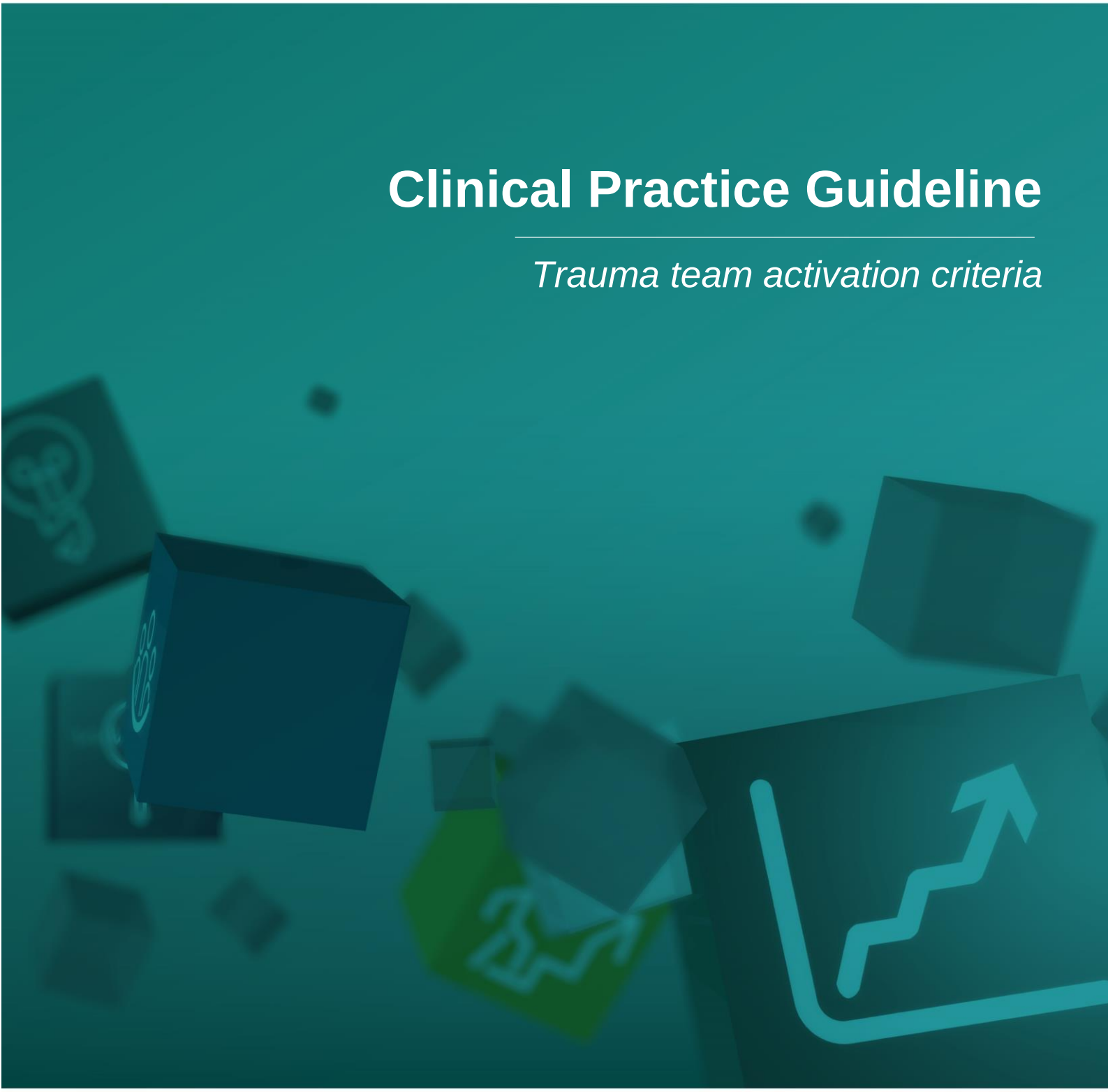
Clinical Practice Guideline

Trauma team activation criteria



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Trauma Team Activation Criteria

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The guideline is not a substitute for clinical judgement, knowledge and expertise, or medical advice. Variation from the guideline, taking into account individual circumstances, may be appropriate.
This guideline does not address all elements of standard practice and accepts that individual clinicians are responsible for:

