MODEL OF CARE

NSW Institute of Trauma and Injury Management

Improving the Quality of Trauma Care in NSW:

Trauma Services Model of Care

2019

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Abbreviations

ACI	Agency for Clinical Innovation
ACS	American College of Surgeons
CNC	Clinical nurse consultant
CNS	Clinical nurse specialist
FTE	Full-time equivalent
ICU	Intensive care unit
ISS	Injury Severity Score
ITIM	Institute of Trauma and Injury Management
LHD	Local health district
MTS	Major Trauma Service
NSQHS	National Safety and Quality in Health Service
NSW	New South Wales
PTS	Paediatric Trauma Service
RACS	Royal Australasian College of Surgeons
RTS	Regional Trauma Service
SAC	Severity Assessment Code
TORQUE	Trauma Outcomes Registry and Quality Evaluation
TPOE2	Trauma Patient Outcome Evaluation

Supporting documents

- NSW Health. Selected Specialty and Statewide Service Plans: NSW Trauma Services (2009)
- NSW Health. Guide to the Role Delineation of Clinical Services (2018)
- NSW Health. Critical Care Tertiary Referral Networks and Transfer of Care (Adults) PD 2018_11
- NSW Health. Critical Care Tertiary Referral Networks (Paediatrics) PD 2010_030
- NSW Health. Critical Care Tertiary Referral Networks (Perinatal) PD 2010_069
- Royal Australasian College of Surgeons (Aug 2018). Model Resource Criteria for Level I, II, III & IV Trauma Services in Australasia
- NSW Institute of Trauma and Injury Management. Trauma Patient Outcome Evaluation Qualitative Report. NSW Agency for Clinical Innovation, 2016
- Australian Commission on Safety and Quality in Health Care (November 2017). National Safety and Quality Health Service Standards, Second Edition
- NSW Institute of Trauma and Injury Management. A Guide to the NSW Trauma Process Indicators. NSW Agency for Clinical Innovation, 2017
- Rehabilitation Network. NSW Rehabilitation Model of Care. NSW Agency for Clinical Innovation, 2015

Important note

The scope of this document is limited to describing the resourcing, activity and performance of designated NSW trauma services in the acute care hospital phase. It is acknowledged that this does not encompass all aspects of trauma care such as pre-hospital, rehabilitation or community based care. As such, this document should read and considered in conjunction with other key supporting documents as listed above.

The criteria outlined within this document represent model of care standards for designated trauma hospitals in NSW to meet minimum requirements and functions. Trauma hospital designation is determined by the NSW Ministry of Health in *Selected Specialty and Statewide Service Plans: NSW Trauma Services* (NSW Trauma Plan).[1]

The following document provides a framework by which the NSW Institute of Trauma and Injury Management specifically and the Agency for Clinical Innovation (ACI) as a whole can assess resourcing, activity and performance of designated trauma services.

Executive summary

Trauma services coordinate and ensure the highest level of care for trauma patients admitted to hospitals across NSW. To fulfil these functions, trauma services need to be adequately staffed and resourced. The *Trauma Patient Outcome Evaluation Qualitative Report (2016)* was a needs analysis conducted in consultation with all trauma services, local health district (LHD) and hospital executives and other stakeholders. The analysis identified substantial variation in staffing and models of care in trauma centres across NSW[2], and this has been associated with unwarranted clinical variation with respect to separately reported major trauma mortality rates.[20]

This document is a response to the *Trauma Patient Outcome Evaluation Qualitative Report (2016)* and aims to address gaps in service delivery by outlining performance, responsibilities and expectations of trauma services. It provides a basis for NSW Health pillars, LHDs, specialty health networks, and external accreditation agencies to assess local resourcing requirements and functional activity of trauma services. The document represents the structural component of an overarching statewide trauma quality improvement program comprising the NSW Trauma Outcomes Registry and Quality Evaluation (NSW TORQUE) and the Trauma Death Monitoring and Review programs. These have been identified as key enablers to address gaps in trauma care delivery in NSW. Addressing these gaps is expected to result in improved access to specialist trauma care particularly in rural and regional NSW, increased ability to meet performance and quality improvement standards, and ultimately leading to a reduction in unwarranted clinical variation across the NSW trauma system.

Contents

Introduction

Expert trauma doctors and nurses are required in designated trauma centres to provide clinical care to severely injured patients, provide clinical continuity and leadership with respect to governance and quality improvement and ensure the highest possible quality of care is maintained throughout the patient journey to recovery. This document is designed to assist trauma services and the ACI to identify and address gaps in trauma service staffing and care delivery, so that all trauma services across NSW meet minimum standards of clinical service delivery.

The NSW Institute of Trauma and Injury Management (ITIM) will regularly review and update the Trauma Services Model of Care in consultation with Trauma Services, LHDs and the Ministry of Health, to ensure appropriate models of care are employed to support trauma care in and after hours, and that emerging evidence of alternative models of care, such as geriatric trauma care coordination and trauma nurse practitioners, are taken into account.

Background

Trauma remains the single most common cause of morbidity and mortality in NSW in people less than 40 years of age.[3] The NSW trauma system was formally established in 1991 to help severely injured patients receive timely access to the most appropriate level of trauma care. The primary goal of the trauma system is to optimise patient survival and recovery after severe injury. Designated trauma centres are a central part of the trauma system. This is where patients receive specialist level acute surgical and critical care, backed by the full resources and capabilities of tertiary level or rural base hospitals.

Substantial scientific and empirical evidence demonstrates that appropriately resourced and verified trauma centres, operating in the context of regionalised and inclusive trauma systems, are associated with improved patient outcomes.[4-7] Adequate trauma clinical staffing to minimum standards ensures appropriate clinical care standards and indicators are being met and that multidisciplinary trauma education, data management and quality improvement initiatives can be implemented effectively.

The model of care for trauma services described in this document are based on the Ministry of Health *Selected Specialty and Statewide Service Plans: NSW Trauma Services (2009)* (NSW Trauma Plan), *Guide to Role Delineation of Clinical Services (2017)* and the *Trauma Verification Model Resource Criteria (2018)* published by the Royal Australasian College of Surgeons (RACS).[1,8-9]

Cost of trauma

Beyond the significant personal and social costs of trauma, the financial cost for traumatic injury related healthcare in Australia is estimated at $4.1 billion annually, or 9% of total health expenditure, second only to cardiovascular disease.[14]

The cost of trauma is not limited to the individual or the health system, but also impacts the broader economy, where the annual cost of traumatic injury to the Australian economy has been estimated at $18 billion annually.[15]

Health context for Aboriginal people

In Australia, Aboriginal people are twice as likely to sustain serious injuries and twice as likely to die from these injuries as non-Aboriginal people. These rates have been increasing, with traumatic injuries accounting for the fourth largest cause of disability-adjusted life years, only superseded by cardiovascular disease, mental health and substance abuse and cancer.[16] In NSW traumatic injury related admissions and mortality is consistent with data reported from the Australian Institute of Health and Welfare.[17]

NSW Health is committed to closing the gap in health outcomes between Aboriginal and non-Aboriginal people.

