REPORT

Trauma Patient Outcome Evaluation

Qualitative report

NSW Institute of Trauma and Injury Management

The Agency for Clinical Innovation (ACI) works with clinicians, consumers and managers to design and promote better healthcare for NSW. It does this by:

- **service redesign and evaluation** – applying redesign methodology to assist healthcare providers and consumers to review and improve the quality, effectiveness and efficiency of services
- **specialist advice on healthcare innovation** – advising on the development, evaluation and adoption of healthcare innovations from optimal use through to disinvestment
- **initiatives including guidelines and models of care** – developing a range of evidence-based healthcare improvement initiatives to benefit the NSW health system
- **implementation support** – working with ACI Networks, consumers and healthcare providers to assist delivery of healthcare innovations into practice across metropolitan and rural NSW
- **knowledge sharing** – partnering with healthcare providers to support collaboration, learning capability and knowledge sharing on healthcare innovation and improvement
- **continuous capability building** – working with healthcare providers to build capability in redesign, project management and change management through the Centre for Healthcare Redesign.

ACI Clinical Networks, Taskforces and Institutes provide a unique forum for people to collaborate across clinical specialties and regional and service boundaries to develop successful healthcare innovations.

A priority for the ACI is identifying unwarranted variation in clinical practice and working in partnership with healthcare providers to develop mechanisms to improve clinical practice and patient care.

Acknowledgements

The NSW Institute of Trauma and Injury Management wishes to acknowledge the NSW Trauma Services, NSW Ambulance, CareFlight and the Newborn and Paediatric Emergency Transport Service (NETS) for their contribution to the Trauma Patient Outcome Evaluation.

This report was made possible by the facilitation of Ashton White and Associates Consultancy Services, and Zest Health Strategies.
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC</td>
<td>Aeromedical Control Centre</td>
</tr>
<tr>
<td>ACI</td>
<td>Agency for Clinical Innovation</td>
</tr>
<tr>
<td>ACT</td>
<td>Australian Capital Territory</td>
</tr>
<tr>
<td>ACTAS</td>
<td>Australian Capital Territory Ambulance Service</td>
</tr>
<tr>
<td>AGSU</td>
<td>Acute General Surgical Unit</td>
</tr>
<tr>
<td>AIS</td>
<td>Abbreviated Injury Scale</td>
</tr>
<tr>
<td>AMRU</td>
<td>Aero Medical Retrieval Unit</td>
</tr>
<tr>
<td>AMRS</td>
<td>Aeromedical and Medical Retrieval Service</td>
</tr>
<tr>
<td>ASU</td>
<td>Acute Surgical Unit</td>
</tr>
<tr>
<td>CATE</td>
<td>Critical care, Acute, Trauma and Emergency</td>
</tr>
<tr>
<td>CCLHD</td>
<td>Central Coast Local Health District</td>
</tr>
<tr>
<td>CEC</td>
<td>Clinical Excellence Commission</td>
</tr>
<tr>
<td>CHHC</td>
<td>Coffs Harbour Health Campus</td>
</tr>
<tr>
<td>CHIP</td>
<td>Chest Injury Protocol</td>
</tr>
<tr>
<td>CHW</td>
<td>Children’s Hospital Westmead</td>
</tr>
<tr>
<td>CNC</td>
<td>Clinical Nurse Consultant</td>
</tr>
<tr>
<td>CMO</td>
<td>Career Medical Officer</td>
</tr>
<tr>
<td>CNS</td>
<td>Clinical Nurse Specialist</td>
</tr>
<tr>
<td>CPF</td>
<td>Clinical Paper Folder</td>
</tr>
<tr>
<td>CRRS</td>
<td>Canberra Region Retrieval Service</td>
</tr>
<tr>
<td>CT</td>
<td>Computed Tomography</td>
</tr>
<tr>
<td>CTP</td>
<td>Compulsory Third Party</td>
</tr>
<tr>
<td>DASS 21</td>
<td>Depression Anxiety Stress Scales</td>
</tr>
<tr>
<td>DBH</td>
<td>Dubbo Base Hospital</td>
</tr>
<tr>
<td>ECMO</td>
<td>Extracorporeal Membrane Oxygenation</td>
</tr>
<tr>
<td>ED</td>
<td>Emergency Department</td>
</tr>
<tr>
<td>EMET</td>
<td>Emergency Medicine Education and Training program</td>
</tr>
<tr>
<td>eMR</td>
<td>electronic Medical Record</td>
</tr>
<tr>
<td>EMST</td>
<td>Early Management of Severe Trauma</td>
</tr>
<tr>
<td>FACEM</td>
<td>Fellow of the Australasian College for Emergency Medicine</td>
</tr>
<tr>
<td>FIM™</td>
<td>Functional Independence Measure</td>
</tr>
<tr>
<td>FLECC</td>
<td>First-Line Emergency Care Course</td>
</tr>
<tr>
<td>FTE</td>
<td>Full Time Equivalent</td>
</tr>
<tr>
<td>GCUH</td>
<td>Gold Coast University Hospital</td>
</tr>
<tr>
<td>GDH</td>
<td>Gosford District Hospital</td>
</tr>
<tr>
<td>GP</td>
<td>General Practitioner</td>
</tr>
<tr>
<td>GSA HEMS</td>
<td>Greater Sydney Area Helicopter Emergency Medical Service</td>
</tr>
<tr>
<td>HDU</td>
<td>High Dependency Unit</td>
</tr>
<tr>
<td>HNELHD</td>
<td>Hunter New England Local Health District</td>
</tr>
<tr>
<td>HRS</td>
<td>Hunter Retrieval Service</td>
</tr>
<tr>
<td>ICIP</td>
<td>Intensive Care Unit Electronic Information System</td>
</tr>
<tr>
<td>ICU</td>
<td>Intensive Care Unit</td>
</tr>
<tr>
<td>IPPV</td>
<td>Intermittent Positive-Pressure Ventilation</td>
</tr>
<tr>
<td>ISLHD</td>
<td>Illawarra Shoalhaven Local Health District</td>
</tr>
<tr>
<td>ISS</td>
<td>Injury Severity Score</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>ITIM</td>
<td>Institute of Trauma and Injury Management</td>
</tr>
<tr>
<td>JHCH</td>
<td>John Hunter Children’s Hospital</td>
</tr>
<tr>
<td>JHH</td>
<td>John Hunter Hospital</td>
</tr>
<tr>
<td>JMO</td>
<td>Junior Medical Officers</td>
</tr>
<tr>
<td>KPI</td>
<td>Key Performance Indicator</td>
</tr>
<tr>
<td>LBH</td>
<td>Lismore Base Hospital</td>
</tr>
<tr>
<td>LHD</td>
<td>Local Health District</td>
</tr>
<tr>
<td>M&amp;M</td>
<td>Morbidity and Mortality</td>
</tr>
<tr>
<td>MDS</td>
<td>Minimum Data Set</td>
</tr>
<tr>
<td>MIST</td>
<td>Mechanism of Injury, Injury, Signs and Symptoms, Transport</td>
</tr>
<tr>
<td>MLHD</td>
<td>Murrumbidgee Local Health District</td>
</tr>
<tr>
<td>MNCLHD</td>
<td>Mid North Coast Local Health District</td>
</tr>
<tr>
<td>MOI</td>
<td>Mechanism of Injury</td>
</tr>
</tbody>
</table>
Foreword

On behalf of the Institute of Trauma and Injury Management, I am proud to present the report that will help shape the integration of systems and facilities in the NSW trauma system, the future strategic direction, and ultimately the quality of care our injured patients both expect and deserve. This report is the culmination of many months of clinician contributions, expert engagement and ongoing feedback from those dedicated doctors, nurses, paramedics and countless support personnel who make up the State’s trauma system.

Despite impressive advances in road engineering, car safety design and countless public health messages regarding the dangers of irresponsible driving, motor vehicle accidents continue to cause untold suffering and injury throughout NSW. Falls are now emerging as the predominant cause of severe injury, particularly so in the elderly, a demographic that is rapidly growing in our ageing population. Children, thankfully, remain in the minority of severe critical care trauma victims. It is clear that there is an opportunity to continue to integrate our individual trauma centres more closely into a mutually supportive network operating at a regional and statewide level.

Ultimately this report provides insights, reflections, opportunities and on a practical level, recommendations to help continuously improve the care we proudly provide and the model of care within which to achieve this. This report was made possible by the professionalism of the ITIM team and most importantly the time taken by our clinicians to devote their thoughts and skills to helping optimise the system we all work in.

Associate Professor Oran Rigby
Clinical Director, ITIM
Executive Report

This report is a component of the Trauma Patient Outcome Evaluation and has focused on the resources / resourcing components of the NSW Trauma Services, including paediatric services and the systems and processes that are currently in place in the NSW trauma system. In examining the system through conducting site visits, audits and interviews, this evaluation identified key areas to assist in future planning and development of the NSW trauma system to further enhance patient outcomes.

Individual recommendations that form the key findings can be found under each section of the following report.

The key findings from this Trauma Patient Outcome Evaluation Qualitative report are as outlined below.

- Consideration should be given to addressing the initial pre-hospital triage process by improving efficiencies in identification and tasking, reinforcing the advance warning call system for major cases from pre-hospital settings
- Develop clear guidelines on standardised indications for inter-facility referral amongst, major and paediatric trauma services (RTS, MTS, PTS, respectively) and non-trauma centres, whilst converging on the critical care referral pathway
- Paediatric trauma patients meeting major trauma criteria should be taken directly to a PTS if within 60 minutes travel time, unless there is an exceptional reason for this not to occur, e.g. MTS being a more clinically appropriate service. Paediatric patients unable to be transported directly to a PTS need to be notified to Aero Medical Retrieval Service (AMRS) via the Control Centre to facilitate timely retrieval (also includes paediatric patients transported to RTSs and MTSs)
- Establish a standardised post-discharge follow-up process for trauma patients
- Provide clear expectations for trauma reporting including costs and outcome measures whilst considering mandatory review of all trauma deaths by an external independent state committee
- Establish mandatory 5-yearly Royal Australasian College of Surgeons (RACS) trauma verification for all NSW trauma services by 2021 and progressively implement systemwide standards associated with RACS trauma verification requirements

Building relationships

- Design and implement strategies to enable more effective networking and support across multiple MTS and RTS facilities, incorporating an integrated model for trauma training, rotations and clinical integration
- Develop clear guidelines on standardised roles and responsibilities of the trauma team
- For border regions of NSW, develop and / or formalise transfer memorandum of understandings between facilities for interstate trauma transfer
- Formalise the interfacility trauma transfer process for both paediatrics and adults
- Explore opportunities to develop a statewide rehabilitation referral process and increase local capacity of paediatric trauma rehabilitation to improve time to discharge to their home location
- Introduce and implement post-discharge telephone follow-up systemwide
• The Institute of Trauma and Injury Management (ITIM) should consider ways of improving engagement with transport providers to add value to the whole trauma system journey, while involving ITIM for strategic and clinical governance, where appropriate

• Review Critical Care Referral Network to improve support for RTSs provided by MTSs and clearly communicate the relationship and degree of support provided / received to all parties involved

**Infrastructure and resourcing**

• Develop a process for capturing and presenting dynamic real-time healthcare intelligence at institutional, regional, network and state levels and ensure clinical and executive buy-in

• Create and implement a NSW State Trauma patient database that incorporates improved clinical information data linkages between care providers, collection of patient outcome measures and leverages real time data. This will enable access by all treating clinicians to the trauma patients entire journey in supporting the provision of clinical care

• Explore opportunities to maximise the use of existing telemedicine technology and plan for implementation of emerging technologies utilising mobile technology

• Align and standardise telehealth equipment across the NSW trauma system linking all stakeholders across the trauma continuum

• Consider relocating helipads closer to resuscitation areas and allocate adequate room for resuscitation

• Develop a systemwide workforce plan that includes minimum expectations for level of cover within each trauma service to ensure adequate senior clinicians for prompt definitive treatment decisions

• Identify opportunities to increase and improve the capacity and resources within the network

• Value may be added to the trauma model of care by utilising nurse practitioners in trauma care delivery

**Documentation**

• Create and implement consistent trauma terminology and documentation for use statewide, including discharge summaries and patient outcome data

• Implement a process to ensure standardisation and completeness of clinical documentation, including use of eMR functionality to improve data consistency

• Develop patient-focussed outcome measures that can be incorporated into the minimum data set and collected via electronically-linked data records, optimally derived from e-medical record data

• Develop a NSW State Trauma Model of Care that will standardise trauma services, networks and clinical care across the trauma continuum

**Training and education**

• Develop a system to standardise staff trauma training to ensure a minimal level of expertise with a system of accreditation and ongoing currency implemented

• Consider the development of a systemwide trauma-specific medical training program with the colleges
Contents
Acknowledgements .............................................................................................................. ii
Glossary ............................................................................................................................... iii
Foreword ............................................................................................................................... v
Executive Report ................................................................................................................ vi
Contents ............................................................................................................................... viii
Navigating this document ................................................................................................... ix
1. Introduction ..................................................................................................................... 10
  1.1. Context ....................................................................................................................... 10
  1.2. Background ............................................................................................................... 10
  1.3. Purpose of the Trauma Patient Outcome Evaluation .................................................. 11
  1.4. Primary Audience ..................................................................................................... 11
2. Review Methodology ....................................................................................................... 12
  2.1. Site Visits ................................................................................................................... 13
  2.2. Trauma Services Audit ........................................................................................... 13
  2.3. Online Survey .......................................................................................................... 13
  2.4. Paediatric Trauma Transport Provider Review ......................................................... 13
3. Trauma Patient Outcome Evaluation ............................................................................ 15
  3.1. Resources and Resourcing Components of NSW Trauma Services ......................... 15
  3.2. Paediatric Outcomes By Agency Retrieval Providers ............................................... 22
4. Trauma Service Systems and Processes ..................................................................... 31
  4.1. Transfers ..................................................................................................................... 31
  4.2. Network Support ...................................................................................................... 33
  4.3. Education and Training ........................................................................................... 35
  4.4. Protocols and Guidelines ........................................................................................ 36
  4.5. Patient Outcomes .................................................................................................... 38
5. Summary ........................................................................................................................ 41
6. Appendix ........................................................................................................................ 43
  Appendix A: Participants .................................................................................................... 43
  Appendix B: Trauma Services Summary Reports ............................................................. 45
  Appendix C: Transport or Retrieval Missions .................................................................. 88
  Appendix D: Medical Retrieval Service Providers ............................................................ 89
  Appendix E: Paediatric Trauma Admissions by Mission .................................................. 90
  Appendix F: Trauma Site Visit Questions ....................................................................... 93
  Appendix G: Trauma Service Audit Questions ............................................................... 94
  Appendix H: Trauma Survey ........................................................................................... 104
  Appendix I: Paediatric Transport Providers Site Visit Questions .................................... 106
  Appendix J: Paediatric Case Audit .................................................................................... 107
References ............................................................................................................................. 109

Institute of Trauma and Injury Management
Trauma Patient Outcome Evaluation
# Navigating this document

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction</strong></td>
<td>An overview of the NSW trauma system and the purpose and proposed audience of this document</td>
<td>11</td>
</tr>
<tr>
<td><strong>Methodology</strong></td>
<td>Methods used to generate results for this document</td>
<td>13</td>
</tr>
<tr>
<td><strong>Trauma Patient Outcome Evaluation</strong></td>
<td>Evaluation and identification of issues with resources and resourcing components by trauma services</td>
<td>16</td>
</tr>
<tr>
<td><strong>Trauma Service Systems and Processes</strong></td>
<td>Evaluation and recommendations for the systems and processes utilised in trauma services</td>
<td>32</td>
</tr>
<tr>
<td><strong>Summary</strong></td>
<td>Discussion points and summary of document</td>
<td>41</td>
</tr>
<tr>
<td><strong>Appendices</strong></td>
<td>Further information and supporting documents</td>
<td>43</td>
</tr>
</tbody>
</table>
1. Introduction

1.1. Context

The context of the NSW trauma system evaluation is central to the Agency for Clinical Innovation’s (ACI) core values and purpose as the leader in the health system for designing, evaluating and supporting implementation of innovative models of patient care.