- Providing care within the context of locally available resources, expertise, and scope of practice
- Supporting consumer rights and informed decision making, including the right to decline intervention or ongoing management
- Advising consumers of their choices in an environment that is culturally appropriate and which enables comfortable and confidential discussion. This includes the use of interpreter services where necessary
- Ensuring informed consent is obtained prior to delivering care
- Meeting all legislative requirements and professional standards
- Applying standard precautions, and additional precautions as necessary, when delivering care
- Documenting all care in accordance with mandatory and local requirements

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Contents

Summary

An appropriate clinical and system level response to trauma patients presenting to a healthcare facility is an essential component of excellence in trauma care. Critically ill trauma patients often require rapid activation and response of a multidisciplinary team, and therefore it is important to have established processes in place where acutely injured patients are managed. Trauma Team Activation Criteria (TTAC) are widely used to guide this trauma response at a facility level. This guideline has been developed with consideration of the best available evidence-base in addition to extensive clinical experience; and local TTAC should always be developed with consideration of facility size and location, patient case mix and available services.

1. Purpose

The TTAC clinical guideline aims to guide Queensland Health clinicians on the development and modification of local TTAC, to achieve the appropriate level of hospital system and staff response for managing injured patients presenting to Queensland Health Emergency Departments (EDs). This guideline considers the available evidence in combination with expert clinical experience, to provide recommendations and considerations that should always be applied according to local context, and do not replace expert clinical judgement.

2. Scope

This document is relevant to all Queensland Health facilities that manage acute trauma patients, recognising that local TTAC development should be formulated based on specific local factors. All clinicians required to manage a trauma patient, regardless of facility size and location, are referred to as the *'trauma team'*.

3. Related documents

Early notification of trauma (guideline)

Criteria for early notification of trauma for interfacility transfers (flowchart)

Referral pathways: major trauma (adult)

Referral pathway for paediatric major trauma patients

Paediatric trauma manual

Trauma in pregnancy

Older adult trauma clinical framework

Geriatric silver trauma care

Trauma prehospital bypass

4. Trauma team activation criteria

4.1 Background

Trauma team activation criteria (TTAC) refer to a set of clinical parameters used by healthcare professionals to determine when a trauma team should be assembled to provide immediate care to a patient following a traumatic injury. These criteria help ensure that the right level of care is provided in a timely manner, based on the severity and type of injury. When clearly defined, a functional TTAC will triage and stream patients appropriately within a framework that is well suited to the local population, hospital, and available services. The TTAC should ensure that patients who are likely to require time-critical treatments and interventions are identified early, with prompt activation and response of the appropriate staff and resources. The type of system utilised may be one or two tiers, and will depend on the local context, including patient population, location, and available resources.

A single tier system may be appropriate in some facilities, which provides a system-wide response for **all** trauma team activations, however most larger centres commonly implement a two tier TTAC. The two tier system has lower acuity (tier 2) trauma presentations activate internal ED systems (e.g. ED clinicians, ED medical imaging, Trauma Service); and the higher acuity (tier 1) trauma cases resulting in a system-wide response beyond the ED, as outlined in *Appendix 1*. In this type of system, a tier 2 activation may be escalated to a tier 1 activation if clinically indicated. While there are benefits to consistency in trauma activation criteria guidelines, there will often be local, facility-specific considerations that must be incorporated into the development of a trauma activation system. Therefore local and hospital-wide responses may vary between facilities. This guideline is intended to assist with the development and review of local TTAC procedures, acknowledging that there will be variation in detail between hospitals.

4.2 Evidence base

There are significant limitations in the evidence supporting the various, individual trauma activation criteria commonly used. Unfortunately, there are no ideal, established TTAC that combine very high sensitivity and specificity, and for this reason TTAC vary significantly between jurisdictions. However, it has been demonstrated that a combination of physiologic, anatomical and mechanistic criteria generally perform well in trauma triage.[(1)] Meanwhile, physiological criteria such as airway, respiratory or neurological compromise are the best predictors of major trauma; whilst trauma activation based on mechanism of injury alone may contribute to significant over-triage.[(2)]