Designated trauma services and networks

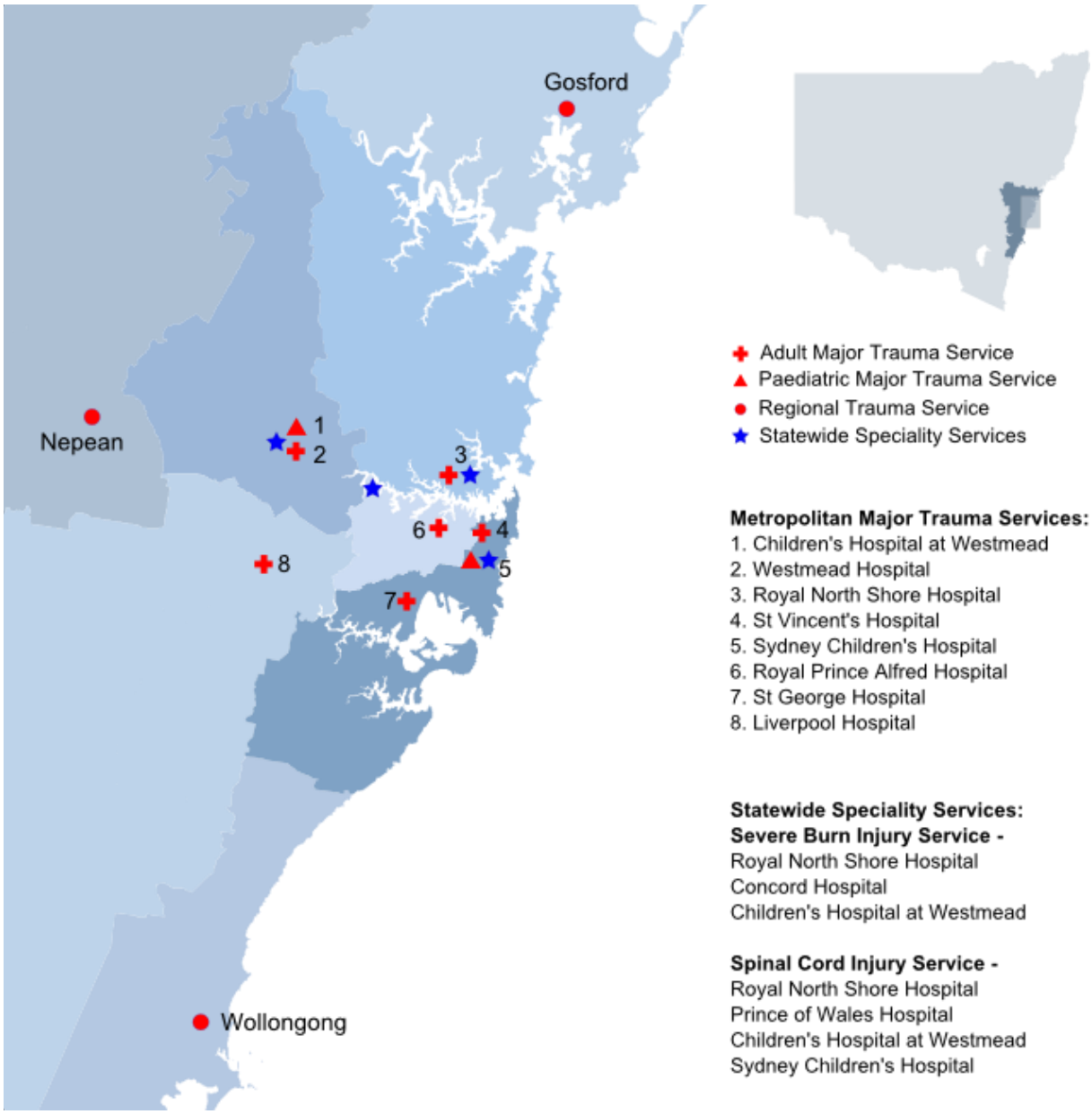
The NSW trauma system provides a coordinated and systematic means of identifying and managing patients who have, or potentially have, suffered serious injury. A core component of the trauma system is the acute and post-acute care services provided by facilities with designated trauma services. Trauma services provide expert care for injured patients, coordinating the multidisciplinary teams and advocating for patients, both within the acute and rehabilitative phases.

The NSW trauma system comprises three levels of trauma service (Figures 1 and 2):

- major trauma services (adult and paediatric)
- regional trauma services
- local hospitals.

Figure 1. NSW rural and regional trauma services

Figure 2. NSW metropolitan trauma services (breakout map)



Major Trauma Services (Level 1)

Major Trauma Services (MTS) must be capable of providing the full spectrum of care for the most critically injured patients, from initial resuscitation, access to definitive care, through to rehabilitation and discharge. These hospitals provide a full range of specialist services and critical care capabilities and provide both local and statewide leadership on trauma research, quality improvement and clinical governance. Each MTS acts as a hub for larger referral networks across NSW and provides resources and education to support acute care facilities within those networks. The MTS is expected to deliver the highest possible level of trauma care and is equivalent to a Level 1 trauma centre as defined by the RACS *Trauma Verification Model Resource Criteria*.[9]

According to the *Resources for the Optimal Care of the Injured Patient (2014)* published by the American College of Surgeons (ACS) Committee on Trauma, Level 1 trauma centres are expected to treat at least 240 severe to critically injured trauma patients (Injury Severity Score greater than 15) each year.[10] Although there is conflicting evidence regarding the effect of volume on outcomes, this caseload provides an indication of the volume required to sustain a viable trauma service and required staffing as outlined in this document.

The NSW Trauma Plan identifies six adult and three paediatric designated MTS.[1] Subsequent to the release of the plan, St Vincent's Hospital was approved as an adult MTS in early 2010, bringing the total to seven.

Adult MTS

- John Hunter Hospital
- Liverpool Hospital
- Royal North Shore Hospital
- Royal Prince Alfred Hospital
- St George Hospital
- St Vincent's Hospital
- Westmead Hospital

Paediatric MTS

- John Hunter Children's Hospital
- Sydney Children's Hospital
- The Children's Hospital at Westmead

Regional Trauma Services (Level 2-3)

A Regional Trauma Service (RTS) can provide all aspects of care to patients with minor to moderate trauma and definitive care to a limited number of major trauma patients in collaboration with the MTS. The RTS provides initial assessment, stabilisation, definitive care, and can initiate transfer to an MTS, where clinically appropriate. The RTS also provides local and regional trauma expertise and leadership as well as support for statewide trauma initiatives. An RTS is equivalent to a Level 2-3 trauma centre as defined by the RACS *Trauma Verification Model Resource Criteria*, recognising that the facilities may have varying levels of clinical capability including the provision of emergency surgery.