The evaluation of the NSW trauma system is consistent with the intentions of the NSW Government Evaluation Framework (2013) which notes:

“We want NSW to lead the way in evidence-based policy by ensuring that program evaluation is an integral part of managing government programs at every stage of the policy cycle.”

1.2. Background

In NSW, consideration of the most appropriate configuration for adult trauma services prompted a comprehensive review of the entire trauma system in the 2000’s. The review resulted in the publication of the NSW Trauma Services Plan (2009).

According to the NSW Trauma Services Plan: “A Major Trauma Service (MTS) or Paediatric Trauma Service (PTS) can provide the full spectrum of care for major and moderately injured patients, across the trauma care continuum from initial resuscitation through to rehabilitation and discharge. A Regional Trauma Service (RTS) can provide a high level of care to the injured patient. They provide initial assessment, stabilisation and definitive care and initiate transfer to the MTS when a patient requires services not available at the regional centre.”

The NSW Trauma Services Plan (2009) identifies six adult MTSs located at Liverpool, Royal Prince Alfred, Royal North Shore, St George, Westmead and John Hunter Hospitals. It describes defined networks including regional hospitals that support the transfer of patients to the MTS and ideally return transfer for ongoing care and rehabilitation. Subsequent to the release of the NSW Trauma Services Plan, St Vincent’s Hospital was approved in early 2010 as an MTS bringing the total to seven.

The NSW Trauma Services Plan (2009) incorporates the transport of injured patients to the level of care most appropriate for their management. Transport or retrieval missions are either primary (pre-hospital transfer) or secondary (between hospital sites) (Appendix C). Both adult and paediatric patients’ primary missions (from scene of injury) are undertaken by NSW Ambulance (NSWA) and CareFlight, whereas inter-hospital missions will be performed by either NSWA or the Newborn and Paediatric Emergency Transport Service (NETS) depending on the age of the patient (Appendix D).

In 2015, it was considered appropriate and timely to evaluate trauma patient outcomes since the implementation of the NSW Trauma Services Plan (2009). The first stage was designed to evaluate pre-hospital and inter-hospital trauma transfers across regional and metropolitan NSW. This included an evaluation of both adult and paediatric trauma patient current transport practices, protocols and patient outcomes.
1.3. Purpose of the Trauma Patient Outcome Evaluation Qualitative Report

The purpose of this evaluation is to review:

1. resources and resourcing components of NSW Trauma Services
2. paediatric outcomes by agency retrieval providers

The findings of the evaluation are intended to identify how patients are managed, identify patient outcomes and guide future service improvements. This stage of the evaluation seeks to address these issues using qualitative analysis.

In addition, as part of stage two of the Trauma Patient Outcome Evaluation, data linkage from the Critical care, Acute, Trauma and Emergency (CATE) Public Health Register, will be used to examine system outcomes including length of stay, mortality, readmissions, ward movements, unplanned return to theatre and other relevant information where data is available and it addresses the key focus of evaluation. This quantitative analysis will complete the Trauma Patient Outcome Evaluation and will focus on:

3. adult patient outcomes for MTS, RTS and injured patients from metropolitan versus rural sectors
4. outcomes for adult secondary transfer patients
5. paediatric patient outcomes for PTS, MTS, RTS and injured patients from metropolitan versus rural sectors
6. outcomes for paediatric secondary transfer patients

1.4. Primary Audience

The primary audience for this report comprises of:

- The NSW Ministry of Health
- The ACI Executive Committee – responsible for ensuring that clinicians and consumers work together towards an equitable and effective health system in NSW
- The ACI Surgery, Anaesthesia and Critical Care portfolio
- NSW Institute of Trauma and Injury Management (ITIM) – responsible for developing and implementing innovative models of care to improve service delivery across NSW
- The NSW Trauma Network primarily consisting of the clinicians providing frontline management and care – responsible for ensuring a comprehensive, safe and effective trauma system, consumers of trauma services, their families and carers – the recipients of the service.
2. Review Methodology

In order to address the terms of reference, three different data collection methods were used:

- Site visits to all PTS, MTS and RTS locations
- An audit of PTS, MTS, RTS and T1 preferred provider
- An online survey for staff working in or associated with trauma

All tools used to gather the data and the findings can be found in the Appendix as outlined in Table 2.1.

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Participants</td>
<td>Details of those who provided individual feedback, and / or were involved in site meetings or interviews</td>
</tr>
<tr>
<td>B</td>
<td>Trauma Services Summary Reports</td>
<td>Individual site summary reports</td>
</tr>
<tr>
<td>C</td>
<td>Transport or Retrieval Missions</td>
<td>Explanation of medical retrieval missions</td>
</tr>
<tr>
<td>D</td>
<td>Medical Retrieval Service Providers</td>
<td>Description of medical retrieval services providers in NSW</td>
</tr>
<tr>
<td>E</td>
<td>Trauma Admissions by Mission / Transfer</td>
<td>Breakdown of number of trauma admissions according to primary missions and secondary transfers</td>
</tr>
<tr>
<td>F–I</td>
<td>Trauma Site Visit Questions / Trauma Service Audit Questions / Trauma Survey / Paediatric Transport Providers Site Visit Questions</td>
<td>Sources of information that were used to develop the content of this report</td>
</tr>
<tr>
<td>J</td>
<td>Paediatric Case Audit</td>
<td>A case audit to assist in better understanding of the paediatric patient journey through the trauma system</td>
</tr>
</tbody>
</table>
2.1. Site Visits

Site visits were arranged with all NSW designated trauma services. Invitations were sent to Trauma Service Directors and Trauma Clinical Nurse Consultants (CNCs) with the option of involving other staff in the meetings. The Canberra Hospital was included in the site visits given the strong relationship with the NSW trauma system.

2.2. Trauma Services Audit

The trauma services audit tool (Appendix G) was developed in workshops with ITIM and tested with stakeholders prior to distribution. The questions were designed to collect information that would support the focus of the review, whilst recognising the requirements identified in the NSW Trauma Services Plan (2009).

The audit was distributed in advance to all of the designated trauma services before the commencement of the site visits to enable any further clarification or discussion of responses to occur at the site meetings. All facilities completed the audit.

The audit tool was structured such that there were specific questions for PTS, MTS, RTS and T1-preferred providers as well as core questions for all providers. The audit tool was in the form of an Excel spreadsheet and results were collated by ITIM.

2.3. Online Survey

The online survey (Appendix H) was designed by ITIM to enable all staff caring for the injured patient and working within the NSW trauma system to contribute to the review. The survey was developed in SurveyMonkey and responses were collated by ITIM. The survey was available to all staff working in, or in association with, trauma services irrespective of whether they attended site meetings. The survey was made available for 6 weeks and there were 122 respondents to the survey.

2.4. Paediatric Trauma Transport Provider Review

The methodologies involved in this review were face-to-face meetings with NSWA, Greater Sydney Area Helicopter Emergency Medical Service (GSA HEMS), NETS and CareFlight, analysis of NSW Trauma Minimum Data Set (MDS) and service activity data and case audit of paediatric retrievals / transfers.

Interview templates (Appendix I) were developed to ensure consistency in approach. Information gained from the meetings was supplemented by collection of agreed data relating to the retrieval / transfer model of care.
Case Audit

A template was designed for the case audit to ensure consistency of approach and was used to understand the processes and activities associated with the paediatric journey, from injury to completion of the journey; this is included in this report as Appendix J.

The NSW MDS from the NSW Trauma Registry was used to identify the paediatric patient cohort. This data was extracted and correct as of 29/07/2016. Inclusion criteria for the 2015 MDS is as follows:

- all major trauma patient records from the NSW Trauma Registry, where the date of injury occurred in the calendar year of 2015
- ‘paediatric patients’ are defined as < 16 years of age at time of injury
- ‘major trauma’ is defined as patients, who were admitted to a NSW Trauma Service within 14 days of sustaining an injury, and who:
  - had an injury severity score (ISS) > 12 (moderate-to-critically injured); or
  - died in hospital following injury (irrespective of ISS), except those with an isolated fractured neck of femur injury sustained from a fall from a standing height (< 1 metre)
3. Trauma Patient Outcome Evaluation

The NSW Trauma Services Plan (2009) described the trauma model of care and staff resourcing requirements as well as the trauma network structure. The Canberra Hospital was not included in the NSW Trauma Services Plan (2009) but met all criteria as a Major Trauma Service. The NSW trauma system currently operates as a series of networks, mostly driven by local decisions and requirements. Currently, although the model of care is followed at the highest level, there is high variability with how each network functions. The models within each service have developed separately to reflect these local structural and operational priorities.

The model of care within each MTS and RTS reflects the component outlined in the NSW Trauma Services Plan (2009). Details of differences can be found in the individual site summaries (Appendix B). Overall, variations in services were apparent across all MTSs, RTSs and PTs as demonstrated from the site visits and surveys. These variations may have developed as a result of matching requirements of each local institution, rather than as a response to any apparent patient or demographic need. Likewise, a diverse range of workforce resources were committed to MTSs, RTSs and PTs as demonstrated by the staffing dedicated to trauma services and trauma team responses. Finally, it was evident that there was a varied composition of a MTS or RTS trauma team, as first respondents depending on the time of day or night.

3.1. Resources and Resourcing Components of NSW Trauma Services

3.1.1. Major Trauma Service

Model of care

- It was evident that there were mechanisms for receiving trauma calls and criteria-based triage tools in all MTSs, and current policies and protocols were regularly updated
- Trauma staff were involved in the initial and subsequent care of trauma patients
  - The degree of involvement significantly depended on the workforce model and the facilities’ expectations of how the trauma service model of care worked
- Trauma services were placed differently within an institution’s structure, which is thought to have been driven by the differing interpretation of the trauma service requirements outlined in the NSW Trauma Services Plan (2009)
  - Some trauma services were considered a part of the varying clinical specialty’s normal workload and any resource or advisory service that was provided were seen as an added value
  - Other trauma services provided the initial response and admitted patients under the trauma services bed card
- There was variability in persons responsible for the completion of tertiary surveys, trauma follow-up and outpatient clinics
  - Tertiary surveys were the responsibility of Trauma Registrars / Nurse Practitioner in some services, and the specialty team in other services; a combination of both approaches was also evident
- **No requirements currently exist for post-discharge follow-up** in clinics conducted by trauma services
  - Trauma patients were most commonly followed-up through non-trauma specialty outpatient clinics
- **Rehabilitation was identified as an area of concern** in most MTSs (trauma specific requirements, availability of resources, or the waiting period to gain acceptance into a specialist rehabilitation program)

**Workforce**

In considering the workforce involved in trauma response and care in an MTS, it is necessary to examine this within the context of the local health district’s model of care. The NSW Trauma Services Plan (2009) recommended five full time positions in the MTS staffing infrastructure. The staffing infrastructure for MTSs is illustrated in Figure 3.1.

- The workforce model in two trauma services involved a **shared model at the Director level with different clinical disciplines involved** in the fractional appointments
- **Medical staff** employed by trauma services comprised Trauma Registrars (in 5 MTSs), Trauma Fellows (in 4 MTSs) and Trauma Interns / Residents (in 4 MTSs)
- **Trauma response** was led by the emergency department (ED) and / or general surgery in most MTSs
  - Staff attending trauma responses in hours were in-line with the NSW Trauma Services Plan (2009), but there was significant variation in staff attending trauma responses after hours
  - In most MTSs a trauma or ED Consultant was not available onsite between 2300 and 0700 hours, although some MTSs did have a Fellow available for some shifts
  - On call Consultants were always available via telephone as were Senior Registrars and Fellows from other clinical specialties but generally not onsite
  - Westmead Hospital was the only MTS that provided **comprehensive trauma specific junior and senior medical staff coverage** within hours and this reflected the trauma model of care that involved both trauma response and admissions provided by the trauma service
  - Other MTSs provided admission under trauma services for varying periods of time (24 hours or based on the complexity of patient management)
- **Most trauma services and retrieval providers identified the lack of consultant staff as an issue**
  - The model of care in most MTSs reverted to general surgery as responsible for admissions after hours and at weekends, and the onsite medical coverage was hence dependent upon the level of the Registrar(s) available
  - All MTSs advised that they tried to ensure that in addition to the Senior Registrar in ED, another Senior Registrar / Fellow could attend a trauma response call from a critical care specialty (intensive care unit [ICU] / trauma / anaesthetics).
  - The majority of facilities did not have a workforce plan in place to cover leave and succession planning, although some facilities did have leave cover arrangements in place
  - Some facilities had medical staff vacancies that had not been filled
3.1.2. Regional Trauma Service

Models of care

- It was evident that there were mechanisms for receiving trauma calls and criteria-based triage tools in all RTSs, and current policies and protocols were regularly updated.

- Different personnel were involved in the practical application of the trauma model of care between the RTSs.
  - Most RTSs relied on other clinical specialties within the facility as trauma service staff did not have capacity to deliver the care or, in some cases, to undertake clinical assessments.
  - Some rural locations relied on the general surgical services with the acute surgical unit resources case-managing the patients (Consultant / Registrar / CNC).
  - The Trauma Director accepted additional responsibilities in other locations as they had a substantive role in ED / ICU or surgery within the facility; this enabled a greater degree of involvement by trauma services.

- Trauma nursing staff involvement in the delivery and monitoring of the model of care was limited, given other expectations of the nursing roles.
  - RTSs with a 1.0 full time equivalent (FTE) trauma nursing position tended to have a greater role in monitoring and providing advice regarding trauma patients than those with fractional appointments.

Recommendations for major trauma services

- Standardise electronic documentation recording across all MTSs.
- Develop a systemwide workforce plan that includes minimum expectations for level of cover after hours within each MTS, including components for onsite, remote, retrieval, and supra-specialist advice.

Figure 3.1 Current MTS staffing infrastructure (Trauma Services Audit)

*Includes position titles Trauma Director, Deputy Director and Consultant; with exception of St Vincent’s Hospital, with 0.3 FTE.
†Includes position titles Trauma Nurse Coordinator, Trauma CNC, Trauma Case Manager and Area Trauma Coordinator.
‡Includes trauma data entry, management and/or administrative support; with exception of St Vincent’s Hospital, with only a part-time data entry officer.
• It was identified by most RTSs that MTSs or individual clinicians provided support for patient management
  o The importance of these relationships enabled patients to be managed in the RTS and / or transferred appropriately
  o Support appeared to be predominantly via telephone with telemedicine underutilised as a support strategy for the local model of care due to shortfalls in accessibility, usability and / or availability
  o Both Nepean and Gosford Hospitals identified issues with the T1 Protocol that resulted in patients being taken to the nearest MTS rather than the closer RTS
• Over 75% of the RTSs have access to general rehabilitation onsite, within their Local Health District (LHD), or in another local facility for their own trauma patients, in addition to back transfers from MTSs
• 70% of the RTSs have limited access to specialty brain injury rehabilitation
• RTSs do not provide any trauma-specific outpatient follow-up

Workforce
The staffing infrastructure for RTSs is illustrated in Figure 3.2.
• In most RTSs, the Trauma Director had another role within the RTS – most commonly in ICU or ED
  o In two RTSs the Trauma Director was based on a ‘fly-in fly-out’ model, whereby the Trauma Director held other substantial positions and flew to the RTS (usually once per month)
  o The degree to which Trauma Directors engaged with the broader services involved in managing the trauma patients appeared to be reflective of their other roles within the RTSs and being more available onsite for consultation by other consultants
• The NSW Trauma Services Plan (2009) proposed 1.0 FTE Nurse Coordinator / CNC position for each RTS, however, the trauma nurse coordinator positions in all RTSs did not meet the levels recommended
  o There were some RTSs with nurse practitioners qualified in trauma, although these are not currently being utilised in trauma-associated roles, there were other examples where fractional trauma nursing roles also included other roles such as disaster management and this further eroded the workforce availability for trauma services
  o Utilising nurse practitioners in trauma care delivery would appear to add value in the delivery of a trauma model of care
• With the current capacity of administration staff, some RTSs identified meeting timely reporting requirements as a challenge
• There were no workforce plans in place for backfill or succession planning except at Gosford
Figure 3.2 Current RTS staffing infrastructure (Trauma Services Audit)
*With exception of Tamworth Rural Referral Hospital, where the position has been vacant long-term and is partly provided by the ED Director.
†Includes position titles Trauma Nurse Coordinator, Trauma CNC; with exception of Coffs Harbour Health Campus, Lismore Base Hospital, Port Macquarie Base Hospital, The Tweed Hospital, and Wagga Wagga Rural referral Hospital (all 0.5 FTE).
‡With exception of Coffs Harbour Health Campus, Port Macquarie Base Hospital, Tamworth Rural Referral Hospital (all with no capacity).