It is well established that there is a need to find balance between TTAC that over-activates with a low miss rate but increased pressure on local resources, and one that under-activates with an unacceptable miss rate. Regular local audits are recommended to identify cases that do not fit with the specified criteria, and for monitoring of over-triage and under-triage rates. For hospital wide (tier 1) trauma activations, the American College of Surgeons has formulated a list of minimum criteria, including hypotension, most gunshot wounds, Glasgow Coma Scale (GCS) <9, blood product resuscitation, intubation or airway compromise, respiratory failure, and Emergency Physician discretion.[(3)] While this list of minimum criteria provides some initial direction, it is expected that a more comprehensive list is needed to reduce under activation. However, there is insufficient data on the various individual criteria to

develop definitive TTAC that should be implemented across all settings, which emphasises the importance in utilising this document as a guide for individual institutions to formulate TTAC that are relevant to that specific facility.

4.3 Current state

Most larger trauma centres in Queensland utilise a two-tier trauma activation system, which has demonstrated safety and efficiency.[4, 5] Other facilities utilise a single tier system, which may be more appropriate for patient populations and location (e.g. rural settings, paediatric and geriatric populations).[6] It has been demonstrated that patients have a higher mortality rate when injured in a rural setting,[7, 8] highlighting the importance of timely initial management and minimising delay to definitive care. Early communication with Retrieval Services Queensland (RSQ) should occur where the *early notification* criteria are met,[9, 10] in addition to local activation considerations. Early referral to RSQ should also occur in regional centres, where the patient's injuries are identified as exceeding local services and capabilities, and the major trauma referral pathways may be utilised.[11] RSQ will also liaise with the Statewide Paediatric Medical Coordinator for any paediatric trauma clinical advice, support and transfers according to the Paediatric major trauma referral pathways.[12]

4.4 Special patient populations

Certain presenting patient groups can cause a disproportionate injury when compared to the mechanism. Trauma presentations that this can occur in are:

- **Geriatric presentations** - older adult patients are recognised to sustain injury at lower mechanisms and lack the vital sign abnormalities that are traditionally incorporated into TTAC.[13] Additionally, frailty and co-morbidities may complicate relatively minor injury profiles necessitating dedicated processes to be incorporated into TTAC to ensure this cohort are identified and managed early.[14] A dedicated geriatric trauma pathway may be utilised for this specific population.[15]
- **Obstetric presentations** – even in low mechanism trauma, pregnancy-specific factors must be considered such as altered anatomy and physiology, radiation exposure and foetal wellbeing.[16] The Trauma in Pregnancy guideline contains further information for treating clinicians.[16]
- **Paediatric presentations** – trauma accounts for approximately 50% of all childhood deaths, and 75% of adolescent deaths.[17] The anatomical, physiological, mechanism of injury and injury patterns can be significantly different to adults. The Trauma Manual[17] produced by Children's Health Queensland contains many supporting documents for both clinicians and patients for paediatric trauma care.

4.5 Other considerations

In addition to the individual activation criteria discussed below, it is important that systems are established to facilitate implementation of the TTAC. Some important considerations include:

- A single dedicated contact phone number for Queensland Ambulance Service (QAS) paramedics to notify the appropriate senior clinician in the ED about incoming patient/s when indicated.[18]
- A single contact number for RSQ, which may be a different contact number to above, for notifying the appropriate senior clinician in the ED about incoming patient/s when indicated.
- Determination of which teams receive notification for hospital wide TTAC. An example list is provided in *Appendix 1.*
- The communication system utilised for notification of teams both within and outside the ED, with phone/pager numbers and processes clearly documented.
- Provision for TTAC processes to be dynamic, e.g. if a stable trauma patient deteriorates and subsequently meets higher activation criteria, this should occur.
- Specific TTAC for paediatric[19]/geriatric/obstetric (where there is a dedicated obstetrics and neonatal service).
- System audits to review utilisation and compliance with TTAC, along with revision over time as required. See below section 4.7 for details.[20]

4.6 Recommended TTAC

All TTACs should be correlated to the Emergency Triage Education Kit (ETEK) and local triage education team, as this is primarily when TTAC is initiated.[21] A guide to recommended two tier TTAC has been developed from a combination of established TTAC in Australia and New Zealand, clinical evidence and expert recommendation, as contained in *Appendix 2* and *Appendix 3.* These have been named *Trauma Alert* (tier 2 - limited, internal ED response) and *Trauma Respond* (tier 1 - full, hospital wide response). This naming convention has been selected as the most consistently used terminology in Queensland. As previously noted, a single tier TTAC may be more appropriate in some settings, and the *Trauma Respond* criteria may be adapted to local context. In addition, the TTAC should contain information relevant to early referrals and transfer considerations, particularly in rural locations and where access to required resources is limited.