The NSW Trauma Plan identifies ten designated RTS facilities in NSW:

- Coffs Harbour Base Hospital
- Gosford Hospital
- Lismore Base Hospital
- Nepean Hospital
- Orange Health Service
- Port Macquarie Base Hospital
- Tamworth Rural Referral Hospital
- The Tweed Hospital
- Wagga Wagga Rural Referral Hospital
- Wollongong Hospital.

Trauma and critical care referral networks

The NSW trauma system is a networked system of hospitals designed to provide various levels of trauma management across the metropolitan, regional and rural settings, in order to deliver definitive trauma care to all injured patients across NSW.

Most of the MTS facilities are networked with one or more RTS facilities and associated referring local health districts (LHDs) as outlined in Tables 1-3.

Trauma networks are closely aligned with the NSW Critical Care Tertiary Referral Networks. They define the links between LHDs and tertiary referral hospitals, and are largely determined by the location of the MTS and the imperative to achieve early clinical intervention for seriously injured patients. The networks take into account established clinical referral relationships, which may include referral patterns across LHD boundaries and cross jurisdictional state border arrangements.

Referral pathways for critically injured or time urgent trauma patients are dictated by the following NSW Ministry of Health policy directives:

- NSW Critical Care Tertiary Referral Networks and Transfer of Care (Adults) PD 2018_11
- Critical Care Tertiary Referral Networks (Paediatrics) PD 2010_030
- Critical Care Tertiary Referral Networks (Perinatal) PD 2010_069.[11-13]

The performance requirements of the trauma services in relation to their trauma and critical care referral network are outlined in Table 4.

Table 1. NSW adult trauma and critical care networks

NSW Adult Trauma and Critical Care Networks		
MTS (Level 1)	**Networked RTS (Level 2-3)**	**Referring LHD**
John Hunter Hospital	Coffs Harbour Lismore Port Macquarie Tamworth Tweed Heads	Hunter New England LHD Mid North Coast LHD Northern NSW LHD[i]
Liverpool Hospital	N/A	South Western Sydney LHD
Royal North Shore Hospital	Gosford	Northern Sydney LHD Central Coast LHD
Royal Prince Alfred Hospital	N/A	Sydney LHD Western NSW LHD (critical care)[ii] Far West NSW LHD (critical care)[ii]
St George Hospital	Wollongong Wagga Wagga	South Eastern Sydney LHD Illawarra Shoalhaven LHD Southern NSW LHD[iii] Murrumbidgee LHD[iv]
St Vincent's Hospital	N/A	Murrumbidgee LHD (critical care)[v]
Westmead Hospital	Nepean Orange	Western Sydney LHD Nepean Blue Mountains LHD Western NSW LHD (trauma)[ii] Far West LHD (trauma)[ii, vi]

[i] Owing to proximity, hospitals within the Northern NSW LHD maintain a clinical referral network with Queensland.

[ii] Western NSW LHD and Far West LHD have a split critical care and trauma referral network, where critical care patients are networked with Royal Prince Alfred Hospital and trauma patients with Westmead Hospital.

[iii] The Canberra Hospital maintains a referral network for the following hospitals: Batemans Bay, Batlow, Bega, Bombala, Boorowa, Braidwood, Cooma, Crookwell, Delegate, Goulburn, Moruya, Pambula, Queanbeyan, Tumut, Yass and Young.

[iv] Owing to proximity, Albury Hospital maintains a clinical referral network with Victoria.

[v] St Vincent's Hospital maintains a critical care referral network with Murrumbidgee LHD but does not maintain trauma referral network.

[vi] Owing to proximity, Broken Hill Hospital maintains a referral network with South Australia.

Table 2. NSW paediatric trauma networks

NSW Paediatric Trauma Service Networks		
PTS (Level 1)	**Child Health Network**	**Referring LHD**
John Hunter Children's Hospital	Northern	Hunter New England LHD Mid North Coast LHD Northern NSW LHD[vii]
Children's Hospital at Westmead	Western	South Western Sydney LHD (Liverpool, Fairfield) Sydney LHD (Concord) Nepean Blue Mountains LHD Western Sydney LHD Northern Sydney LHD (Hornsby, Ryde) Central Coast LHD (Gosford, Wyong) Western NSW LHD Far West LHD[viii]
Sydney Children's Hospital	Greater Eastern and Southern	South Eastern Sydney LHD Illawarra Shoalhaven LHD Northern Sydney LHD (Northern Beaches, Royal North Shore) Sydney LHD South Western Sydney LHD (Bankstown, Bowral, Camden, Campbelltown) Sydney LHD (Canterbury) Southern NSW LHD[ix] Murrumbidgee LHD[x] Australian Capital Territory (ACT)

[vii] Owing to proximity, referrals from the Northern NSW LHD may go to Brisbane.

[viii] Owing to proximity, referrals from the Far West LHD may go to Adelaide.

[ix] Owing to proximity, referrals from the Southern NSW LHD may go to Royal Children's Melbourne.

[x] Owing to proximity, Albury Hospital maintains a clinical referral network with Victoria.

Cross border patient flow and arrangements

Owing to proximity, some facilities may refer major trauma patients to an interstate trauma service or specialty service.

Table 3. Interstate trauma referral patterns

INTERSTATE TRAUMA REFERRAL PATTERNS		
MTS (LEVEL 1)	**PTS (LEVEL 1)**	**REFERRING FACILITIES / LHD**
Gold Coast University Hospital	Queensland Children's Hospital	Northern NSW LHD
The Canberra Hospital	Sydney Children's Hospital	Southern NSW LHD Batlow / Adelong Multi-Purpose Service Boroowa Multi-Purpose Service Murrumburrah-Harden Hospital Tumut Hospital Young Hospital
The Alfred Hospital Royal Melbourne Hospital	Royal Children's Hospital	Barham Health Service Deniliquin Health Service Finley Hospital Tocumwal Multi-Purpose Service Berrigan Health Service Corowa Health Service Holbrook Health Service Culcairn Multi-Purpose Service
Royal Adelaide Hospital	Women's and Children's Hospital	Far West LHD