3.1.3. Paediatric Trauma Service
A total of 271 paediatric trauma admissions and 256 paediatric trauma patients, including 23 paediatric trauma deaths were recorded at designated trauma services in 2015. The number of primary missions and secondary transfers of paediatric trauma patients can be found in the Trauma Admissions by Mission or Transfer results (Appendix E).

Models of care
- All three PTSs had well established processes for managing trauma from admission to discharge, using a case management model
  - There was variation in electronic documentation recording the paediatric trauma journey throughout all three facilities
  - The model at Children’s Hospital Westmead was further strengthened by admission under a trauma bed card

Recommendations for regional trauma services
- Standardise electronic documentation recording across all RTSs
- Explore opportunities to maximise the use of existing telemedicine technology to improve support for patient management within RTSs
- Value may be added to the trauma model of care by utilising nurse practitioners in trauma care delivery
- Develop a systemwide workforce plan that includes minimum expectations for level of cover after hours within each RTS, including components for onsite, remote, retrieval, and supra-specialist advice
Significant gaps were identified in information retention of electronic records at Sydney Children’s Hospital and Children’s Hospital Westmead, through the paediatric case note audit (refer to 3.2.4)

- The model at John Hunter Children’s Hospital is integrally linked to the adult service which provides a holistic family trauma capacity at a single location
  - This will be further enhanced with the completion of the additional paediatric intensive care beds

- Both Sydney Children’s Hospital and Children’s Hospital Westmead operate as separate trauma services, which does not provide for a single telephone number across both facilities for advice or triage despite both being partners within the Sydney Children’s Hospital Network

- **Referral to rehabilitation** was not well established for paediatric trauma patients, nor addressed statewide in PTSs
  - Referral to brain injury services and adult rehabilitation services exists and each site had further capacity to provide additional paediatric rehabilitation for inpatients
  - Little evidence exists of how paediatric rehabilitation was being provided post-discharge
  - There was very little evidence of any outcome assessment being undertaken on an ongoing basis
  - Discharge to the patients’ home location was being delayed due to lack of paediatric trauma rehabilitation capacity locally

**Workforce**

The staffing infrastructure for PTSs is illustrated in Figure 3.3.

- In hours, paediatric staffing (Registrar / Consultant), paediatric anaesthetic and pain management were available onsite
  - After hours, paediatric trauma involvement is based on an on call basis with general surgical / adult trauma / ED being the primary respondents

- Case management is shared between paediatric surgical CNC and the trauma CNC

- **Paediatric and adult trauma services were integrated** at John Hunter Hospital
  - Integrated services resulted in access to the wider adult trauma resources and strong relationships between adult and paediatric staff

- There is approximately the same workload (number of paediatric trauma admissions) in the Sydney Children’s Hospital and Children’s Hospital Westmead
  - The Children’s Hospital Westmead had a similar staffing structure as the MTSs
    - The staffing structure comprises a Trauma Director, Deputy Director, Consultant medical staff, Nurse Coordinators, Data Manager and Administrative Support
    - The staffing structure enables admission under a trauma bed card and enables consultant-led ward rounds and follow-up of patients in subspecialties
In contrast, at the Sydney Children’s Hospital, there is no resource allocated to the Trauma Director role (fractional ED Consultant) and a reliance on other services within the facility to provide trauma management

- The capacity of the clinical nursing and data management positions do not enable comprehensive case management or follow-up for paediatric trauma patients

- There were no workforce plans in place for backfill or succession planning.

![PTS staffing infrastructure](image)

**Figure 3.3 Current PTS staffing infrastructure (Trauma Services Audit)**
At John Hunter Children’s Hospital, services shared with adult trauma services.

*Includes position titles Trauma Director, Deputy Trauma Director, Trauma Consultant, Trauma Fellow; at John Hunter Children’s Hospital, a fractional Paediatric Trauma Director is available 0.2 FTE; at Sydney Children’s Hospital (0.0 FTE), the Trauma Director is substantively appointed in ED and accepts a managerial allowance to provide the role.

†Includes position titles Trauma Nurse Coordinator, Trauma Case Manager, Area Trauma Nurse Coordinator.

**Recommendations for paediatric trauma services**
- Establish a statewide rehabilitation referral process for discharged paediatric patients
- Standardise electronic documentation recording across all PTSs
- Explore opportunities to increase local capacity of paediatric trauma rehabilitation to improve time to discharge to their home location
- Develop a systemwide workforce plan that includes minimum expectations for level of cover after hours within each PTS, including components for onsite, remote, retrieval, and supra-specialist advice
3.2. Paediatric Outcomes by Agency Retrieval Providers

The service models adopted by the respective retrieval providers have developed individually and have been driven primarily by the policy and funding environment which has changed over the last decade to a more commercial and contestable model. The advent of improved technical and transport capability has also impacted the positive opportunities in the service model that are available to manage increasingly complex retrievals and transfers.

3.2.1. NSW Ambulance

Model of service delivery

- The Hunter Retrieval Service (HRS) involves **physician and paramedical staff for primary missions and medical and nursing staff for secondary transfers**
  - The secondary transfer staff are rostered and paid for retrieval work by retrieval services but also hold clinical positions within John Hunter Hospital (JHH)
  - HRS believe that the medical / nursing staff model is essential for paediatric patients given the specialist skill sets required and the need to stabilise prior to transport
- There is a **24-hour dedicated phone number** for the Hunter New England Region and the phone is answered by the intensive care nurse rostered for retrieval
  - The service takes approximately 1200 calls per year, with approximately 600 resulting in secondary transfers by HRS
- Paediatric transfers average 69 per year (11%) (2011 – 2015 HRS data)
- HRS have an established relationship with NETS (Westmead), whereby either service will call the other directly to assist in tasking retrieval where appropriate
  - If there is a helicopter requirement then Aeromedical Control Centre (ACC) would be involved in the tasking
  - The NETS team, based at JHH, are only involved in neonatal retrievals, not trauma
- The **GSA HEMS** retrieval service model involves **teams comprising medical and paramedical staff**
  - Tasking is from the ACC and includes the use of the Rapid Launch Trauma Coordinator
  - In 2015, GSA HEMS responded to 135 pre-hospital paediatric trauma cases
- GSA HEMS try, where possible, to **transport paediatric trauma patients to a PTS**
  - The decision, however, is made by the treating clinician
  - The real challenge for paediatric trauma is that it is relatively rare, and that within the NSW system, there are insufficient cases to build up expertise across the various transport providers
• There is a robust education system in place
  o Training accreditation is recognised by the Australian College of Emergency Medicine and the Australian and New Zealand College of Anaesthetists
  o Paramedics are accredited Critical Care Paramedics, and are required to meet competency and education standards to meet this qualification
  o GSA HEMS also conduct established education programs with participants being drawn from other transport services and the wider trauma system
  o GSA HEMS have a strong debrief and clinical review culture and participate actively in ITIM clinical and governance forums

Issues and opportunities
• GSA HEMS identified that after hours, although Senior Clinicians were meant to be available at MTSs, often only junior (non-consultant) staff were available when the retrieval team arrived
  o This impacted on both the speed and nature of definitive treatment decisions
  o This was considered an issue that the trauma system needed to address in order to provide the best outcomes for paediatric patients
• The lack of integration between the various telehealth camera systems in place across NSW Health does not facilitate optimal advice for remote treatment of patients
  o NETS have installed cameras, as have some LHDs, and the ACC, but none of the systems are linked and there is no central point that any of the transport services can view the information from all systems
  o ACC would be a logical point for this to occur but there has been little commitment to date to address the issue by those providing the camera systems
• GSA HEMS identified a range of issues including support for rural facilities, both in terms of training and preparedness for managing trauma and available equipment, and poor data linkage between services, but these applied more generally to retrieval services rather than specifically to paediatric trauma retrieval
• HRS identified the lack of involvement with ITIM at a strategic and clinical governance level as an issue
  o HRS have a good relationships within Hunter New England LHD (HNELHD), JHH trauma and other services but this does not enable their expertise in paediatric transport to be leveraged by the wider trauma system
3.2.2. CareFlight

Model of Service Delivery

- CareFlight provides a primary retrieval emergency medical service for paediatric trauma cases within metropolitan Sydney
  - The service is helicopter-based and physician staffed
  - CareFlight also provides adult retrieval services
  - In 2015, from the 81 overall paediatric patient case load (and an all ages overall caseload of 379 NSW patients, 18% of their total clinical caseload), CareFlight provided a primary retrieval service to 68 trauma paediatric patients, defined as any injury caused by an external force and including immersion / drowning. The age distribution of these patients is illustrated in Figure 3.4.

![Figure 3.4. 2015 CareFlight paediatric cases by age (n = 81) (Source 2015 CareFlight data)](image)

- CareFlight has capacity to provide a secondary transfer service for paediatric trauma patients, but is not contracted to do so within NSW
- Since May 2011, CareFlight is tasked via the Ambulance NSW Rapid Launch Trauma Coordinator (RLTC)
- CareFlight’s service delivery model consists of Registrar / Consultant Physicians and paramedic teams
  - Some of the CareFlight Consultants also work on the NETS roster via a contractual agreement, which is seen to be of value to both paediatric trauma transport services
- The service delivery model focusses on:
  - getting to the site of the trauma as soon as possible; and
  - undertaking appropriate assessment; and
• undertaking treatment to enable retrieval to a PTS as rapidly as possible

• The CareFlight team is staffed with clinicians (specialist and trainees), allowing the retrieval process to be completed quickly and effectively

• CareFlight will transport paediatric cases to a MTS rather than a PTS, when clinically appropriate

• CareFlight has appropriate equipment for paediatric retrieval and training programs in place for staff to ensure skills competency
  o An alternative ventilator would need to be considered if CareFlight were to provide ventilation to children under the age of 1 year

Issues and Opportunities

• CareFlight clinicians continue to perceive that the model in place prior to 2007 (and is also in place in other overseas jurisdictions) is better achieved when the case identification, and hence, subsequent tasking / dispatch is better achieved in a service delivery model
  o This service delivery model involves that the staff who assess the information at a tactical level and ultimately provide the clinical decisions at a coordination level, are also engaged in rostered clinical delivery of the retrieval service.

• CareFlight believe that they have capacity to undertake paediatric secondary transfers and that, in major paediatric trauma cases, these would be better undertaken by specialist paediatric trauma clinicians

• Whilst the relationship with PTSs and MTSs is good, CareFlight clinicians have identified that the:
  o helipad at Children’s Hospital Westmead is too far away from the resuscitation areas; and
  o the resuscitation room at Sydney Children’s Hospital is too small

3.2.3. Newborn and Paediatric Emergency Transport Service (NETS)

Model of Service Delivery

• NETS is a major provider of paediatric and neonatal transport within NSW which:
  o includes secondary paediatric trauma transfers
  o does not provide primary retrieval services
  o does provide what are effectively primary secondary transfers from non-designated trauma facilities, to designated trauma services
  o has its base currently located at the Westmead Hospital Campus, but is relocating to Bankstown Airport later in 2016

• NETS has a direct telephone number which is used by NSW Health facilities
  o The telephone is answered by a clinician who facilitates rapid assessment
  o NETS will refer to other transport providers if the NETS skillset available or response time is not optimal
  o NETS emphasised that determining the retrieval process is a complex decision best made by the senior clinician rather than by a pre-determined protocol
• There are **five NETS teams available per 24 hours**, on 10-hour shifts, with staggered starts
  o Teams comprise medical and nursing staff, with specialist consultants as required
  o Medical staff within the NETS team can range from first year advanced trainees to consultants, including contracted trauma specialists
  o Hospital clinicians have access to expert consultant input from NETS via telemedicine when onsite
• NETS have developed a neurosurgical model of care that enables critical neurosurgery to be undertaken at the retrieval site through inclusion of a neurosurgeon within the retrieval team
  o Published results (Owler et al., 2015) from this model of care demonstrate its effectiveness and reflect the capacity of NETS to leverage off specialist tertiary services in supplementing retrieval team skills
• NETS define a trauma case as involving one or more of the following criteria:
  o head injury (symptomatic)
  o near drowning (especially with neurological depression or respiratory symptoms)
  o burns (see NSW Health Burns Transfer Guidelines July [2005])
    ▪ ≥ 10% Total Body Surface Area (TBSA) burnt
    ▪ encircling the neck or involving the airway, face, hands, feet, perineum, or inner joint surfaces
    ▪ associated other significant injury
    ▪ electrical or chemical burns
  o major trauma (including spinal injury)
  o envenomation
  o shock from blood or fluid loss (requiring treatment with volume replacement or inotropes)
• In 2015, there were 240 **direct referral trauma calls** to NETS
  o Of these, 58 resulted in retrieval by NETS by meeting the above NETS trauma criteria (Figure 3.5)
Figure 3.5 2015 NETS trauma calls by age group (n = 240) (Source 2015 NETS data)

Issues and Opportunities

- NETS believe that their process for responding to trauma calls is effective and enables them to implement a range of responses in respect to retrieval
  - They are flexible in recognising the need for skill sets that they may not have available when required, and their data demonstrate that a significant number of trauma calls responding to needs are directed to, and undertaken by other providers
  - NETS are also increasing the core team nursing resources of staff with trauma backgrounds and experiences as well as supplementing the medical roster with trauma specialists who also work with CareFlight and / or HEMS – this has created a capacity to address the concerns raised by some other service providers in respect of the trauma skills and time taken onsite to retrieve paediatric trauma

- NETS believe that implementing an advanced warning call system for major cases from the pre-hospital setting would enable NETS to better match the skills required to the trauma retrieval

- NETS also believe that there needs to be consistency of definitions of what constitutes time critical as this would also assist in the appropriate team being sent
3.2.4. Case Note Audit

- **The purpose** of the case note audit was to better understand the paediatric patient journey through the trauma system.

- The case audit utilised paediatric cases from the *2014 NSW ITIM Trauma MDS*.
  - There were 98 secondary transfers to a paediatric trauma service, involving retrieval services, identified for 2014 calendar year.

- A random case note audit of 35 cases was undertaken.
  - All cases were assessed against a pre-designed tool by the same two assessors.
  - Five cases were excluded due to not meeting assessment criteria.
  - The cases were equally distributed between the Children's Hospital Westmead and Sydney Children’s Hospital, which reflects the approximately equal caseload associated with paediatric trauma cases seen at each facility.

- **The characteristics of the cases assessed** are outlined in Table 3.1.