For several of the TTAC variables contained in the appendices, there may be variation in the wording or terms used to describe the mechanism or condition (e.g. motor vehicle crash/collision/accident). The specific terminology used in this guideline is based on expert consensus. In addition, there is no compelling evidence base for some of the parameters that may be utilised for specific factors and mechanisms of injury (e.g. speed of motor vehicle crash, exact height of fall, etc) and therefore the best available evidence has been applied in combination with extensive clinical experience to establish these parameters. Consistent terminology across Queensland is recommended to facilitate standardised benchmarking and auditing. However, this document is intended to be used as a guide only for local facilities and should not be interpreted as being prescriptive.

4.7 Auditing and review

It is recommended that all TTAC are regularly and consistently audited by the local Trauma Service, or clinical leaders in trauma care at sites that do not have a formal Trauma Service. Audit frequency may vary depending on local resources and are recommended to occur annually at a minimum. This should occur at regular, more frequent intervals (particularly in the first six months) of implementation or significant changes to criteria.

The key areas TTAC audits should cover include:

1) *Adherence to appropriate trauma call activation, in accordance with local TTAC*.
   This should include a focus on both under-triage and over-triage of trauma patients. Under-triage may expose a patient to treatment delays and risk of harm, while over-triage may result in unnecessary diversion of valuable resources and alarm fatigue.
   Numerical targets of under-triage and over-triage are set by some institutions, but it is recommended that if these are adopted they are devised in consideration of local context and resources.
2) *Outcomes of patients undergoing trauma call activation*
   It is worthwhile to assess the injury details, interventions, and outcomes for patients undergoing trauma call activation. It is also helpful to understand whether there are patients who do not meet TTAC but have severe injuries, undergo trauma admission or require urgent intervention. These considerations may inform future changes to TTAC.

4.8 Feedback

The QTCN is committed to quality improvement practices and welcomes all feedback related to this document via email: QldTraumaNetwork@health.qld.gov.au.

Appendix 1: Example list of teams included in a trauma respond

(Tier 1 - full, hospital wide TTAC)

The following list should be considered within the local context, based on resources and services available. Depending on local systems, for the clinical teams, a registrar, a consultant, or both registrar and consultant may be the initial point of contact upon activation. Regardless of the initial contact point, consultant level decision making is required in the management of critically ill trauma patients and, as such, it is expected that consultants are notified and involved in the Trauma Respond process.

As noted in Section 4, it is crucial that there is a clear process for activation and communication, with contact details for all persons listed.

Suggested teams that are activated

- Emergency Department team
- Surgical team
- Anaesthetic team
- Intensive Care Unit team
- Orthopaedic team
- Trauma service/team
- Surgical subspecialty teams available locally (e.g. Ear Nose and Throat, Neurosurgical, Cardiothoracics and Vascular teams) when attendance is clinically indicated
- Radiographer
- Laboratory staff (blood bank)
- Operating theatre Team Leader
- Social Worker
- Nurse Manager (bed manager)
- Operational Services supervisor

Local processes will stipulate which of these teams are activated to respond and attend the emergency department versus be notified to activate the system response. This should be clearly outlined in the local TTAC, with orientation processes to new or rotational staff to ensure they are aware of the activation process and expectations for response.

Special considerations:

- Paediatrics: local paediatric team, social worker / pastoral care
- Older persons: local geriatric team, palliative care team consultation where appropriate
- Obstetrics (gestation >20 weeks): local obstetric team, paediatric (or neonatal) team

Appendix 2: Trauma alert criteria

(Tier 2, limited/ED trauma team activation)

Note: There is no clear evidence on specific injury patterns and/or mechanism of injury to guide trauma alert criteria, therefore these should be interpreted accordingly and utilised according to local requirements.