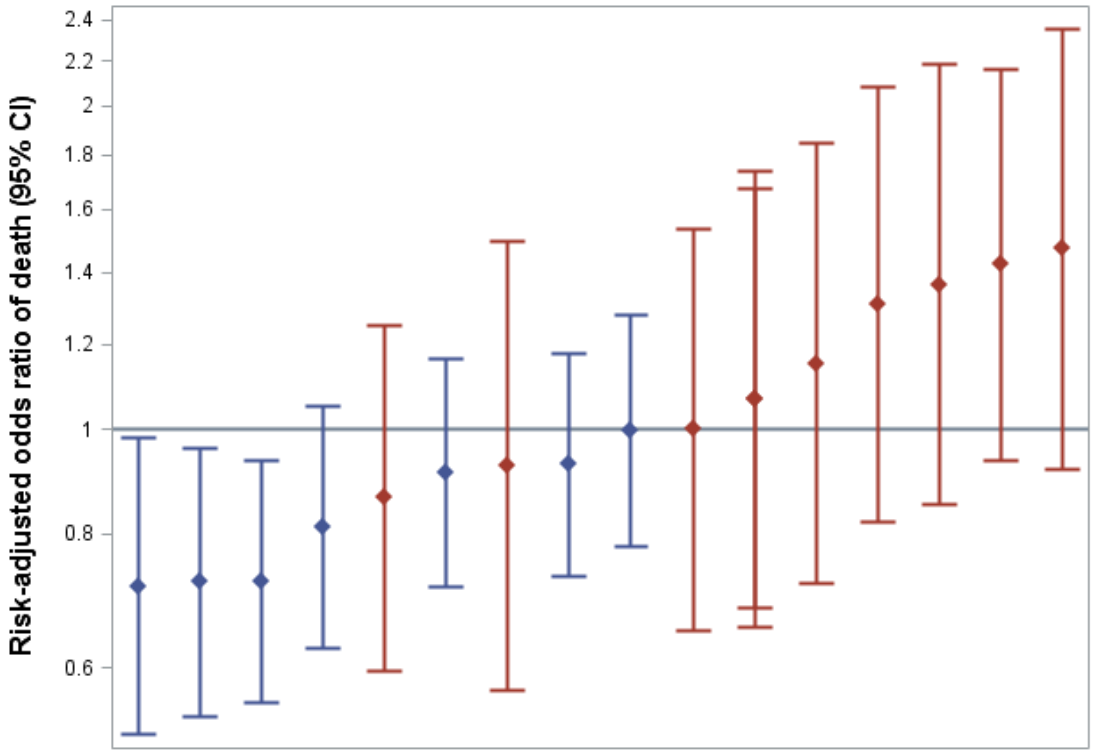
Known issues

An audit of NSW trauma services conducted by ITIM in 2016 culminated in the *NSW Trauma Patient Outcome Evaluation Qualitative Report* (TPOE2).[2] This report detailed staffing and model of care arrangements across all trauma services in NSW and served as a needs-analysis for future trauma service planning. Although recurrent funding for trauma services was allocated by the Ministry of Health in 2009 to meet staffing levels in accordance with the NSW Trauma Plan, the TPOE2 report revealed considerable variation in clinical staffing and models of care employed across all levels of trauma service. Many of these variations were related to local service arrangements and reflected varying interpretations of the NSW Trauma Plan document.

Current scientific evidence suggests that low levels of trauma service resourcing is strongly associated with poorer patient outcomes.[4-7,18] This is supported by empirical data from NSW, particularly with respect to regional trauma services shown in the figure below.[19] Risk adjusted mortality after major trauma is highest in RTSs (see red bars, Figure 3), with up to 30% variation in this outcome between the best and worst performing centres.[20]

Figure 3. Risk adjusted odds ratio for in-patient death after major trauma (ISS>12) across designated NSW trauma hospitals

Blue bars are major trauma services and red bars are regional trauma services.



Source: Figure 3 courtesy of Gomez D, Sarrami P, Hsu J, et al. External benchmarking of trauma services in *New South Wales: Risk-adjusted mortality after moderate to severe injury from 2012 to 2016*. Injury, accepted in press 2018.[20]

The importance of specialist trauma clinicians in NSW

Trauma clinicians are crucial to the functioning of designated trauma centres through provision of the following.

1. Clinical leadership – Provision of senior medical and nursing expertise in acute trauma care of severely injured patients.
2. Clinical continuity and discharge planning – Ensuring severely injured patients are managed and followed up appropriately during their inpatient stay, and continuity of care is provided seven days a week to reduce the rate of complications (such as thromboembolism or wound infections) and inpatient length of stay.
3. Quality improvement – Ensuring the highest standards of care are maintained across the organisation through various initiatives such as education and collection of data for national and statewide quality improvement programs.
4. Care coordination – Ensuring care is coordinated across LHDs and critical care referral networks in accordance with Ministry of Health policy directives, and providing clinical expertise and resource for patients within these referral networks.

ITIM acknowledges that since 2009 the context for trauma services has evolved, including population increases, increases in major trauma activity particularly among older and more complex trauma patients. This necessitates the following review of trauma services' models of care to ensure delivery of optimal multidisciplinary trauma care. For example, since 2009 several major trauma services have experienced increased major trauma volume by 50-100% which has had implications for trauma care coordination and data collection capabilities. It is also recognised that quality improvement and research are pivotal to the translation of research findings and ensuring best practice is being delivered consistently.

To address these needs, this document incorporates contemporary approaches to trauma care and provides a basis, from a NSW trauma system perspective, from which the ACI can assess whether trauma services are adequately resourced to meet service requirements and established quality standards.

Minimum resourcing and performance of NSW trauma services

All trauma services in NSW must fulfil a number of core requirements and functions in keeping with statewide expectations and the National Safety and Quality in Health Service (NSQHS) Standards.[21]

Performance framework

Trauma patients are by nature complex and often require time critical interventions to ensure optimal outcomes. Treatment for major trauma patients requires the coordinated efforts of many agencies, disciplines and specialties. Trauma systems were established to ensure that care for the severely injured is delivered across the state in a coordinated fashion and that severely injured patients can access high level specialist trauma care from wherever they are injured. Key to this is ensuring that all designated trauma services are functioning at a consistent level and contributing to statewide quality improvement programs, which are necessary to monitor and improve outcomes for trauma patients across NSW.

By being a recognised centre for excellence in trauma, designated trauma facilities have responsibilities to their patients, LHD and the NSW trauma system. These responsibilities involve not just direct clinical care, but also clinical leadership in the form of statewide trauma system engagement, quality improvement, education and research. At a minimum, these responsibilities are summarised and mapped to relevant NSQHS Standards in Table 4. This is to ensure that minimum performance requirements across trauma services in NSW align with consumer expectations and current national standards for the provision of health care.

Table 4. Quality improvement and performance framework of NSW trauma services

QUALITY IMPROVEMENT AND PERFORMANCE FRAMEWORK					
DOMAIN	**DESCRIPTION**	**NSQHS STANDARD**	**MTS** (LEVEL 1)	**PTS** (LEVEL 1)	**RTS** (LEVEL 2-3)
Clinical leadership	• Access to consultant level clinical leadership and supervision of trauma team resuscitations in the emergency department 24 hours 7 days a week • Admission of all trauma patients under trauma specialist on call, with a hospital-wide trauma admission policy [xi,xii] • Evidence of tertiary surveys by admitting trauma team documented within medical records • Daily multidisciplinary and trauma consultant led ward rounds on all patients admitted under the trauma service	• 5.10 – Screening of risk • 5.11 – Clinical assessment • 5.12 and 5.13 – Developing the comprehensive care plan • 6.7 and 6.8 – Clinical handover • 6.9 and 6.10 – Communicating critical information • 6.11 – Documentation of information	Essential	Essential	Essential

[xi] Admission of all complex, multi-system and critically injured patients under a trauma consultant-led specialist service.

[xii] Trauma Specialist defined as any medical or surgical specialist who is responsible to the trauma clinical stream director and participates in the trauma on-call roster.