Table 3.1 Characteristics of cases assessed in the Case Note Audit

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number of cases assessed (N=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>≤2 years (youngest case was 12 days old)</td>
<td>20</td>
</tr>
<tr>
<td>13–15 years</td>
<td>7</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td></td>
</tr>
<tr>
<td>Outside the greater Sydney area to a PTS</td>
<td>9</td>
</tr>
<tr>
<td>Within the greater Sydney area to a PTS</td>
<td>3</td>
</tr>
<tr>
<td>Transfer from Canberra to a PTS</td>
<td>3</td>
</tr>
<tr>
<td>Transfer from a rural location to an intermediate designated trauma facility and subsequently to a PTS</td>
<td>2</td>
</tr>
</tbody>
</table>

- **PTS, Paediatric Trauma Service**

  - The assessment and treatment undertaken at the initial site was **appropriate to the level of the site** receiving the child in the majority of cases (*n* = 17).
    - In 13 cases, it was not possible to determine from the documentation in the clinical record whether the assessment and treatment was appropriate.
    - In the case involving transport from a rural location to Canberra, and then to a PTS, the assessment documentation at both sites was excellent.
• The handover from the transport service to the PTS was excellent, either in the form of case sheets, referral letters, or both in the majority of cases (n = 21)
  o There was no documentation of handover in 9 cases

• There was variable compliance with local trauma call criteria evident in the documentation
  o For the purpose of the audit, a trauma call was defined as trauma call, alert, standby or other local terminology
  o There were 8 cases where a in hospital trauma call was made, 10 cases where the admission was direct to ICU or did not warrant a trauma call, and 12 cases where there was no evidence of a trauma call being initiated

• Documentation demonstrated that assessments were undertaken in:
  o 23 cases for primary and secondary assessments, with no evidence of primary and secondary assessment for 7 cases
  o 7 cases for tertiary assessments, with two ICU direct admissions that did have evidence of a tertiary survey being undertaken

• Handover to subspecialty services was well documented in all cases
  o Handover from the ED to ICU was documented well
  o There was variability in handover between ICU and wards, and between wards and other services

• Most cases had little evidence of referral, whilst good evidence of referral to other specialist services was evident in some cases
  o There was no evidence of referrals to rehabilitation services nor was there evidence of case management review by trauma services in most of the records examined
  o Psychosocial referral was evident in 14 cases with the largest group of trauma patients related to non-accidental injuries (mostly head ± other fractures)
    ▪ Although psychosocial referral may not be required, it would be expected for non-accidental injuries

• Discharge summaries (when available; n = 16) were good
  o Many cases had no discharge summaries or documentation reflecting clinic follow-up or assessment post-discharge
Recommendations for paediatric retrieval providers

- Paediatric trauma patients meeting major trauma criteria should be taken directly to a PTS if within 60 minutes travel time, unless there is an exceptional reason for this not to occur, e.g. treating clinician decision / MTS being a more clinically appropriate service.

- Paediatric patients unable to be transported directly to a PTS need to be notified to Aero Medical Retrieval Service (AMRS) via the Control Centre to facilitate timely retrieval (also includes paediatric patients transported to RTGs and MTSs).

- Reinforce the advance warning call system for major cases from pre-hospital settings.

- MTSs should ensure adequate staffing with senior clinicians for prompt definitive treatment decisions.

- Explore methods to address the initial triage process for both primary and secondary retrievals, in particular, utilising senior clinicians in determining the retrieval process.

- Standardise electronic documentation recording across all PTSs.

- Develop consistent PTS terminology for implementation across the NSW trauma system.

- Explore opportunities to maximise the consistent use of existing telemedicine technology and plan for implementation of emerging technologies utilising mobile technology.

- Align and standardise telehealth equipment across the NSW trauma system.

- Create and link camera systems from NETS, LHDs and ACC.

- Standardise staff trauma training, including paramedics, to ensure a minimal level of expertise.

- Consider relocating helipads closer to resuscitation areas and allocate adequate room for resuscitation.

- Involve ITIM for strategic and clinical governance, where appropriate.

- ITIM should consider ways of better engaging with transport providers to add value to the whole trauma system journey for paediatric patients.
4. Trauma Service Systems and Processes

4.1. Transfers

- All referral facilities advised that the trauma transfer system for referral to specialist services (paediatric, spinal and burns) worked well
  - The Children’s Hospital Westmead, Sydney Children’s Hospital, John Hunter Hospital, Prince of Wales, Concord and Royal North Shore Hospital all have established processes for accepting specialist transfers from other trauma services
  - There were occasionally issues relating to bed availability in the spinal units, especially if the patient had already had spinal surgery at the initial trauma facility

- All MTSs have a phone contact point for transfers and adhere to the no refusal policy for transfers that meet appropriate trauma criteria
  - The interpretation of ‘appropriate’ varied from accepting all trauma transfers, to more active support for the RTS to manage the patient, although this is limited to telephone advice rather than any form of even rudimentary telemedicine
  - Some RTSs advised that there were some patients with specific diagnoses who may be transferred to a facility because there was a surgeon there with specific expertise (e.g. complex multi-pelvic fractures)

- In some rural RTSs, there was occasional uncertainty about who to transfer to, and how the process worked
  - There were occasions reported where individual consultants were making direct calls to other consultants in tertiary facilities rather than using the agreed processes
  - In other cases junior medical staff at the RTS were having difficulties in negotiating with consultants in subspecialties at the MTS

- After hours, there was some uncertainty about who (the referring or referral service) rang ACC / AMRS, and the circumstances in which the responsibility for finding an admitting service within the RTS or ACC / AMRS

- The facilities in which the transfer call was directly answered by a Trauma Specialist or ED Consultant tended to enable an expedited process, compared with when the call required further internal consultation before being resolved

- Transfers within NSW are undertaken by NSWA and NETS (for paediatric transfers)
  - ACC provide coordination and tasking for primary and secondary retrieval providers
  - Both NETS and the Hunter Retrieval Service (part of Northern Sector HEMS) have direct telephone numbers with telephone calls answered by clinicians

- Transfer arrangements (that are largely informal and clinician-to-clinician-based) exist between Northern NSW RTSs and trauma facilities located at the Gold Coast and Brisbane
  - Given the geography and the need for transfer to the most appropriate level of care quickly, it is clearly sensible for these transfers to occur (rather than for patients to be transferred south to Newcastle or Sydney)
There are formal transfer memorandum of understandings (MOUs) being developed between the Northern NSW LHD (NNSWLHD) and Queensland services that clearly articulate the expectations and responsibilities of services involved in the transfer and retrieval of patients between the two states.

There is a similar situation in the southern sector of NSW that involved cross border transfers of patients from the Southern NSW and Murrumbidgee LHD (SNSWLHD, MLHD), who were being retrieved via a local retrieval provider (SouthCare) and admitted to The Canberra Hospital; this is a variation to the critical care and trauma services plan for the MLHD.

- Back transfers were generally identified as occurring appropriately
  - The largest issue impacting the back transfer is the availability of appropriate rehabilitation services, accepting inpatient team or bed availability

**Issues and Opportunities**

- The length of time that it may take a retrieval provider to arrive in order to transfer the patient to a higher care facility was identified as an issue by some sites

- Some hospital and prehospital clinicians raise concern regarding the deployment of NETS teams to retrieve paediatric trauma patients as primary interhospital missions or interhospital transfers
  - It was identified by some facilities that NETS took longer to stabilise and prepare paediatric patients for transfer than the adult retrieval teams
  - Additional comments involved the skill and training of the NETS staff to deal with trauma critical care
  - There were other facilities that identified no issues with transfers and valued the three-way NETS consultation model

- There is the lack of standardised training requirements amongst those managing paediatric trauma critical care retrievals

- It is clear that early triage and involvement with senior specialist trauma staff would help optimise the appropriate retrieval teams
4.2. **Network Support**

The NSW trauma system is characterised by a series of networks. The NSW Trauma Services Plan (2009) articulated a statewide trauma system, but growth and development of the current network components has been driven through local institutional needs and developments resulting in individual networks associated with each of the seven MTSs, which vary widely in the level of integration with their referring hospitals and within the state system itself.

- The **trauma service network arrangements**, in terms of how MTS, RTS and other facilities were related, as described in the NSW Trauma Services Plan (2009) are in place, on one level
  - However, it was apparent from site visit discussions and survey results that there are other referral arrangements, either historic or clinician-based, which overlay the proposed structure
  - The inclusion of St Vincent’s as a trauma centre further impacts this model as it is not associated with any other network, but has established some informal advisory and referral arrangements with other facilities
- **RTSs should receive a strong support base from their associated MTSs**, which is the notion underpinning existing trauma networks
  - This should be evident through training, education, policy and active clinical advisory support and a clear understanding by RTSs and other referring facilities of where their MTS support should come from
  - It was apparent from site visits, particularly in rural areas, that the level of understanding of how the network operated and the degree of support for the RTS from the MTS was very varied — in some cases the relationship between an RTS and the designated MTS was not

---

**Recommendations for trauma transfers**

- Develop a process for capturing and presenting dynamic real-time healthcare intelligence at institutional, regional, network and state levels and ensure clinical and executive buy-in
- Develop clear guidelines on standardised roles and responsibility of trauma team
- Formalise the interfacility trauma transfer process for both paediatrics and adults
- Formalise transfer MOUs between all border regions of NSW that clearly articulates expectations and responsibilities of services involved in the transfer and retrieval of patients between two states
- Optimise the appropriate retrieval team by involving specialist trauma staff to triage early
- Develop a model of collaborative and standardised paediatric trauma education for all retrieval providers, with a system of accreditation and ongoing currency implemented
the primary relationship, whereas in other cases, there was strong evidence of support from the MTS for the RTS

- All the PTs and statewide specialist services were identified as providing support to RTS, MTS and other principal referral facilities and networking arrangements were effective and well established for access by trauma clients

- The primary network issue identified related to some paediatric clients being taken to either an RTS or MTS as a primary retrieval when retrieval direct to a PTS would have been more appropriate. As such, it was suggested that:
  - there needs to be stronger emphasis on the need for paediatric clients to go directly to a PTS; and
  - the accompanying medical support to safely facilitate the transfer and notwithstanding the need for staff in either a RTS or MTS to have appropriate skills, focused primarily on damage control resuscitation and surgery, to manage paediatric trauma patients that present at the facility too unstable to safely transfer in the first instance

- The current Critical Care Referral Network needs to be better aligned with the Trauma Network (Agency for Clinical Innovation, 2010, 2013)
  - This further compounds the network issue which is a source of ongoing confusion and overlap — trauma clients are invariably critical care clients and clinicians will use either mechanism to facilitate secondary transfer

- The network that extends from RTS to preferred providers and other local facilities is variable
  - Most RTSs did not have the capacity to regularly engage with potential referring facilities particularly in the more rural areas
  - There was some evidence of staff from both the appropriate RTS and MTS undertaking site visits and providing feedback post-transfers from small regional sites but nothing to suggest a strong unpinning of an integrated trauma system network.

### Recommendations for network support

- Design and implement strategies to enable more effective networking and support across multiple MTS and RTS facilities, incorporating an integrated model for trauma training, rotations and clinical integration
- Review Critical Care Referral Network to improve support for RTSs provided by MTSs and clearly communicate the relationship and degree of support provided / received to all parties involved
- Identify opportunities to increase and improve the capacity and resources within the network
4.3. **Education and Training**

The surveys and site visits identified that there is no college-affiliated comprehensive trauma training program at a registrar level. Registrars may participate in trauma rotations as part of their postgraduate surgical training, or as Fellows, in facilities that have these positions available. As a trauma system, there should be consideration as to whether a systemwide training program specific to trauma could be developed with the colleges.

**MTS (adult and paediatric)**

- A range of education within the institution was provided by trauma service staff including:
  - Department in-services — Conducted weekly to monthly in a range of departments, mostly critical care and trauma ward areas
  - Skills training — Varied from no provision of training to being conducted quarterly
  - Team training — Conducted team training ranging from weekly to twice-yearly with many providing monthly training
- The majority of MTSs provided education and training within their LHD
  - Only 2 MTSs provided education and training to their networked rural LHD
- Staff at three MTSs undergo clinical rotations at an RTS or other MTS
- All of the MTS staff who manage trauma data have completed the Abbreviated Injury Scale (AIS) coding course

**RTS**

- The trauma service audits indicated that all RTs provided a range of education in their institution including:
  - Department in-services — Conducted weekly to monthly in a range of departments in most RTSs, mostly critical care and trauma ward areas
  - Skills training — Less than half of the RTSs provided skills training
  - Team training — The majority of RTSs conducted team training ranging from fortnightly to quarterly
- Approximately half of the RTSs conduct education and training in the LHD
  - Two RTSs have staff who do clinical rotations at an MTS
- All of the RTS staff who manage trauma data have completed the AIS coding course
4.4. Protocols and Guidelines

- Responses to the survey and provision of additional documentation from trauma services demonstrated that all services have documentation consistent with provision of the appropriate level of trauma service
  - The documentation also identified the use of differing language, or the same language but meaning something different in a different location
  - The NSW Trauma Services Plan (2009) did not provide direction regarding terminology nor in respect of minimum standards that might be included in specific protocols or policies and hence, the trauma system has developed these based on local requirements for each service (refer to Box for example)
  - Whilst consistent terminology is an appropriate goal, local use of terminology also needs to be considered as trauma services are integrated within the local facility
- In addition, there is little consistency with other areas of documentation demonstrated in various guidelines and discharge information provided through the survey and the site visits
  - Some areas have comprehensive material whereas others have very little
  - Much of the information could be generic and taking a broader view about what components of post-discharge information could be available to all trauma patients might assist in addressing the current variance
- The minimum standard for response (who is required to attend and in what situations) is interpreted differently
  - The lack of any systemwide standard has led to the after-hours trauma response in one RTS being whomever might be in ED, which challenges the notion that the RTS is anything different from any other rural referral service
  - Other areas that would benefit from clarification would be standardised state guidelines for indications for interfacility transfer and acceptance
- There are no statewide guidelines that describe what staffing and response requirements are after hours resulting in significant variance

Recommendations for education and training

- Develop a system to standardise staff trauma training to ensure a minimal level of expertise, such as a NSW trauma training curriculum that outlines the minimal expectations, content and frequency that is aligned with the Royal Australasian College of Surgeons (RACS) trauma verification criteria (to be provided or facilitated by all NSW trauma services and undertaken by all NSW trauma services personnel)
- Consider the development of a systemwide trauma-specific medical training program with the colleges

Terminology use

Across facilities, differing terminology is used to describe trauma calls and response, including:
- Trauma call
- Trauma standby
- Trauma alert
- One-tier
- Two-tier
- Three-tier
This is also the time period in which the least expert resources are available across the facility, yet, it is the time period when many traumas occur

ED in most facilities leads the response to trauma between 2400 and 0600 hours, however, the level of clinical medical response from other specialties during these hours (e.g. pre-Surgical Education Training [SET] Registrar) is not senior enough to make the appropriate decisions at the bedside

In most facilities, there is no requirement for consultant attendance within 15 minutes and, in some cases, consultants may not have been notified of the arrival of the trauma patient

Protocols that required consultant level teleconferencing between specialties for multisystem trauma patients would potentially address this issue in MTSs

Better use of telemedicine would assist RTS EDs in their initial management

- **There is an evolving, if somewhat segmented, development of regional critical care advisory services**
  - Services range from purely patient flow management to dedicated nursing and medical specialist advice
  - This strategy offers promise to ultimately transition to a teletrauma network, with each RTS having access to 24/7 MTS level clinical support (either with their designated network MTS, or perhaps more efficiently to a state level specialty roster as per Extracorporeal Membrane Oxygenation [ECMO], Transplant, or Burns, providing the top-tier advice, as required, to multiple LHD or RTS generalist trauma services in a pyramid model of care)

- The **RACS trauma verification Model Resource Criteria document provides comprehensive guidelines** with respect to many of the protocols and requirements that are part of the NSW trauma system delivery
  - It may be appropriate for the whole NSW trauma system to adopt these guidelines, and then work towards achieving verification appropriate to their delineation in the trauma plan
  - ITIM are offering financial assistance to trauma services who are seeking RACS verification and this approach would be consistent with achieving the objective as well as developing standardisation across the system
  - The RACS verification provides a two-tier approach to MTS classification and it may also warrant considering how this approach fits with the current classification structure
4.5. **Patient Outcomes**

Patient outcomes are key to the success of the trauma system and at present there is a paucity of data to support outcomes.