Injury Pattern		
Significant crush injury, blunt or penetrating trauma to any of the following, or		
Head	Significant blunt injury GCS 9-14 Axial load injury	
Face	Significant facial trauma	
Neck	Significant blunt neck injury	
Spine	Any suspected spinal cord injury*	
Chest	Multiple rib fractures Significant blunt chest trauma	
Abdomen	Handlebar injury / pinning or entrapment / positive FAST scan	
Pelvis	Suspected pelvic fracture	
Limbs	Severe injury / pinning or entrapment / degloving injury / distal traumatic amputation / compound long bone fracture / >2 long bone fractures / vascular compromise]	
Special Considerations	Pregnancy >20weeks Age >65years Patient on anticoagulation or bleeding disorder Abnormal vital signs	Severe assault Significant comorbidities or severe disability Aeromedical transfer from scene Concerning injury mechanism < 24 hours
Mechanism of injury		
Fall	>3m or twice height of child	
Motor vehicle crash	≥ 60km/hr Rollover or ejection Fatality in vehicle Extrication > 30 minutes	
Motorbike crash (including quadbikes)	>30km/hr Crushed or pinned Rollover	
Bicycle crash (including E-personal mobility devices)	>20km/hr Significant impact	
Pedestrian	Pedestrian vs vehicle	
Water sport injury	> 30km/hr Significant impact	
Animal	Large animal related injury (e.g. horse or cow)	
Burns	>20% TBSA burns* Inhalation burns Explosion / blast injury	
Drowning, hanging or non-fatal strangulation		

* Burns and suspected spinal cord injury are noted in both criteria, and individual facilities should consider which level of local trauma response is most appropriate for these injuries.

Appendix 3: Trauma respond criteria

(Tier 1, hospital wide trauma team activation)

Trauma Respond activation occurs upon any single criteria being met

Note: **Bold** criteria are recommended for all facilities. All other criteria should be considered in the context of available local resources, skills and expertise.

	Physiology compromised	Pre-arrival treatment
Airway	**Airway compromised**	Intubation
Breathing	Respiratory rate <10 or >24 **Respiratory distress post intervention (analgesia, oxygen etc.)**	Thoracostomy Assisted ventilation
Circulation	**Systolic blood pressure <90mmHg** **Heart rate <50 or >130** **Traumatic cardiac arrest**	**Resuscitative thoracotomy** **Blood product** **Inotrope requirement**
Deficit / Disability	GCS < 9 Signs of spinal cord injury	

Injury pattern or mechanism of injury	
Penetrating injury	**Penetrating injury and haemodynamically unstable** Penetrating injury to the neck / chest / abdomen / pelvis / junctional zones
FAST scan	**Positive FAST and haemodynamically unstable**
Limbs	**Amputation proximal to wrist or ankle and haemodynamically unstable** **Major crush injury or mangled limb**
Burns	>20% TBSA Airway burns

Other
Other considerations according to local criteria, may include: - **Discretion of Emergency Physician** - Multiple concurrent trauma patients - Significant trauma in pregnancy ≥20 weeks

Paediatric physiology to trigger trauma respond (QCH guideline, v4.0, 2021)			
	Infant < 1 year	**Child 1-11 years**	**Child > 12 years**
Respiratory rate	>50	>40	>30
Hypotension (SBP)	<65mmHg	<75mmHg	<90mmHg
Pulse rate	>170	>150	>130
Conscious state	GCS <9 AVPU – pain / unresponsive	GCS <9 AVPU – pain / unresponsive	GCS <9 AVPU – pain / unresponsive

Abbreviations

AVPU	Alert/Verbal/Pain/Unresponsive
ED	Emergency Department
ETEK	Emergency Triage Education Kit
FAST	Focused Assessment with Sonography in Trauma
GCS	Glasgow Coma Scale
QAS	Queensland Ambulance Service
QCH	Queensland Children's Hospital
RSQ	Retrieval Services Queensland
SBP	Systolic Blood Pressure
TBSA	Total Body Surface Area
TTAC	Trauma Team Activation Criteria

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Consultation

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Queensland Emergency Department Strategic Advisory Panel
Queensland Surgical Services Clinical Network
Statewide Anaesthesia and Perioperative Care Clinical Network
Queensland Intensive Care Clinical Network
Queensland General Medicine Clinical Network
Queensland Rural and Remote Clinical Network
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