QUALITY IMPROVEMENT AND PERFORMANCE FRAMEWORK					
DOMAIN	**DESCRIPTION**	**NSQHS STANDARD**	**MTS** (LEVEL 1)	**PTS** (LEVEL 1)	**RTS** (LEVEL 2-3)
Discharge planning and care coordination	• Care coordination provided by a senior trauma nurse or case manager • Documented record of case management reviews, specialty consultations and interventions arranged by the trauma team for each trauma admission • Ensure timely referral and transfer of care to specialty rehabilitation service • Provision of weekly trauma service led and multi-disciplinary follow up clinics	• 1.16, 1.17 and 1.18 – Healthcare records • 5.14 – Using the comprehensive care plan • 6.11 – Documentation of information	Essential 7 days a week to ensure continuity of care	Essential 5 days a week	Essential 5 days a week

Quality improvement and data collection	• Trauma minimum dataset (including process indicators) submitted to ITIM within three calendar months of admission for those patients who meet the NSW trauma minimum dataset inclusion criteria • Monthly summary report of trauma volume, case-mix and in-patient mortality for each facility • Participate in the collection and entering of data for the NSW Trauma Outcomes Registry and Quality Evaluation (TORQUE) database • Evidence of local trauma policies relating to the following: trauma team activation protocol; code crimson and massive transfusion protocols; head injury; cervical spine assessment; trauma imaging protocols; trauma admission and inter-hospital trauma network transfer policies • Reporting of local and statewide process (key performance) indicators • Participation in local and statewide quality improvement projects and audits • Ensuring compliance with mandatory training and credentialing requirements for clinical staff within trauma service • Participates in hospital accreditation processes in relation to trauma service provision	• 1.6 – Clinical leadership • 1.7 - Policies and procedures • 1.8 - Measurement and quality improvement • 1.10 - Risk management • 1.11 Incident management systems and open disclosure • 1.13 – Feedback and complaints management • 1.20 – Safety and quality training • 1.23 and 1.24 – Credentialing and scope of clinical practice • 1.25 and 1.26 – Safety and quality roles and responsibilities • 1.27 – Evidence-based care • 1.28 – Variation in clinical practice and health outcomes • 5.1, 6.1, 7.1 and 8.1 – Integrating clinical governance • 5.2, 6.2, 7.2 and 8.2 – Applying quality improvement systems • 5.4 – Designing systems to deliver comprehensive care • 7.4 – Optimising and conserving patients' own blood • 7.6 – Prescribing and administering blood and blood products • 8.4 and 8.5 – Recognising acute deterioration • 8.6, 8.7, 8.8 and 8.9 – Escalating care • 8.10, 8.11, 8.12 and 8.13 – Responding to deterioration	Essential In addition, evidence of hospital wide and district wide trauma quality improvement program	Essential In addition, evidence of hospital wide and district wide trauma quality improvement program	Essential

QUALITY IMPROVEMENT AND PERFORMANCE FRAMEWORK					
DOMAIN	**DESCRIPTION**	**NSQHS STANDARD**	**MTS** (LEVEL 1)	**PTS** (LEVEL 1)	**RTS** (LEVEL 2-3)
Clinical governance	• Monthly trauma morbidity and mortality meetings with terms of reference and a record of minutes and actions submitted to facility patient safety and quality units • Notification of all preventable (Severity Assessment Code (SAC) 1) and potentially preventable trauma deaths and adverse events through incident management systems • Submission of all trauma deaths to NSW ITIM Clinical Review Committee for peer review via the Clinical Excellence Commission death review database[xiii] • Membership of other relevant local and statewide committees, including Disaster, Blood Product Management, Operating Theatre Management and Radiology committees • Evidence of regular audits showing compliance with statewide Critical Care Referral policy and related specialty network transfers and support for trauma, spinal, burns and brain injury referral pathways and models of care	• 1.7 – Policies and procedures • 1.8 and 1.9 – Measurement and quality improvement • 1.10 - Risk management • 1.11 – Incident management systems and open disclosure • 1.27 – Evidenced-based care • 1.28 – Variation in clinical practice and health outcomes	Essential	Essential	Essential

[xiii] See the Clinical Excellence Commission *Death screening and review tools* webpage for more information.

QUALITY IMPROVEMENT AND PERFORMANCE FRAMEWORK					
DOMAIN	**DESCRIPTION**	**NSQHS STANDARD**	**MTS** (LEVEL 1)	**PTS** (LEVEL 1)	**RTS** (LEVEL 2-3)
Education	• Provision of education on trauma care at local, regional and statewide levels • Participation in trauma team training and related simulation-based trauma training sessions • Documentation of trauma clinical staff compliance with mandatory training and trauma specific online training modules	• 1.20 – Safety and quality training • 1.23 – Credentialing and scope of clinical practice	Essential	Essential	Essential
Research	• Support and participate in local, regional and statewide trauma research projects • Proven track record in trauma research publications and collaboration with other trauma stakeholders	• 1.27 – Evidence-based care • 1.28 – Variation in clinical practice and health outcomes	Essential In addition, evidence of trauma research capacity through external and competitive grant schemes Leadership of trauma research projects forums	Essential In addition, evidence of trauma research capacity through external and competitive grant schemes Leadership of trauma research projects forums	Essential

QUALITY IMPROVEMENT AND PERFORMANCE FRAMEWORK					
DOMAIN	**DESCRIPTION**	**NSQHS STANDARD**	**MTS** (LEVEL 1)	**PTS** (LEVEL 1)	**RTS** (LEVEL 2-3)
Trauma network support	• Second monthly trauma / critical care network meetings to be co-chaired by the network trauma directors. Meetings to include morbidity and mortality reviews • Provision of a clinical advisory service for all facilities within trauma referral networks • MTS/PTS support and attendance at annual trauma education events held at networked trauma services, such as the ITIM trauma evening events. • MTS/PTS support and attendance at trauma team training programs held at networked trauma services • Provision of support for follow-up of trauma patients using the TORQUE framework and timely access to specialist advice	• 1.20 – Safety and quality training • 1.25 – Safety and quality roles and responsibilities • 1.28 – Variation in clinical practice and health outcomes • 1.6 – Clinical leadership • 1.7 – Policies and procedures • 5.11 – Clinical assessment • 6.4 – Organisational processes to support effective communication • 6.9 and 6.10 – Communicating critical information • 8.6, 8.7, 8.8 and 8.9 – Escalating care • 8.10, 8.11, 8.12 and 8.13 – Responding to deterioration	Essential Evidence of supra LHD trauma leadership and coordination	Essential Evidence of supra LHD trauma leadership and coordination	Essential Evidence of LHD coordination

Trauma service core requirements

Trauma service structure and core functional requirements are outlined in Table 6. It is acknowledged that some role descriptions are interchangeable and flexibility is required to cover leave. LHDs should ensure that these core requirements of trauma services, including quality of care initiatives, research, and clinical education needs are consistently with appropriate clinical staffing levels and seniority required to provide trauma expertise.[9,10] A guide to appropriate staffing levels typically required to maintain this level of clinical service and quality improvement is available in the appendix and on discussion with ITIM as part of the implementation package.