“It would be great to have more standardisation in the level of trauma care we give our patients. We are constantly asking ourselves ‘Are we providing the right service?’”

- The site visits identified that there was **considerable variance in the approach to following-up patients post-discharge**
  - There were little or no follow-up in some facilities and established telephone follow-up or clinic review in others
  - In some facilities follow-up was left to specialty clinics whilst those facilities that conducted trauma clinics identified coordination of patient management and picking up missed diagnoses as important aspects of the clinic work

- There was very **variable use of electronic medical records (eMR) for identifying trauma patients**, which was clearly demonstrated in the survey responses and site visits
  - eMRs allow patients to be easily followed through the system
  - Many nursing coordinators were found to be downloading ICU and FirstNet datasets into Excel to sort / search for trauma patients. This is both inefficient and problematic as a process for identifying trauma patients, particularly after weekends and public holidays.
  - Initial tagging of the patient in FirstNet (mandatory rather than optional box) may help streamline the process and improve the data consistency

---

**Recommendations for protocol and guidelines**

- Develop a NSW State Trauma Model of Care that will standardise trauma services, networks and clinical care across the trauma continuum
- Establish 5-yearly RACS verification as a requirement for all trauma services by 2021 and progressively implement systemwide standards associated with RACS verification requirements
- Consider developing consistent trauma service terminology for implementation across the NSW trauma system
- Establish and implement processes to assess completeness of clinical documentation, in particular the completion of discharge summaries
- Develop clear state guidelines on standardised roles and responsibilities of the trauma team
- Develop clear state guidelines to standardise indications for interfacility referral transfer and acceptance amongst RTS, MTS, PTS and non-trauma centres
- Maximise the use of existing telemedicine technology so each RTS has 24 / 7 access to MTS level support to assist RTSs with the initial management
Data and reports generated are often not shared or explained across LHDs or down the organisation to the clinical frontline, much less the public.

Data that clinicians could use for changing practice is not clearly identified or developed in a format that makes for easy comprehension and action.

Usable information must be developed to gain insight and support changing clinical practice.

- Most transport providers expressed concerns that they were often unable to discover the paediatric outcome following retrieval due to various privacy requirements or being advised about the outcomes by NSW Health staff.

  - Access to this information would enhance reporting paediatric retrieval outcomes as well as promoting more transparent sharing of information between services.

  - Whilst informal processes enabled some awareness of the paediatric journey in ICU and RCA enabled discussion of cases (those identified for that purpose), most clinicians involved in the retrievals also held positions within the NSW health system, and are bound by privacy and confidentiality requirements for their patients.

  - An exception to this was JHH, where shared appointment arrangements of the staff allowed follow-up of their retrievals and access to information on outcomes.

- After the patient has been discharged from the trauma hospital, the ITIM MDS does not capture any patient outcomes.

  - A post-discharge survey is not included in the ITIM MDS.

  - There is no MDS expectation for post-discharge follow-up and often, the best available data is from generic facility discharge surveys.

  - Those facilities that have adopted post-discharge telephone follow-up have generally modelled this on the Victorian system and have introduced it in their own facilities; there is no trauma systemwide requirement or expectation to do this.

  - In most visits the importance of understanding outcomes from a patient perspective was discussed and there was little evidence that systems were in place to do this currently but strong agreement that it was important and should be addressed.

  - Some facility rehabilitation teams were measuring patient outcomes but these were mostly via generic rehabilitation rather than trauma-specific tools.

“Trauma patients who are discharged into rehab fall into a black hole; there is nowhere specifically for them to go”
Recommendations for patient outcomes

- Develop patient reported outcome measures that can be incorporated into the MDS and collected via electronically linked data records optimally derived from eMR data.
- Create and implement a NSW State Trauma patient database that incorporates improved clinical information data linkages between care providers, collection of patient outcome measures and leverages real time data. This will enable access by all treating clinicians to the trauma patients entire journey in supporting the provision of clinical care.
- Provide clear expectations for trauma audit including costs and outcome measures whilst considering mandatory review of all trauma deaths by external independent state committee.
- Mandate tagging within the drop down on FirstNet to improve data consistency.
- Introduce and implement post-discharge telephone follow-up systemwide.
5. **Summary**

The Trauma Patient Outcome Evaluation Qualitative Report has focused on the resources / resourcing components of the NSW Trauma Services and further, paediatric outcomes by agency retrieval providers. In conducting site visits, audits, and interviews, this evaluation (in addition to the NSW Trauma Services Plan [2009]) has identified key areas that trauma facilities could advance in order to provide an effective and efficient future NSW trauma system and enhance patient outcomes.

Across the trauma facilities there is recognition that services have developed in response to local institutional needs and models of care, and that whilst the NSW Trauma Services Plan (2009) provided some broad direction, there has not been a focus on consistency, comprehension of value based care or measurement of outcomes at a system level. To some extent, this is a result of the challenges in collecting and sharing data across the system both from a technical and subjective perspective. For the future, if the trauma system is to truly measure and focus on the patient outcomes, then the issues associated with data must be addressed. With electronic medical records in place, issues such as linking data across the trauma episode of care, inconsistency in coding and reporting data, and minimal measurements of post-discharge outcomes at a system level should not occur.

All providers identified the importance of early clinician involvement in determining the appropriate retrieval process which allows the trauma patient to be correctly identified initially and retrieved more quickly. This may be best achieved through clinician involvement in receiving the initial call, which is the current model for NETS and HRS. Furthermore, all providers identified the potential opportunity of utilising telemedicine or teletrauma to optimise patient assessment, pre-mission planning, remote diagnostics and operational level clinical support decision processes throughout the patient journey.

Telemedicine, teletrauma and any other future technologies may be utilised more effectively with training and support for RTSs and smaller facilities. There are already three telemedicine systems providing remote camera support available across health facilities and most facilities have access to at least one, however, none of these systems are linked. Some are available to specific networks, some LHD-based, and some clinical system-based. Integration of these systems should be a short-term priority whilst other emerging technologies using secure portals through smartphones can be developed and implemented.

It was evident that each trauma service had their own model of care, which was developed and is reflective of the local workforce availability. It was identified that a systemwide workforce plan should be developed, including minimum expectations for level of cover after hours within each service. Further, in order to account for significant changes in the trauma workload, planning data may be used to help plan for resources, changes and the role of the trauma centres. Without planning data, the following strategies can be considered from a systemwide perspective:

- Ensuring registrar rotations provide more senior registrars after hours
- Embed and resource the trauma service more broadly across the clinical streams in the facility, similar to the model currently used at Westmead hospital
- Creating a larger network across MTSs that include multiple sites and could generate greater capacity for consultant level cover as well as supporting more structured trauma system education across networked facilities

These strategies could also help to provide support for the RTSs through integrating the registrar training to include both MTS and RTS rotations. These strategies would best be addressed through negotiated arrangements with the appropriate Colleges to ensure recognition and support to meet College standards.
All providers are of the opinion that paediatric trauma should be taken to a PTS unless there is an exceptional reason for this not to occur. The perception by transport providers is that taking paediatric trauma to an MTS and then transferring to a PTS is sub-optimal and potentially inefficient. Effective management of primary trauma should enable retrieval to a PTS and if the issues / triage associated with managing the initial call could be addressed, this would result in far less requirements for secondary trauma transfers and in particular time critical transfers.

This report also revealed that a general consensus existed that the skills required for secondary retrieval of paediatric trauma cases should be the determinate of which transport providers should be involved. CareFlight and GSA HEMS considered that neonates under 1 year of age were appropriately transported by NETS, where paediatric and neonatal experience was important but older children may often have more specialist trauma retrieval skill requirements. NETS considered that their triage process identified those time critical cases for older children needing trauma expertise that was not available at NETS are referred back to ACC for re-tasking. HRS believed that the model of involving nursing staff (NETS and HRS) was critical for retrieval of paediatric cases. Overall the system appears to work effectively currently as there are many medical clinicians working across all services and thereby cross-fertilising the appropriate skill sets.

The ability to visualise trauma patients and support clinicians at the scene, until expertise is available, should be an area of focus. In addressing this, the relationship between MTSS and all other facilities is pivotal. Removing current areas of confusion regarding who (MTS or Critical Care Service) is providing advice may assist local clinicians and help build sustainable links and relationships across the system. Whilst the NSW Trauma Services Plan (2009) identified the relationships it is clear that documenting a relationship is unlikely to be effective if it does not translate in tangible and practical ongoing support for clinicians in the smaller facilities.

Lastly, to assist in building future capacity and succession planning and developing consistency across the system, a strong, standardised and integrated education program across the trauma system needs to be developed. It is recommended that a 5-yearly RACS trauma verification is established as a requirement for all NSW trauma services; and subsequent implementation of systemwide standards, guidelines and protocols will assist in achieving consistency and standardisation across the trauma system.
6. Appendix

Appendix A: Participants

The Institute of Trauma and Injury Management would like to thank the following for their contribution to the Trauma Patient Outcome Evaluation Report.

**Interview participants**

- Sarah Adams
- Kay Best
- Emma Burgess
- Danny Cass
- Kevin Cornwall
- Anne Drinkwater
- Ailene Fitzgerald
- Trevor Gardiner
- Karel Habig
- Emma Jarvis
- Kate King
- Peter Mackay
- Steve McIlveen
- Richard Morris
- Jeff Petchell
- Frank Ross
- Julie Seggie
- Oliver Shaw
- Allan Tinkell
- Andrew Weatherall
- Teresa Anderson
- Bill Bestic
- Brian Burns
- Wilma Cassimatis
- Emma Curtin
- Sandra Farrugia
- Alan Forrester
- Alan Garner
- Anne Hawkins
- Penny Jones
- Trish Lemin
- Patricia Manglick
- Lorna McLeod
- Marek Nalos
- Tim Pollitt
- Steve Ross
- Jorge Seseperez
- SVS Soundapan
- Skye Vagg
- Deb Wilcox

**Interview participants**

- Zsolt Balogh
- Rod Bishop
- Sharryn Byers
- Robyn Chaffey
- Kate Curtis
- Donovan Dwyer
- Tony Fogg
- Emma Giddens
- Claire Helm
- Tony Joseph
- Liz Leonard
- Franco Martinese
- Gail Mogg
- Huong Nguyen
- Duncan Reed
- Gerard Roy
- Maryanne Sewell
- David Story
- Elizabeth Walter
- Andrew Berry
- Christine Bowles
- Chris Byrne
- Vicki Conyers
- Michael Dinh
- John Estelle
- Paul Gallagher
- Tony Grabs
- Jeremy Hsu
- Tina Kendrick
- Garth Lohan
- Karon McDonell
- Mary Morgan
- Rebekah Ogilvie
- Susan Roncal
- Nick Ryan
- Tony Shakeshaft
- Sandy Thompson
- Tamsa Waterhouse
NSW Ambulance and NSW Retrieval services
NSW Ambulance
NSW Health Emergency and Aeromedical Services
Newborn and Paediatric Emergency Transport Service
CareFlight

Major Trauma Services
John Hunter Hospital
Liverpool Hospital
Royal North Shore Hospital
Royal Prince Alfred Hospital
St George Hospital
St Vincent's Hospital
Westmead Hospital

NSW Local Health District
Hunter New England LHD (HNELHD)
South Western Sydney LHD (SWSLHD)
Northern Sydney LHD (NSLHD)
Sydney LHD (SLHD)
South East Sydney LHD (SESLLHD)
St Vincent’s Health Network
Western Sydney LHD (WSLLHD)

Paediatric Trauma Services
John Hunter Children’s Hospital
Sydney Children’s Hospital
The Children's Hospital at Westmead

NSW Local Health District
HNELHD
Children’s Hospital Network

Regional Trauma Services
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 Base Hospital
Wollongong Hospital

NSW Local Health District
Mid North Coast LHD (MNCLHD)
Central Coast LHD (CCLHD)
Northern NSW LHD (NNSWLHD)
Nepean Blue Mountains LHD (NBMLHD)
Western NSW LHD (WSWLHD)
MNCLHD
HNELHD
NNSWLHD
Murrumbidgee LHD (MLHD)
Illawarra Shoalhaven LHD (ISLHD)
Appendix B: Trauma Services Summary Reports

Visits to each trauma service were undertaken during February and March 2016. These were conducted by Mr David White (external health services consultant, Ashton White & Associates) and ITIM staff members. These visits were aided by a trauma service audit, which was conducted via email and aimed to capture information about current services and where gaps may exist (see appendix F and G).

This report is the result of the visits to each of the trauma services and the trauma service audits. The summaries are a reflection of the individual services opinion on their service and issues in the trauma system.
John Hunter Hospital — Major Trauma Services

1. Service Description:
John Hunter Hospital (JHH) is an adult major trauma service (MTS) within New South Wales (NSW), and is located in Newcastle. It has primary responsibility for Hunter New England Local Health District (HNELHD) and also Northern NSW Local Health District (NNSWLHD) and Mid North Coast Local Health District (MNCLHD), as well as being the only single-site MTS and paediatric trauma service (PTS).
Data for 2014 (NSW Institute of Trauma and Injury Management [ITIM]: Major Trauma in NSW 2014) identified 631 major trauma admissions (peer average 394) to JHH with a case fatality rate of 9.0% (peer average 13.0%).

2. Model of Care:
   a. Presentation
      Trauma patients rarely arrive by private car to JHH, it is usually by ambulance. There is a trauma phone, which connects via the switchboard, to a trauma specialist but there is no single point of contact.
   b. Trauma Notification
      There is a protocol-driven response to pre-hospital notice of trauma (Code 3). A trauma call can be received and initiated by the nurse in charge of emergency department (ED). There is a single-tier trauma notification system at JHH. These are criteria-based following pre-set mechanism of injury, injury, signs and symptoms, transport (MIST) criteria. There is an immediate response time to the trauma notification and set to the estimated time of arrival.
   c. Trauma Response
      The patient is received into the resuscitation bay. Senior ED Registrar / Fellow or Consultant in ED is the Trauma Team Leader with a Nursing Team Leader. Teams have clear roles allocated: intensive care unit (ICU, airway), Surgical Registrar (second survey and procedures), and Trauma Fellow (overall support).
   d. Trauma Admissions
      The patient is admitted under general surgery (acute surgery unit [ASU] roster for trauma acceptance) until a tertiary survey is completed. There is no trauma bed card. Trauma Consultant rounds daily in the ICU reviewing trauma patients. The trauma service will perform a tertiary survey in ICU. The trauma service provides a 24 / 7, 1 in 2 consultant roster (on call during afterhours). The episode of care continues under the surgery unit or subspecialty that the patient was referred to following the tertiary survey.
      The Clinical Nurse Consultant (CNC) conducts rounds each day and may involve the Trauma Case Manager or Registrar. Issues that cannot be dealt with at registrar level are escalated to the on call Trauma Specialist Surgeon.
   e. Transfers
      JHH accepts transfers and will provide advice to rural trauma service (RTS) staff, but there are only two trauma consultants to undertake this work. JHH trauma service staff recognised that patients from The Tweed Hospital will be transferred to the Gold Coast University Hospital. The trauma service staff at JHH have an understanding that more Lismore Hospital patients are coming south to JHH now, and they anticipate that this trend will increase pressure on the JHH trauma service.
   f. Rehabilitation
      There is a dedicated rehabilitation consultant at JHH who is the single point of contact. The consultant does ward rounds and will see patients early prior to needing transfer to rehabilitation. Generally low acuity rehabilitation needs can be achieved at the referring (or local) hospitals. There are two multidisciplinary case meetings per week to discuss insurance status with trauma patients, which can assist in determining rehabilitation options.
g. **Outpatient clinic / s**

Trauma patients are followed-up by the specialist that they are admitted under, so usually they attend trauma / orthopaedic outpatients and / or acute general surgery unit (AGSU) at 2 weeks and then subspecialties thereafter e.g. neurology, pain and physiotherapy.

3. **Workforce:**

a. **Medical** *(1.0 full time equivalent [FTE] Trauma Director, 1.0 FTE Deputy Trauma Director, 1.0 FTE Trauma Fellow)*

The Director and Deputy Director constitute the consultant roster, which is unsustainable as a 24 / 7 model for a service with 600 – 700 admissions per year.

b. **Nursing** *(2.0 FTE Trauma Nurse Coordinator, 1.0 Area Trauma Nurse Coordinator, 1.0 FTE Trauma Case Manager)*

There currently are 2.0 FTE CNC funded positions, however only 1.0 FTE is filled; as one CNC is on a secondment. It is planned to recruit to backfill only 0.5 FTE of this position.

c. **Data Manager** *(0.4 FTE Data Manager)*

d. **Other** *(1.0 FTE Trauma Research Officer, 1.5 FTE Trauma Service Administration Staff)*

Lack of staff to cover after hours and weekend case management is an issue. There is no backfill or succession planning for either medical or nursing staff.

4. **Quality and review:**

Case management rounds are conducted 3 times a week and attended by the trauma service, rehabilitation officer, social worker and physiotherapist. The Hospital Trauma Committee consists of a multidisciplinary team including ICU, ED, NSW Ambulance (NSWA), forensics, retrieval radiology, physiotherapy and surgical subspecialties.

Morbidity and mortality (M&M) meetings are conducted weekly and include independent peer review as required. Clinical indicators are collected and reported on weekly.

5. **Education and training:**

There is an established education and training program that includes regular departmental activities as well as quarterly simulation and rural training. Trauma breakfasts are an established practice as is ad hoc use of simulation facilities to maximise training opportunities.

HNELHD has a clinical stream for trauma but it does not include other LHDs – some RTSs have been invited to teleconference but do not always participate.

The CNC undertakes site visits and new staff in the RTSs come to JHH in the first few weeks of their employment.

There is a newly established clinical research laboratory for trauma services onsite at JHH.

6. **Issues and opportunities:**

The current ICU / high dependency unit (HDU) bed ratios do not support population requirements and this creates challenges for trauma admissions given the demand for these beds. The lack of computed tomography (CT) scan facilities adjacent to the resuscitation room and access to a hybrid operating theatre both further compound issues and affect efficiencies in managing these patients.

JHH trauma service staff would like resources for a sustainable trauma surgeon roster as well as an after-hours case management role.

The addition of a 1.0 FTE data manager could be a non-nursing data entry and nursing quality position. Currently they have a 0.4 FTE position filled; and a 0.6 FTE funded position that is vacant.

The future implementation of a clinical services plan at JHH would provide additional ICU capacity, hybrid operating theatre and imaging CT in the ED.
Liverpool Hospital — Major Trauma Service

1. **Service Description:**
Liverpool Hospital is an adult major trauma service (MTS) within New South Wales (NSW) and is located in metropolitan Sydney. It has primary responsibility for South Western Sydney Local health District (SWSLHD). Liverpool Hospital also receives patients from more remote locations, commonly Lithgow, Bathurst and Goulburn.

Data for 2014 (NSW Institute of Trauma and Injury Management ITIM): Major Trauma in NSW 2014) identified 364 major trauma admissions (peer average 394) to Liverpool Hospital with a case fatality rate of 12.1% (peer average 13.0%).

2. **Model of Care:**
   a. **Presentation**
      Trauma patients are transported directly from scene by road ambulance or aeromedical retrieval unit (AMRU, helicopter). Advanced notice of primary presentations from ambulance via BAT call and radio allows Liverpool Hospital to activate their trauma response. There are also patients that are transferred via their inter-hospital trauma hotline. After assessment at the referring hospital they will be either transported via AMRU, or road ambulance with paramedics. There are also patients who self-present.
   b. **Trauma Notification**
      There is a two-tiered, criteria-based, trauma notification system at Liverpool Hospital: ‘Full trauma’ and ‘Level 2 trauma’. There is an expected immediate response time to the Full trauma notification and a 30-minute response time to the Level 2 trauma notification. All trauma patients arriving at Liverpool Hospital are assessed against criteria and if met, a trauma team activation is initiated. The level of activation is dependent on the results of this assessment.
   c. **Trauma Response**
      The Team Leader is from emergency department (ED), but the level and experience of the Registrar will vary. The team member composition is different after hours and at weekends. Main attending members are ED Team Leader, Surgical Registrar, Intensive Care Unit (ICU) Registrar, ED Nurses, Trauma Clinical Nurse Consultant (CNC), and ward orderly. The duty Anaesthetist may attend as needed.
   d. **Trauma Admissions**
      A trauma patient will be admitted under the general surgeon of the day. In the daytime (Monday – Friday) this can be the Trauma Surgeon. There is no trauma bed card. All Trauma Surgeons are general surgeons and there are now a couple of trauma appointments within general surgery. Following tertiary survey by the admitting team, the Trauma Consultant may take over the care of the patient the next day. Patients are usually transferred to a subspecialty team after the tertiary survey, if the patient has a single system injury. Liverpool Hospital trauma service staff believe trauma patient volumes would not support an onsite consultant after hours model. There are Fellows in all specialties, but they are not required to be on site after hours. The case manager and CNC follow-up patients on a daily basis. They contact the appropriate Registrars and use Trauma Consultants for escalation, if required. The Trauma Team takes over care of complex patients. There are consultant-led ward rounds Monday to Friday with the CNC. There is one after hours Case Manager who does rounds independently during evening and on weekend. On weekends, the Registrar does rounds independently. The ward staff will contact the Trauma Nurses, if concerned about trauma patients. Trauma patients may be in a variety of locations across the hospital, as there is not one trauma ward.
   e. **Transfers**
      Liverpool Hospital has a trauma hotline for the in-area referring hospitals with set transfer guideline / criteria. The hotline is for trauma patients who are likely to need urgent surgery or intensive care. Subspecialty referrals should not use the hotline call system.
f. **Rehabilitation**
One of the two state brain injury rehabilitation services is located at Liverpool Hospital. There is limited trauma rehabilitation. Rehabilitation is seen to be only for elderly patients. The rehabilitation model involves allied health and social workers and has no dedicated trauma physiotherapy.

g. **Outpatient clinic/s**
Most patients are discharged home with a small number returning to referring hospitals. There is an outpatient trauma clinic conducted second weekly. The clinic follows up patients with complex management, checks on other appointments. It provides an opportunity to identify any missed injuries.

h. **Other**
Sometimes trauma notes are completed in FirstNet, sometimes in the trauma call and trauma alert drop down; but this is not consistent. The trauma patients are identified by searching the ED presentations and ICU and ward inpatient lists in FirstNet each day.

3. **Workforce:**
   a. **Medical** *(1.0 full time equivalent [FTE] Trauma Director, 1.0 FTE Deputy Trauma Director, 1.0 FTE Trauma Fellow)*
   Fellow position is funded and has been unfilled for 6 months.
   b. **Nursing** *(1.0 FTE Trauma Nurse Coordinator, 1.0 FTE Area Trauma Nurse Coordinator, 1.0 FTE Trauma Case Manager)*
   Backfill of nursing roles for annual leave is limited. Liverpool trauma service staff would like to have Trauma Nurse Practitioners. They believe the value of Trauma Nurse Practitioners needs to be articulated at a state level, so it can be used to support local initiatives and proposals.
   c. **Data Manager** *(1.0 FTE Data Manager)*
   d. **Other** *(1.0 FTE Trauma Service Administration Staff)*

4. **Quality and review:**
Clinical rounds in ICU are conducted daily by the Trauma Surgeon, CNC, registrar, and ICU consultant. There is a Hospital Trauma Committee attended by trauma, ICU, ED, radiology, anaesthetics, physiotherapy, occupational therapy, social work and ambulance. There is no Area Trauma Committee. The trauma service undertakes case review and clinical audits weekly. Morbidity and mortality (M&M) monthly and death audits are conducted quarterly. The mortality review process underwent an external peer review and validation in 2006, with the results published in the ANZ Journal of Surgery (Sugrue M, et al. 2008).

5. **Education and training:**
Local referring hospitals ED Director and Nursing Unit Managers are provided with feedback on hotline referrals. The Area Trauma CNC and Trauma Fellow give case presentations, which are ED-based. Trauma Team training is conducted at Liverpool Hospital aiming for four programs per year. The staff who attend are mainly from ED but the training is offered to other multidisciplinary departments. Skills training is provided twice a year and registrar training three times a week. The South West Area Network (SWAN) Trauma Conference is held yearly at Liverpool Hospital and they have recently commenced the Prevent Alcohol and Risk-Related Trauma in Youth (PARTY) program.

6. **Issues and opportunities:**
Liverpool Hospital has an outdated legacy database registry which is not supported by their information technology (IT) department and the trauma service is at risk of losing historic data. The trauma service staff would like to see the trauma profile raised across the state as there is currently very little marketing, positioning and / or community awareness. This would require an increase in injury prevention funding. Presenting data to the public would be one strategy that ITIM could be actively involved in from a state perspective. There should be a structured process for measuring patient outcomes that would be consistent between services. This could be implemented when seeing patients in the Outpatients Department.
Royal North Shore Hospital — Major Trauma Service

1. Service Description:
Royal North Shore Hospital (RNSH) is a major adult trauma service within New South Wales (NSW) and is located in metropolitan Sydney. RNSH hosts a full range of complex multitrauma services including state specialty units for severe burns and spinal cord injury. It has primary responsibility for Northern Sydney Local Health District (NSLHD) but also receives patients from Central Coast Local Health District (CCLHD) and receives trauma patients from across all of NSW.
Data for 2014 (NSW Institute of Trauma and Injury Management [ITIM]: Major Trauma in NSW 2014) identified 501 major trauma admissions (peer average 394) to RNSH with a case fatality rate of 16.4% (peer average 13.0%).

2. Model of Care:
   a. Presentation
   Approximately 70% of severely injured patients arrive directly from the scene and the remaining 30% are transferred from another facility. RNSH trauma service has seen a 25% increase in severely injured patients over the last 5 years. 19% of admissions arrive via helicopter and 73% arrive via road ambulance, the remainder of the patients arrive via fixed wing ambulance or self-presentation.

   b. Trauma Notification
   Pre-hospital notification of the patient is given by the ambulance service for the trauma team to be available and present on the injured patients arrival in the emergency department (ED). RNSH has a two-tiered trauma notification, led by an ED physician or Registrar. Senior medical staff discuss with Senior Nurses and a trauma attend call is sent by nurse (Nursing Unit Manager or Triage), if needed. Otherwise assessment is performed on arrival.

   c. Trauma Response
   The two-tier trauma notification system at RNSH include: ‘Trauma attend’ and ‘Trauma alert’. This is criteria-based following pre-set mechanism of injury, injury, signs and symptoms, transport (MIST) criteria. There is an immediate response time to the trauma attend and set to the estimated time of arrival. There is a good response to ‘Trauma attend’ calls (anaesthetics will phone in sometimes and will not be required in the absence of airway issues). The after-hours Surgical Registrar (Fellow is second on call) plus Anaesthetic Registrar (senior) and Intensive Care Unit (ICU) Registrar (senior) will attend.

   d. Trauma Admissions
   The patient is admitted under gastrointestinal general surgeon of the day; or if the patient has only a single system injury, may be admitted under a subspecialty team. The trauma team do rounds across six days; they do not take new patients at weekends, but accept handover on Monday morning. Complex multitrauma patients remain under the trauma team until discharge or are transferred to another specialty (e.g. spinal) when other injuries are resolved. Nursing staff review all ED admissions via FirstNet and ICU data and identify trauma patients to let the team on Monday morning know who to accept. They have acute and chronic pain teams. The acute pain team is involved with trauma patients. If the patient has chronic pain, they can be referred to a chronic pain service to enable follow-up post-discharge.

   e. Transfers
   RNSH has a single phone point of contact that is the emergency admitting unit and the phone is answered by the ED Consultant between 0700 – 2400 hours and the ED Registrar (senior) between 2400 – 0700 hours. They will contact subspecialty teams if required; there is no refusal admission for trauma that meets the criteria.
f. **Rehabilitation**
The rehabilitation service prefers to see patients when multitrauma issues are resolved and the rehabilitation registrar will consult. There are often issues in finding a bed. Referral for private rehabilitation requires an insurance case number. Social work can assist with this, but families are sometimes slow in completing paperwork.

g. **Outpatient clinic / s**
There is a monthly trauma clinic that the trauma consultant runs to see all complex patients (usually only seen once) and this is timed to see patients after other subspecialty follow ups have been attended to allow any gaps to be identified and coordinated. Letters are sent to General Practitioners (GPs) and other referrals are made as appropriate.

h. **Other**
The nurses have been conducting post discharge telephone follow ups for two years at 2 weeks, 1 and 3 months. This includes asking questions about general wellbeing, pain, disability and mental health. If post-traumatic stress disorder (PTSD) is suspected the patient is then referred to a psychologist and the Mental Health Service is alerted. They are not using a formal screening tool but results for their follow-up program are almost ready for publication.

3. **Workforce:**
i. **Medical** (0.5 full time equivalent [FTE] Trauma Director, 0.4 FTE Trauma Consultant, 1.0 FTE Trauma Resident)
There is only 1.0 FTE medical staff position spread across fractional time and this is not enough to provide a seven-day trauma service cover. An additional FTE may enable this to occur.
There is no Trauma Fellow. If an acute surgery unit (ASU) was established, it is possible that a Fellow could be appointed and this could include a proportion of trauma work.

j. **Nursing** (1.0 FTE Trauma Nurse Coordinator, 1.0 FTE Trauma Case Manager, 1.0 FTE Area Trauma Coordinator)
Nurses work 4 x 10-hour shifts and the Area Trauma Nurse Coordinator also works in the hospital.
There is a Case Manager until 2000 hours on Wednesday who also does rounds on Sunday.
Nursing staff resources do not enable cover outside normal hours except 2000 hours Tuesday and Wednesday and a Sunday shift.

k. **Data Manager** (1.0 FTE Trauma Data Manager)

l. **Other** (1.0 FTE Trauma Secretary)
There is no backfill for leave for any positions; so if the social worker is on leave there is no replacement. Medical and nursing staff cover each other when on leave. There is some ability to backfill secondments and long service leave.

4. **Quality and review:**
A Hospital Trauma Committee is currently being set up however there is an Area Trauma Committee in place where all hospitals in the LHD are represented. There are monthly morbidity and mortalities (M&Ms), clinical audits and case reviews. Clinical indicators are reported weekly.

5. **Education and training:**
RNSH have a youth program (Prevent Alcohol and Risk-Related Trauma in Youth [PARTY] Program). There are monthly trauma in-services, second yearly skills training, annual Trauma Team training and monthly Trauma Registrar training.

6. **Issues and opportunities:**
RNSH trauma service staff believe that there are not enough resources to allow the RNSH trauma service to be staffed 24 hours a day, seven days a week.
RNSH trauma service staff would like to see better inter-agency training links and preparation for disasters.
Better resourcing could improve the promotion of public awareness and address public expectations regarding trauma services (e.g. falls prevention, Roads and Traffic Authority (RTA) and youth programs) and encourage a more realistic attitude with the public about what is achievable with trauma patients.
Royal Prince Alfred Hospital — Major Trauma Service

1. Service Description:
Royal Prince Alfred Hospital (RPAH) is an adult major trauma service (MTS) within New South Wales (NSW) and is located in metropolitan Sydney. It has primary responsibility for Sydney Local Health District (SLHD) but also receives patients from Western NSW Local Health District (WNSWLHD).