ITIM recognises that trauma service models of care may vary based on local needs, from formal inpatient units to purely consultative services. The following provides a guide to core minimum requirements and functions of trauma services and the clinical roles and designations required to fulfil them.

Table 5. Matching NSQHS Standards for trauma service staffing requirements

Action number(s)	Item
1.22 and 1.23	Credentialing and scope of clinical practice
1.25 and 1.26	Safety and quality roles and responsibilities
1.27	Evidence-based care
1.28	Variation in clinical practice and health outcomes
5.5 and 5.6	Collaboration and teamwork

Table 6. Trauma service structure (per service)

TRAUMA SERVICE STRUCTURE AND ROLE DESCRIPTION	
POSITION	**ROLE DESCRIPTION**
Trauma Director (Fellow in recognised Specialist College with a subspecialty qualification or demonstrated clinical, research and education interest in trauma management)	• Provides medical leadership, governance and direction with respect to trauma care at local, regional and statewide levels • Available on-site to lead trauma team resuscitation, daily trauma clinical rounds and supports relevant on-call arrangements • Ensures the highest quality of care is delivered to all patients admitted under the trauma service on a daily basis, including compliance with all local and statewide policies and processes of care • Chairs or contributes substantially to monthly hospital and network trauma committees • Engages with monthly NSW ITIM and national trauma committees • Engages in trauma-related research on local, regional and statewide levels • Leads clinical governance and quality improvement activities including monthly morbidity and mortality reviews • Leads weekly multidisciplinary trauma unit meetings and education sessions • Supervises medical and nursing staff working under the trauma service, including team evaluations and performance reviews • Engages in medical student and post graduate education and training in trauma management • Engages in other hospital committees related to trauma care (Disaster, Blood Transfusion Management, Radiology) to improve stakeholder engagement and trauma advocacy • Maintains clinical practice and professional development relevant to trauma practice and relevant area of specialisation
Deputy Trauma Director* (or Co-Director Model – as per Trauma Director)	• Assists with above trauma director roles with respect to role delegation and ensuring adequate senior medical coverage on a daily basis for trauma patients at Major Trauma Centres • Participates in trauma team resuscitation, trauma clinical rounds on a daily basis and participates in relevant on-call arrangements • Provides support for trauma service staff supervision and performance reviews • Participates in trauma research and quality improvement activities

TRAUMA SERVICE STRUCTURE AND ROLE DESCRIPTION	
POSITION	**ROLE DESCRIPTION**
Trauma Fellow/Senior Registrar*	• Works closely with senior clinical staff to deliver clinical care to trauma patients • Ensures patient care meets minimum standards with respect to trauma team resuscitation, post-operative care and clinical documentation • Participates in trauma research and quality improvement activities relevant to their area of expertise and training • Leads trauma unit meetings and clinical rounds on a daily basis • Coordinates trauma education sessions and programs relevant to their area of expertise and training
Trauma Registrar	• Participates in trauma resuscitation and ward management on a daily basis • Conducts trauma tertiary surveys, completes clinical tasks related to routine clinical care on a daily basis supervised by Trauma Director or Deputy Director • Liaises with senior trauma clinical staff regarding clinical issues arising from trauma patient management including discharge planning, transfer of care, analgesia, venous thromboembolism prophylaxis and follow up of imaging and pathology results • Participates and assists with trauma related education for clinical staff and medical students • Participates in trauma research and quality improvement activities relevant to their area of expertise and training
Trauma Coordinator (Clinical Nurse Consultant# or equivalent with a demonstrated post graduate qualification or clinical, research or education interest in trauma management)	• Provides clinical leadership in trauma care at a local, regional and statewide levels on a daily basis • Participates in trauma resuscitation as a senior nursing team leader, daily clinical rounds and case reviews • Ensures that all local and statewide trauma related policies and processes of care are being followed on patients admitted under the trauma service on a daily basis – including tertiary surveys, transfer of care, coordination of subspecialty consultations and discharge planning • Audits compliance with trauma policies for the purposes of quality assurance and facility accreditation purposes using established trauma registries • Leads and coordinates trauma education programs at local, regional and statewide levels • Leads and coordinates weekly trauma nursing in-service sessions for wards and emergency department • Facilitates trauma related research on local, regional and statewide levels • Leads quality improvement activities including morbidity and mortality reviews

TRAUMA SERVICE STRUCTURE AND ROLE DESCRIPTION	
POSITION	**ROLE DESCRIPTION**
District Trauma Coordinator*–as per Trauma Coordinator	• Provides clinical leadership in trauma care across trauma referral networks • Coordinates trauma referral networks and ensures relevant referral pathways are being followed in accordance with Critical Care and Trauma Referral networks • Conducts clinical in-service and education across networked facilities • Audits trauma care at networked facilities and reports on individual and aggregate trauma data at these facilities • Supports trauma research and quality improvement activities across trauma referral networks
Trauma Case Manager (Clinical Nurse Specialist or equivalent#)	• Provides senior nursing support in the emergency department and inpatient units, including intensive care unit required to provide seven day a week senior nursing support and case management for trauma patients • Ensures patient management meets minimum standards and process indicators • Conducts trauma case review and audit of all trauma patients with respect to local and statewide trauma process indicators on a daily basis • Facilitates quality assurance by reviewing cases and abstracting data relevant to local and statewide trauma datasets • Communicates with other trauma service members when clinical issues arise
Quality Improvement and Research Support Officer*	• Assists the trauma service conduct research projects, performs quantitative data analyses relevant to quality improvement and research using the trauma registry • Collates data using screening tool required for statewide trauma death review program and enrolling patients for NSW TORQUE on a weekly basis • Assists with trauma audits and case reviews in relation to clinical incidents • Reports all process and relevant local key performance indicators on a monthly basis to the hospital trauma committee • Assists with data collection for research and quality improvement initiatives at a local and statewide level

TRAUMA SERVICE STRUCTURE AND ROLE DESCRIPTION	
POSITION	**ROLE DESCRIPTION**
Trauma Data Officer	• Ensures data is entered and up to date for all trauma patients meeting minimum dataset criteria on a weekly basis • Abstracts clinical and trauma service documentation required for the statewide trauma registry (NSW TORQUE) and Australian Trauma Registry (ATR) • Ensures data quality and performs validation completeness checks on a monthly basis • Ensures trauma service compliance with current NSW trauma minimum dataset requirements • Performs audits of process indicators on all trauma related admissions • Prepares monthly activity and outcomes reports for hospital trauma committee • Analyses and reporting of local trauma activity and relevant local and statewide process indicators using data from the trauma registry • Queries local trauma registry data and uses related data visualisation tools to generate ad hoc reports as requested by trauma clinicians and quality improvement initiatives
Trauma Service clerical staff*	• Provide administrative support to the trauma service

*Applies to adult MTS only. At RTS and PTS, these roles are fulfilled by Trauma Coordinator and or Trauma Director.