Data for 2014 (NSW Institute of Trauma and Injury Management [ITIM]: Major Trauma in NSW 2014) identified 269 major trauma admissions (peer average 394) to RPAH with a case fatality rate of 13.4% (peer average 13.0%).

2. Model of Care:
   a. Presentation
   Most trauma patients arrive via ambulance, as direct admissions; with a small proportion of transfers in. There are three resuscitation beds available in emergency department (ED) and RPAH has established a process of using ED staff to facilitate rapid transfer of care. A dedicated BAT Phone in ED and the most senior Nurse or ED Doctor can initiate a trauma call.

   b. Trauma Notification
   RPAH has a three-tier trauma call system that is based on criteria and can be initiated based on pre-hospital information, or on assessment: ‘Trauma consult’ and ‘Full trauma activation’. ‘Trauma consult’ is based on mechanism of injury (MOI) only (haemodynamically stable) with ‘Full trauma activation’ being the addition of vital signs or major injuries. RPAH has a Code Crimson activation for life threatening haemorrhage, and are also trialling a pre-hospital Code Crimson alert.

   c. Trauma Response
   The Trauma Team is led by senior ED medical staff and the Trauma Clinical Nurse Consultant (CNC) or senior ED nurse. The staff notified as part of the Trauma Team activation include: ED Nurse Unit Manager, Occupational Therapy Nurse Manager, ED Staff Specialist / Registrar, Surgical Registrar, Anaesthetics Registrar, Intensive Care Unit Registrar, Trauma CNC*, Radiographer, Social Worker*, ED CNC and Clinical Nurse Educator (*available in-hours). The radiology Fellow and Paediatric Consultant will attend in-hours, if required. There is an ED Consultant onsite between 0700 – 2400 hours and both ED and Surgical Registrars (Surgical Education and Training [SET] 4 / 5) between 2400 – 0700 hours onsite with offsite consultant backup.

   d. Trauma Admissions
   Patients are admitted under the trauma surgeon of the day for 24 hours and then transferred to Subspecialty Team if single isolated body system injury is determined. Some isolated body system injuries may be admitted directly to subspecialty. The 24hr tertiary survey is undertaken by the Trauma Team. All trauma patients are reviewed by the Trauma Team and daily ward rounds involving the Trauma Registrar, Trauma CNC, Trauma Case Manager and physiotherapist are undertaken. The trauma director rounds on all patients on Wednesday each week. At weekends the rounds are undertaken by the registrar and Trauma CNC.

   e. Transfers
   RPAH have large numbers of paediatric trauma and of those only a small number require transfer. They use NETS or AMRS as default to transfer out. RPAH refer spinal cord injuries to Prince of Wales Hospital within 24 hours but most other spinal patients are managed at RPAH. RPAH consults with Concord Hospital on the management of most burns patients. RPAH receives transfers in from other LHD hospitals but most are from within Sydney LHD.

   f. Rehabilitation
   Early referral to rehabilitation occurs and there is a co-rehabilitation model in place that provides more intense rehabilitation to patients that are accepted whilst they are on the ward. Rehabilitation services are provided at Balmain Hospital. Geriatric referrals are also initiated where required.
g. **Outpatient clinic / s**
Complex patients are followed-up in clinic but functional assessments are not made. Nursing staff are using a modified version of the Victorian telephone follow up model to assess patients at home post-discharge. A trauma-specific minor injury clinic is currently being trialled. Other outpatient clinics include: Orthopaedic, Plastics & Hand, Neurosurgical and Mild Head Injury.

h. **Other**
RPAH trauma service staff feel that the ‘lockout laws’ have resulted in an increase in the numbers of trauma patients from Newtown.

3. **Workforce:**
a. **Medical** *(1.0 full time equivalent [FTE] Trauma director, 1.0 FTE Trauma Fellow, 1.0 FTE Trauma Registrar, 1.0 FTE Radiology Fellow)*
The Trauma Director position is a shared roster model involving ED / Surgery and Orthopaedic Consultants. This model has been in place for 10 years. There is a trauma Orthopaedic / Geriatric Staff Specialist and two Fellows (radiology and trauma / orthopaedic) and a Trauma Registrar.
b. **Nursing** *(1.0 FTE Trauma Nurse Coordinator, 1.0 FTE Area Trauma Nurse Coordinator, 1.0 FTE Trauma Case Manager)*
Full-time trauma CNC (between two people), Trauma Case Manager and Area Trauma CNC.
c. **Data Manager** *(1.0 FTE Trauma Data Manager)*
d. **Other** There is no succession planning for either medical or nursing staff with staff covering each other for leave. The Area Trauma CNC covers the RPA trauma CNC when required.

4. **Quality and review:**
There is a Hospital Trauma Committee which involves multiple specialties at RPAH as well an Area Trauma Committee. Both committees involve NSW Ambulance. The Area Trauma Committee also involves the other hospitals in the LHD.
A trauma radiology meeting is conducted every Monday morning to review imaging, identify missed injuries and make suggestions for ongoing imaging / radiology management options (attended by Trauma Director, Trauma Registrar, Trauma Radiology Fellow and Radiologist).

5. **Education and training:**
RPAH trauma service staff conduct Trauma Team Training bimonthly as well as clinical skills based trauma courses conducted several times per year (nursing and medical courses). The Trauma Team have access to a new purpose built simulation facility in the Institute for Academic Surgery. There is a comprehensive education and training program in place that includes other health facilities and sessions within the undergraduate medical and nursing programs at Sydney University.

6. **Issues and opportunities:**
RPAH commissioned a hybrid operating theatre in 2013 and this created increased capacity for interventional radiology. This is considered to be an important future direction that needs to be recognised systemwide, as there is less abdominal and thoracic surgery being undertaken in trauma patients. Increased trauma in the elderly (aged > 65 years) is the significant growth area and also needs to be addressed systemwide with new and innovative models of care that integrate trauma and geriatric services.
There is no benchmarking between trauma services in relation to patient outcomes other than death and RPAH trauma service staff believe that this should be a focus for the future.
RPAH trauma service was previously the allocated tertiary referral centre for all critical care and trauma patients at Dubbo Base Hospital (DBH). RPAH trauma service staff believe that it would be beneficial to re-align the critical care matrix with the trauma referral networks. RPAH Trauma department is prepared to develop a more active role in supporting DBH with respect to trauma referrals, quality assurance and clinical training under the guidance and support of NSW Agency for Clinical Innovation / ITIM.
St George Hospital — Major Trauma Hospital

1. Service Description:
St George Hospital (SGH) is an adult major trauma service (MTS) within New South Wales (NSW) and is located in metropolitan Sydney. It has primary responsibility for South-East Sydney Local Health District (SESLHD) but also receives patients from Illawarra Shoalhaven Local Health District (ISLHD) and Murrumbidgee Local Health District (MLHD).
Data for 2014 (NSW Institute of Trauma and Injury Management [ITIM]: Major Trauma in NSW 2014) identified 331 major trauma admissions (peer average 394) to SGH with a case fatality rate of 16.3% (peer average 13.0%).

2. Model of Care:
   a. Presentation
      Trauma patients arrive via two streams: primary – road ambulance, retrieval (helicopter) direct presentation from the scene; or secondary transfer – helicopter, fixed wing or road transport. Advanced notice of primary presentation from ambulance via BAT call works well. On receipt of call the triage or senior nurse can initiate trauma system call.
   b. Trauma Notification
      There is a two-tiered, criteria-based, trauma notification system in place: ‘Trauma standby’ and ‘Trauma required’. A chest injury protocol (CHiP) protocol is in place for blunt chest trauma and suspected fractured ribs.
   c. Trauma Response
      ‘Trauma standby’ is primarily an emergency department (ED) response with additional respondents from the Trauma Team and Surgical Registrar. Trauma attend includes: Surgical Registrar / Fellow, Anaesthetic Registrar / Fellow, Intensive Care Unit (ICU) Registrar, ED Registrar / Consultant, Trauma Nurse, ED Nurses and supporting services (blood bank, radiology, social work). Between 1800 – 0700 hours there are less registrars but a Surgical Education Training 4 / 5 Surgical Registrar is onsite and allocated to trauma call and ICU and Anaesthetics Registrars will also attend. The senior ED Physician is the Team Leader and there is onsite ED Consultant cover between 0700 – 2400 hours with ED Registrar (Year 4 / 5) cover between 2400 – 0700 hours and offsite consultant backup.
   d. Trauma Admissions
      SGH trauma service currently admits under the surgeon of the day but will revert to the trauma bed card following the implementation of the new medical staffing model. If a patient is admitted after hours or at the weekend they remain under the surgeon’s care until handover of the next business day. Trauma Registrars and Case Managers conduct patient rounds 7 days per week with the Trauma Consultant leading the round on weekdays. After the tertiary survey the Case Managers continue to visit patients under the subspecialties and manage issues with the Registrars unless escalation to the Trauma Director is required.
   e. Transfers
      There is a single point of contact for referral to the hospital. The phone is answered by a Trauma Consultant. Primary role is for SESLHD and Illawarra but also includes Southern NSW and MLHDs. St George trauma service does not refuse any trauma transfer that meets criteria. The referring hospital is responsible for organising medical retrieval once the patient is accepted and the system works well from St George’s perspective. Referrals are only for multitrauma with spinal or burns to RNSH, or spinal to Prince of Wales Hospital (POW) or burns to Concord Hospital. The system works well for acute patient in ED. The situation can be more problematic if spinal injury is not identified initially and particularly after 24 hours as not a priority for admission to POW (RNSH can also refuse if only single system issue).
f. Multidisciplinary involvement
SGH have weekly multidisciplinary meetings at which early rehabilitation requirement and discharge plans are identified and discussed. The meetings are attended by allied health staff, medical teams, and nurse managers.

g. Rehabilitation
Patients with brain injury are referred early to brain injury rehabilitation services and rehabilitation and discharge plans are identified and developed early at the weekly multidisciplinary team meetings. Patients accepted for the acute rehabilitation service have additional rehabilitation team involvement whilst they are on the ward.

h. Outpatient clinic/s
There is a trauma outpatients department clinic staffed by a consultant and Trauma Case Manager as well as specialty clinics for follow up. The trauma clinic sees primarily chest injuries, multiple injuries and complex care patients. The case managers screen patients for anxiety, depression and stress for the early detection of PTSD. There are no formal patient outcome measures but nurses phone patients to check on their progress at home. There is a consultant led pain service as well as a chronic pain clinic.

3. Workforce:
   a. **Medical** (1.0 full time equivalent [FTE] Trauma Director, 0.5 FTE Deputy Trauma Director, 1.0 FTE Trauma Consultant, 1.0 FTE Trauma Registrar, 1.0 FTE Trauma Resident, 1.0 FTE Trauma Intern)
      Current medical workforce is transitioning to a new staffing model with 4 x 0.5 FTE Trauma Specialists with one drawn from four different clinical specialties. An additional 1.0 FTE Fellow will also be appointed in due course.
   b. **Nursing** (1.0 FTE Trauma Nurse Coordinator, 1.0 FTE Area Trauma Nurse Coordinator, 4.5 FTE Trauma Caser Manager)
      Trauma case managers provide a 7-day 0700 – 2200 hour service.
   c. **Data Manager** (0.2 FTE Trauma Data Manager, 0.5 FTE Trauma Database Manager)
   d. **Other** (1.5 FTE Trauma Service Administration Staff)

4. Quality and review:
There is a Hospital Trauma Committee that involves trauma, ED, retrieval, anaesthetics and NSW Ambulance with other specialties invited for specific discussions. There is also an Area Trauma Committee to which all network LHD facilities are invited.
Case reviews occur within St George and with referring hospitals. There are a range of meetings that discuss cases as well as the Area Trauma Committee.
3-monthly audit of all performance indicator violation is conducted.

5. Education and training:
The Area Trauma Clinical Nurse Consultant (CNC) provides education and simulation training within SESLHD and Illawarra. The CNC visits smaller facilities to provide feedback on cases in conjunction with the Trauma Director.
SGH run an ultrasound course and provide a range of education programs (face to face and online) that are available to staff within their network. The nursing staff coordinate a series of regular in-services on the wards and in the ED. They coordinate five early management of severe trauma (EMST) courses a year, host an ITIM education evening, conduct regular trauma teaching for Surgical and ED Registrars and Trauma Team training.

6. Issues and opportunities:
St George Trauma service staff would like to see the trauma plan and the critical care plans align at a state level to remove confusion and ambiguity. Ideally renal, spinal and all other service plans should also follow this model of care.
SGH is increasing theatre and other capacity significantly as part of the planned redevelopment and this could also provide an opportunity to expand its trauma capacity and capability. There is a lack of paediatric surgeons and there are no local hand or eye surgeons at SGH.
St Vincent’s Hospital — Major Trauma Service

1. Service Description:
St Vincent’s Hospital is an adult major trauma service (MTS) within New South Wales (NSW) and is located in the metropolitan Sydney. St Vincent’s Hospital provides a Level 2 trauma service with no defined network of referring hospitals.
Data for 2014 (NSW Institute of Trauma and Injury Management [ITIM]: Major Trauma in NSW 2014) identified 190 major trauma admissions (peer average 394) to St Vincent’s Hospital with a case fatality rate of 12.6% (peer average 13.0%).

2. Model of Care:
   a. Presentation
      Most patients self-present with others arriving by ambulance. There is no single telephone point of contact for the trauma service.
   b. Trauma Notification
      A two-tier trauma activation model is used with a senior Emergency Department (ED) Physician being the Team Leader.
   c. Trauma Response
      The Trauma Team respondents include: Trauma Team, Anaesthetics, Intensive Care Unit (ICU) and Surgery Registrars, Trauma Director, Clinical Nurse Consultant (CNC) and Manager, ED nursing and medical staff, social work, X-ray and blood bank. Between 0800 – 2400 hours there is an ED consultant and trauma consultant or Fellow available onsite. After hours, there is a Trauma Registrar, ED Registrars and Surgical Registrars (Surgical Education Training [SET] 1 – 3). There are Cardiothoracic Consultants and other Visiting Medical Officer (VMO) Consultants and subspecialty Fellows onsite 24 / 7 as backup, as well as ED Consultants on public holidays and weekends.
   d. Trauma Admissions
      Patients are admitted under the general surgeon of the day and all general surgeons are required to be on the trauma roster and to have completed a trauma course as one of the criteria for their appointment. The St Vincent’s model involves all hospital specialists being part of the trauma platform rather than just the trauma surgeons and this creates a responsive and capable model. The second on call Trauma Team involves vascular consultants. Patients are managed by the appropriate General Surgical Team or if referred post-tertiary survey to a subspecialty, they will be managed by that team. The Trauma CNC and Registrar review patients daily with the CNC being the liaison point between the subspecialties.
   e. Transfers
      Referrals for burns patients go to Concord; paediatrics are referred to Sydney Children’s Hospital (SCH) and spinal patients to Prince of Wales (POW) or in complex spinal cases, to Royal North Shore Hospital (RNSH); all work well. Some paediatric trauma patients are transferred via ambulance with clinician escort to Randwick rather than waiting for a retrieval team.
   f. Rehabilitation
      The model works well from ED through the admission to discharge and there are well established rehabilitation services available.
   g. Outpatient clinic / s
      There is no trauma bed card or trauma outpatient follow-up as patients are managed and followed-up through the appropriate specialty. There is no patient outcome data collected but there is neuro-rehabilitation clinic follow-up for some patients.
   h. Other
      As trauma patients are not uniquely identified in the system there is no complete episode of data collection which creates a problem when trying to establish resources attached to individual episodes of care.
3. Workforce:
   a. Medical (0.2 full time equivalent [FTE] Trauma Director, 0.1 FTE Deputy Trauma Director, 0.5 FTE Trauma Fellow, 1.0 FTE Trauma Registrar)
      There is a Trauma Director (0.2 FTE) and a Trauma Deputy Director (0.1 FTE) who is also the ED Director. The Team also includes a Trauma Fellow and a Trauma Registrar.
   b. Nursing (1.4 FTE Trauma Nurse Coordinator / Program manager)
      St Vincent’s has a Trauma Nurse Coordinator and a Program Manager.
   c. Data Manager
      There is a data entry officer (part-time); however some data entry is also done by the coordinator and the CNC.