Recommended CNC Level 3 for Trauma Coordinator and CNS Level 2 for Case manager.

Role delineation for hospital service delivery

Role delineation provides a framework describing the minimum support services, workforce and other requirements for the clinical services that support a designated trauma service. These are listed in Table 7 below. Please refer to the *NSW Health Guide to the Role Delineation of Clinical Services (2018)* for a complete description of role delineation classifications for these clinical services.[8] This guide does not delineate trauma services.

Table 7. Recommended role delineation of clinical services at NSW trauma facilities

RECOMMENDED ROLE DELINEATION			
CORE SERVICE	**MTS** (LEVEL 1)	**RTS** (LEVEL 2-3)	**PTS** (LEVEL 1)
Anaesthesia and recovery	Level 6	Level 5	Level 6
Operating suite	Level 6	Level 5	Level 6
Intensive care service	Level 6	Level 5	Level 6
Radiology and interventional radiology	Level 6	Level 5	Level 6
Pathology	Level 6	Level 5	Level 6
CLINICAL SERVICES	**MTS** (LEVEL 1)	**RTS** (LEVEL 2-3)	**PTS** (LEVEL 1)
Emergency department	Level 6	Level 5	Level 6
Cardiothoracic surgery	Level 6	Level 5 or access to Level 6 MTS	-
General surgery	Level 6	Level 5	-
Neurosurgery	Level 6	Level 5 or NPS	-
Orthopaedic surgery	Level 6	Level 5	-
Plastics surgery	Level 6	Level 4-5	-
Vascular surgery	Level 6	Level 4-5	-
Surgery for Children	Level 4	Level 4	Level 6
Rehabilitation medicine	Level 6	Level 4-5	Level 6
Maternity	Level 6	Level 4-5	-
Mental health (adult and older person)	Level 6	Level 4-5	-
Mental health (child and youth)	-	-	Level 6
Geriatric medicine	Level 6	Level 5	-
Paediatric medicine	Level 4	Level 4	Level 6
Aboriginal health	Level 6	Level 4	Level 6

Note that the requirement for allied health services is stipulated in the role delineation guide as part of the listed clinical services and varies as per level required.

Trauma service capability framework

Service capability describes the planned activity and clinical complexity that a facility is capable of safely providing. The trauma service capability framework (the Framework) identifies the scope of activity for each service capability level and provides a mechanism for LHDs to assess the service capability of their facilities. It is recognised that in emergency situations facilities may need to undertake care normally undertaken at a higher capability service and this should occur in consultation with a networked MTS. The Framework supports the provision of high quality, safe and timely trauma care 24 hours a day 7 days a week.

Table 8. Trauma service capability framework for regional trauma services

REGIONAL TRAUMA SERVICE	
SERVICE SCOPE	
Clinical care	• Provides all aspects of care to patients with minor to moderate trauma and major surgery for selected major trauma patients in consultation with a networked Major Trauma Service • Should not provide ongoing care for complex or critically injured patients who require major complex surgery, tier B interventional radiology procedures, children requiring major or complex major surgery or care outside the scope or designation of clinical services at the hospital (see Table 7) • Children (age <16 years) who present to a regional trauma service facility should be transferred to a paediatric trauma service as soon as possible where clinically appropriate
Case-mix	• Triage, assessment and resuscitation for all levels of trauma severity and high-risk patients including paediatric, obstetric and geriatric trauma • Ongoing management of mild to moderate trauma (ISS 5-12) requiring admission for ongoing care or common to major surgical procedures • Management of major trauma patients (ISS >12) within the scope and designation of clinical services
CLINICAL GOVERNANCE	
Local guidelines	• Scope of trauma service • Trauma triage, trauma team and trauma admission pathways • Consultation, escalation and transfer processes for deteriorating trauma patients and those requiring referral to major trauma service or specialist burns or spinal units • Processes for patients requiring urgent transfer for definitive care • Trauma transfer processes consistent with NSW ITIM Trauma Transfer Guidelines and Critical Care Referral Network Policy • Referral pathways to Post Trauma Amnesia and rehabilitation services • Referral pathways for trauma patients with acute mental health disturbance • Clinical emergency response systems for deteriorating admitted trauma patients • Management guidelines for common major trauma conditions including chest trauma, head injury, pelvic and abdominal trauma • Processes for the management of trauma in specialised areas such as difficult airway, obstetric trauma and traumatic cardiac arrest • Credentialing process for point of care ultrasound use in trauma
Competence and credentialing	Processes to ensure clinical staff are appropriately credentialed and work within their scope of practice

Quality and safety processes	• Participation in NSW Trauma Outcomes Registry and Quality Evaluation (TORQUE) • Monthly hospital-wide trauma mortality and morbidity committee meeting • Regular trauma network committee meeting • Benchmarking and reporting of clinical outcomes and process indicators • Participation in local and statewide trauma death monitoring and review program • Monitoring and external audit of trauma service structure, resourcing and performance
SERVICE REQUIREMENTS	
Consultation, escalation and transfer	• Consultation, escalation and transfer organised within a trauma network in accordance with Critical Care Referral Transfer Policy and Trauma transfer guidelines • Established links with and support of non-trauma facilities across LHD
Research Education and Training	Provide support and leadership to non-trauma facilities across LHD

Table 9: Trauma service capability framework for major trauma services

MAJOR TRAUMA SERVICE (ADULT AND PAEDIATRIC)	
SERVICE SCOPE	
Clinical Care	• Provide care for trauma patients, regardless of injury severity from initial resuscitation, access to definitive care, through to rehabilitation and discharge • Full range of subspecialty services (see table 7) required to perform complex major surgery and complex interventional radiology procedures on trauma patients 24 hours a day seven days a week • Care of complex and other high-risk trauma patients • Referral hub for complex, high risk and critically injured trauma patients within LHDs and supra-LHD trauma referral networks • Children (age<16 years) who present to an adult major trauma service facility should be transferred to a paediatric trauma service as soon as possible where clinically appropriate
Case-mix	As per Regional Trauma Service plus; • Management of severe head injury requiring neurosurgery or neuro-intensive care services, complex pelvic fractures, complex chest or mediastinal injuries • Management of patients requiring or who may require, complex major surgery or tier B interventional radiology procedures • Management of critically injured patients or those with multiple severe or complex injuries • Management of patients requiring complex major surgery for children (paediatric major trauma service)
CLINICAL GOVERNANCE	
Local guidelines	• Scope of trauma service • Trauma triage, trauma team and trauma admission pathways • Consultation, escalation and transfer processes for deteriorating trauma patients and those requiring referral to specialist paediatric, burns and spinal units • Processes for patients requiring urgent surgical procedures or interventional radiology • Referral pathways to Post Trauma Amnesia and rehabilitation services • Referral pathways for trauma patients with acute mental health disturbance • Clinical Emergency Response systems for deteriorating admitted trauma patients • Management guidelines for common major trauma conditions including chest trauma, head injury, pelvic and abdominal trauma • Processes for the management of trauma in specialised areas such as difficult airway, obstetric trauma and traumatic cardiac arrest • Credentialing process for point of care ultrasound use in trauma
Competence and credentialing	Processes to ensure clinical staff are appropriately credentialed and work within their scope of practice
Quality and safety processes	• Participation in NSW Trauma Outcomes Registry and Quality Evaluation • Monthly hospital-wide trauma Mortality and Morbidity committee meeting • Regular trauma network committee meetings

	• Benchmarking and reporting of clinical outcomes and process indicators • Participation in local and statewide trauma death monitoring and review program • Monitoring and external audit of trauma service structure, resourcing and performance
SERVICE REQUIREMENTS	
Consultation, escalation and transfer	• Consultation, escalation and transfer organised within a trauma network in accordance with Critical Care Referral Transfer Policy and Trauma transfer guidelines • Established links with and support of Regional Trauma Services and other facilities within trauma referral network and non-trauma facilities across LHD
Research Education and Training	Provide support and leadership to Regional Trauma Services and other facilities within trauma referral network and non-trauma facilities across LHD

Infrastructure and network requirements

Relevant trauma related infrastructure and network requirements for NSW trauma services in keeping with statewide critical care expectations are outlined below in Table 10.

Table 10: Infrastructure and network requirements of NSW trauma services

INFRASTRUCTURE	MTS (LEVEL 1)	RTS (LEVEL 2-3)	PTS (LEVEL 1)
Helicopter landing site	Direct access from helipad to emergency department, operating theatre or intensive care unit	Access to helipad within close proximity to the hospital	Direct access from helipad to emergency department, operating theatre or intensive care unit
Hybrid operating theatre	Desired	Optional	Desired
NETWORK	**MTS** (LEVEL 1)	**RTS** (LEVEL 2-3)	**PTS** (LEVEL 1)
Network responsibilities	Responsible for supra LHD critical care or trauma referral network	Responsible for referrals within own LHD	Responsible for supra LHD critical care or trauma referral network

Implementation and evaluation

LHDs are expected to meet the above staffing and performance recommendations which are routinely monitored and reported by ITIM. The trauma services model of care outlined in the present document has already undergone a process of consultation with Trauma Services in NSW and the NSW Ministry of Health. Further consultation and engagement is planned across LHDs and key stakeholders and forums in 2019 to determine the most appropriate agreement framework.

ITIM will concurrently plan an implementation project involving audits and site visits to ensure a smooth transition and integration of new roles and quality improvement projects. LHDs and external accreditation agencies such as the RACS may also use this document to assess trauma services in NSW.

Performance may be assessed against the quality improvement and performance frameworks outlined above, approved statewide trauma process indicators using the statewide trauma registry and statewide death monitoring and review program. ITIM will regularly monitor compliance with key deliverables and responsibilities and liaise with the trauma services, LHDs and the Ministry of Health if major or concerning deficiencies in trauma services' model of care arise.

Approved statewide trauma process indicators:

1. Scene time (pre-hospital)
2. Time to laparotomy
3. Time to embolisation
4. Unplanned admission to ICU
5. Complications
6. Unplanned return to the operating room
7. Missed injuries
8. Death review
9. Retrieval team turnaround time
10. Medical retrieval notification time
11. Intubation in ED with GCS <9 in head injury

Conclusion

The *Trauma Patient Outcome Evaluation Qualitative Report* (2016) highlighted a number of resourcing deficiencies and variation amongst the NSW trauma services.[2] To address this, ITIM has outlined a recommended framework for trauma service performance and role delineation. These criteria are the benchmark against which the ACI can assess whether trauma services are adequately meeting service requirements and staffed according to accepted national and international standards.

The outlined staffing structure and quality improvement framework will help to ensure that core performance requirements of trauma services, including quality of care initiatives and clinical education needs, and participation in statewide quality improvement programs such as NSW TORQUE are consistently met. In order to meet the outlined Trauma Services Model of Care, ITIM and the NSW trauma services will need to work collaboratively to resolve any deficiencies and variation in the NSW trauma system which may impact patient outcomes.

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Appendix. Guide to trauma services structure and core requirements audit tool

Essential denotes that this function is required for adequate clinical performance, governance and quality management of a specified trauma service. *Desirable* denotes that this function should be present depending on the capabilities of that facility and should be considered in any trauma service strategic planning

Functions	Major Trauma Service (adult)	Paediatric Trauma Service	Regional Trauma Service
CLINICAL			
Access to trauma consultant-led trauma resuscitation and management available 24 hours a day 7 days a week	Essential	Essential	Desirable
Daily multidisciplinary trauma patient rounds	Essential – 7 days per week	Essential – 5 days per week	Essential – 5 days per week
Senior trauma nurse initiated case management and service coordination	Essential – 7 days per week	Essential – 5 days per week	Essential – 5 days per week
Local trauma multidisciplinary follow up clinic	Essential	Desirable	Desirable
Supra-LHD clinical coordination	Essential	Essential	Desirable
QUALITY IMPROVEMENT			
Trauma Minimum Dataset validation and reporting	Essential – Monthly	Essential – Monthly	Essential – Monthly
Trauma Death Review program submission	Essential – Monthly	Essential – Monthly	Essential – Monthly
Participation in NSW TORQUE program	Essential – Weekly	Essential – Weekly	Essential – Weekly
Trauma unit meeting	Essential – Weekly	Essential – Weekly	Essential – Weekly
Membership of local and statewide trauma committees	Essential – Monthly	Essential – Monthly	Essential – Monthly
Audits of patient transfers using established critical care referral policy and trauma transfer guidelines	Essential	Essential	Essential
Audits of trauma process indicators	Essential – Monthly	Essential – Monthly	Essential – Monthly
EDUCATION AND RESEARCH			
Local nursing trauma and related in-service	Essential – Weekly	Essential – Weekly	Essential – Weekly
Locally initiated research projects	Essential	Desirable	Desirable
Education and clinical support across LHD	Essential	Essential	Essential
Participation in statewide trauma education programs	Essential	Essential	Essential
Participation in statewide trauma research programs	Essential	Essential	Essential

Functions	Major Trauma Service (adult)	Paediatric Trauma Service	Regional Trauma Service
TRAUMA SERVICE STRUCTURE			
Trauma Director	Essential – Available on-site 5 days per week	Essential – Available on-site 5 days per week	Essential – Available on-site on a regular basis
Deputy Trauma Director	Desirable	-	-
Trauma Coordinator	Essential – Available on-site 5 days per week	Essential – Available on-site 5 days per week	Essential – Available on-site 5 days per week
District Trauma Coordinator	Essential	Desirable	Desirable
Trauma Fellow	Essential	Desirable	Desirable
Trauma Registrar	Essential	Essential	Desirable
Trauma Case Manager	Essential – Available on-site 7 days per week	Essential – Available on some days	Essential – Available on some days
Trauma Data Manager	Essential – Available on-site 5 days per week	Essential – Available on some days	Essential – Available on some days
Quality and Safety Officer	Essential – Available on some days	-	-
Administration support	Desirable	Desirable	Desirable