4. Quality and review:
There are fortnightly trauma grand rounds and bimonthly trauma M&Ms.
There is a hospital-based Trauma Committee with wide clinical engagement and St Vincent’s clinicians also participate in SESLHD and ILHD Trauma Committees.

5. Education and training:
Team training is undertaken through the Simulation Centre and there are eight clinical skill based workshops that are available for staff.
There is little education done outside the hospital although the coordinator will do some case follow up education for referred trauma from Sydney Hospital.

6. Issues and opportunities:
St Vincent’s trauma service staff believe that trauma data elements should be collected via the eMR, thus removing the need for separate data collection and double entry. They suggested that there should be sharing between the Occupational Therapy, ED and ICU systems. This could be achieved through establishing a purpose built data registry.
St Vincent’s trauma service staff also recommended that there should be no differences in care systemwide. Patients should have access to the same experiences, rehabilitation and outcomes, irrespective of where the trauma occurs.
Education and information sharing (transparency) need to underpin the trauma service for NSW and there should be statewide approaches to ensure consistent education, standardised guidelines and transfer of care.
St Vincent’s trauma service staff believe that the Agency for Clinical Innovation (ACI) and the Clinical Excellence Commission (CEC) should share trauma patient death case reviews and monitoring. This would assist with a wider application of learning and the identification and implementation of safer patient management systems within the trauma system as a whole.
The trauma service staff believe that there would be benefits in ITIM initiating a costing project to enable understanding of trauma costs and facilitate increased clinician understanding of how activity-based funding and insurance systems work in respect of trauma patients.
They would like system trauma research led through ITIM especially in respect of patient outcomes and consider ITIM developing and/ or working with the trauma system to better leverage of the individual research capabilities to advantage the system as a whole.
The Canberra Hospital — Major Trauma Service

1. Service Description:
The Canberra Hospital (TCH) is an adult major trauma service (MTS) within the Australian Capital Territory (ACT) and is located in Canberra. It has primary responsibility for ACT Health but also receives patients from south to the Victorian border, as far north as Sydney and referrals from Southern New South Wales Local Health District (SNSWLHD) and Murrumbidgee Local Health District (MLHD).

2. Model of Care:
   a. Presentation
      Most patients arrive at TCH via ambulance; there are also a small number of self-presentation. ACT ambulance phone in advance; NSW Ambulance phone via Southcare and are patched into TCH ED (there are two different phones in emergency department (ED), but all calls go to the Triage Nurse for decision-making).

   b. Trauma Notification
      The Triage Nurse issues the call (protocol-based), however the call can be initiated by anyone based on set criteria. There is a three-tier trauma notification system. The trauma call will notify a full team; a trauma alert (mechanism-based) will notify the Trauma Registrar and ED; trauma notification is to let people know there is a patient in ED.

   c. Trauma Response
      There is a 24/7 Consultant / Fellow roster with the Consultant coming in after-hours if the Fellow is on roster. The Team Leader is always the ED Senior Physician with roles allocated to team members. This structure is mirrored by nursing staff (including Trauma Nurse Practitioner (NP) when available) as Team Leader. In-hours, Trauma Nurses / Case Managers (3.0 full time equivalent [FTE]) attend 0700 – 1600 hours across 7 days. The Trauma NP works Monday to Friday.
      Team Registrars attend from intensive care unit (ICU) / anaesthetics / surgery with radiology / blood / social work also called after hours. The Surgical Registrar may be pre-Surgical Education and Training (SET) with Fellow and Consultant backup but there is a SET registrar for surgery (there is an acute surgery unit [ASU] onsite as well). Other after-hour Registrars are SET 4 / 5.

   d. Trauma Admissions
      Patients are admitted under the trauma bed card (after hours this will be under the trauma surgeon from ASU) but care is handed over in the morning. Tertiary surveys are done by the Trauma NP or Trauma Registrar. Isolated injuries are referred (no refusal) to subspecialties and others have care managed by the Trauma Team. Daily rounds of trauma patients are performed by the Registrar, the Trauma NP and Trauma Case Managers. Case managers also follow-up the subspecialty patients and can escalate to Trauma Director if issues cannot be resolved. This is a good system which works well. All the patients / families have business card from a Trauma Team member so they can be contacted if needed.

   e. Transfers
      TCH is the referral centre for the SNSWLHD, with 50% of trauma patients are from NSW and 60% of these arrive via helicopter. TCH accepts paediatric patients on the provision that they are not an ICU transfer. Paediatric patients are transferred out of TCH if they require or have been admitted to ICU from > 48 hours.

   f. Rehabilitation
      TCH identify rehabilitation patients early but rehabilitation clinicians prefer the acute phase to be over before there is any transfer of care. TCH are hoping to develop an integrated rehabilitation model that will provide more rehabilitation in the acute phase for accepted patients by introducing an additional physiotherapist position in the Rehabilitation Team to outreach trauma patients. There are beds in the rehabilitation ward at TCH (aged care focus) and 60 new beds at
University of Canberra rehabilitation hospital. TCH also have an Independent Living Unit and rehabilitation home services. There is no dedicated brain injury rehabilitation service in Canberra – their patients have to go to Goulburn or Liverpool.

g. **Outpatient clinic / s**

There is a weekly outpatient department (OPD) trauma clinic run by the Trauma NP, Registrar and other nurses as available. They follow-up brain injury, ICU, surgery intervention and all complex patients (all have face-to-face review; others receive a telephone call using the same tool as Victoria, implemented 12 months ago). Use depression anxiety stress scales (DASS) 21-item for mental health assessment and the rehabilitation service use Functional Independence Measure (FIM™) (not appropriate for trauma patients). There is no local agreement regarding how to measure patient outcomes but TCH recognise the need to do so.

h. **Other**

TCH have interventional radiology (24 hours onsite (there is a hybrid theatre planned for the new hospital). Computed tomography (CT) is adjacent to ED. ICU will increase to 50 beds and have a trauma ward in the new hospital (which is approximately 4 years away from opening).

3. **Workforce:**

   a. **Medical** *(1.0 FTE Trauma Director, 1.0 FTE Deputy Trauma Director, 3.5 FTE Trauma Consultant, 0.5 FTE Trauma Fellow, 1.0 FTE Trauma Registrar, 1.0 FTE Trauma Resident)*

   From April 2016, TCH are starting 7 / 7 consultant trauma model with five Trauma Surgeons (currently have three) and ICU and ED Consultants. They will have the same style roster as the acute surgical unit (ASU) but will not be rostered on for both departments in the same week. They are currently recruiting to these positions.

   b. **Nursing** *(1.0 FTE Trauma Nurse Coordinator, 3.0 FTE Trauma Case Manager)*

   The Trauma NP prepared a business case to Treasury and Treasury have committed growth funding as per the business case going forward. There is priority reallocation within TCH not new funding.

   c. **Data Manager** *(1.0 FTE Trauma Data Manager)*

   d. **Other** *(0.5 Trauma Service Administrator)*

   Plans to recruit a 0.5 FTE Clinical Psychologist for OPD team are underway. There is currently no dedicated Social Worker; they use the Social Worker from wards (backed up by nursing staff).

4. **Quality and review:**

   Due to the size of the ACT, the Hospital Trauma Committee is also the State Trauma Committee. This committee is attended by Trauma, ACT Ambulance Service (ACTAS), NSW Ambulance Service (NSWAS), Canberra Region Retrieval Service (CRRS), ED, ICU, Theatres, Medical Imaging, Neurosurgical, Orthopaedics, Plastics, Cardiothoracic Surgery, Rehabilitation, Physiotherapy, Clinical Psychology, Calvary ED and the MLHD Trauma Coordinator. TCH conducts monthly morbidity and mortality (M&M) meetings, and will invite peer review of case when indicated.

5. **Education and training:**

   TCH shock trauma service provides departmental in-services, team training on a monthly basis to a multidisciplinary team. They also contribute to the orientation program for staff and registrar training.

6. **Issues and opportunities:**

   TCH trauma service staff would like to see better trauma system communications by way of topic focussed days (ITIM-led) to address and decide on real issues, not just talk.

   TCH trauma service staff suggested that there should be a focus on outcome measures across the trauma system including agreement on rehabilitation and patient centred outcome measures. This should include implementing long-term outcome studies (not the same as funded key performance indicators [KPIs]). They also recommend that cross-border and system funding need to be transparent to the trauma system. There needs to be better system level collaboration between NSW and ACT including the sharing of data.
Westmead Hospital — Major Trauma Service

1. Service Description:
Westmead Hospital is an adult major trauma service (MTS) within New South Wales (NSW) and is located in metropolitan Sydney. It has primary responsibility for Western Sydney Local Health District (WSLHD) and Western NSW Local Health District (WNWSLHD).

Data for 2014 (NSW Institute of Trauma and Injury Management [ITIM]: Major Trauma in NSW 2014) identified 474 major trauma admissions (peer average 394) to Westmead Hospital with a case fatality rate of 13.3% (peer average 13.0%).

2. Model of Care:
   a. Presentation
      Most patients arrive via ambulance and the default policy is to accept all requests for transfers even if some may subsequently be treated and sent home.
   b. Trauma Notification
      There is a three-tier trauma activation system based on criteria and all calls can be initiated: ‘Trauma call’, ‘Major trauma’ and Code Crimson, based on pre-hospital information.
   c. Trauma Response
      There is a single point of contact for all trauma calls and the Trauma Team service respond with the resuscitation and management being led by emergency department (ED) or the trauma service. General surgery do not attend during the day unless requested. There is a multidisciplinary Trauma Team that includes anaesthetics, intensive care unit (ICU), medical and nursing team leaders. There is a Trauma Registrar (Post-graduate Year [PGY] 4 / 5) onsite until 1900 hours. After 1900 hours, the acute surgery unit (ASU) respond with the Team Leader being either the ED or General Surgical Registrar. All overnight patients are admitted under the ASU Surgeon and handed over to the trauma service at 0730 hours. Surgery, ICU and ED Consultants are on call as backup between 2400 – 0730 hours. There is also an ED Registrar (PGY 4 / 5) onsite between 2400 – 0730 hours.
   d. Trauma Admissions
      All trauma patients are admitted in-hours under a trauma bed card but can be located in different wards within the hospital as there is no designated trauma ward. The trauma service conduct daily rounds, led by the trauma consultant. All existing patients continue to be seen and managed by the trauma service after hours and at weekends with the Trauma Fellow being first on call for any concerns regarding the trauma service inpatients. Patients are handed over to other specialties if the primary requirement for care is a single system. Most patients complete their episode of care within the trauma service.
      Case management is a core component of all Trauma Clinical Nurse Consultants (CNCs). Extended coverage is provided by having a Trauma CNC cover after hours and the weekends. There is a Post-Traumatic Amnesia Occupational Therapist (PTA OT) within the team. Social work referral is also made early to ensure that compulsory third party (CTP) status and private patient options can be explored when available.
   e. Transfers
      Referrals mainly come from within WSLHD and Bathurst / Orange. Dubbo patients previously tend to go to Royal Prince Alfred Hospital (RPAH) but are increasingly being transferred to Westmead. Nepean do not transfer many patients although they are bypassed by ambulance directly to Westmead with some patients from the Blue Mountains. Paediatric patients aged under 15 years are transferred to Westmead Children’s Hospital (WCH) after resuscitation.
   f. Rehabilitation
      There is a dedicated inpatient General, Geriatric, Brain Injury & Amputee Rehabilitation Service within Westmead Hospital. Referrals are made by the trauma service for consultation as well as potential transfer of care to those teams. Occasionally patients are able to be transferred to the original transferring hospital for rehabilitation
      Referral to rehabilitation occurs early and as there is no physiotherapist within the Trauma Team, these services are dependent on ward physiotherapy availability.
g. **Outpatient clinic/s**
   There is a weekly trauma clinic involving the Consultant, Fellow and CNC for follow up of trauma patients who were operated on or have complex requirements.

h. **Outcomes**
   Standard outcomes such as in-hospital mortality, length of stay, complications are collected. There are no long-term generic (such as quality of life) patient outcomes being collected, but Westmead trauma service staff is hoping to become involved in implementing the telephone follow up model used at RNSH for assessing how patients are managing at home.

### 3. Workforce:

a. **Medical** (1.0 full time equivalent [FTE] Trauma Director, 1.0 FTE Trauma Consultant, 1.0 FTE Trauma Fellow, 2.0 FTE Trauma Registrar, 1.0 FTE ED Registrar on specialist specified training [SST] rotation, 1.0 FTE Trauma Resident, 1.0 FTE Trauma Intern)
   There are 10 specialists on the trauma consultant roster (4 Surgeons, 4 ED Physicians, an Intensivist and an Anaesthetist). They work on a week on / week off roster arrangement. All have fiscal backfill to their cost centres to enable participation in the roster. This multidisciplinary basis of the Trauma Team is a key strength. In addition to Consultants, there is currently a Trauma Fellow, two Trauma Registrars, a Resident and an Intern.

b. **Nursing** (2.0 FTE Trauma Nurse Coordinator, 1.0 FTE Trauma Case Manager, 1.0 FTE Trauma Nurse)

c. **Data Manager** (1.0 FTE Trauma Data Manager)

d. **Other** (1.0 FTE Research Officer, 1.0 FTE Trauma Service Administration Staff)
   Research officer and access to administrative support staff shared with General Surgery. The intention is to move to a 24 / 7 fully staffed trauma service model and negotiations are underway to identify resources to enable this to occur. They will need at least 2 residents to complete the team roster. There should be a training / mentoring pathway for nurses to create capacity as well as succession planning.

### 4. Quality and review:
There is a Hospital Trauma Committee with wide representation from clinicians and governance and an established system for morbidity and mortality (M&M), clinical audit and case review.

### 5. Education and training:
Westmead trauma service do not provide much education at referral sites but encourage the facilities to send the patients to Westmead early rather than trying to manage them. They will always accept patient transfer requests from WSLHD and WNSWLHD in preference to trying to have the patients managed based on telephone advice. It is the role of the medical retrieval unit (MRU) to be providing advice to smaller facilities that are outside WSLHD and Orange. There should be an opportunity for non-surgical post-fellowship trauma training and a non-surgical trauma training pathway developed.

### 6. Issues and opportunities:
There should be a more integrated network model for Sydney that has increased volumes and hence expertise. This would not be achieved through a staff rotational model alone but requires forward system service planning. There should be more Trauma Team training funded to capture staff movement and development of a new model e.g. simulation on the run.

Westmead trauma service staff suggested that there is a requirement for more rehabilitation beds both locally and in the system; and there is a need for recognition of trauma rehabilitation needs within an overall framework for rehabilitation services in NSW. There should be consistency between the critical care network and the trauma network as there is confusion in smaller facilities as to the appropriate referral pathway. Relationships are still driving some referral pathways.

Westmead trauma service staff believe that ITIM should be advocating for a no fault accident system and providing support (guidance and/or education) to the trauma system, so trauma services can better maximize state revenue through CTP (Lifetime Care and Support Scheme).
1. Service Description:
Children’s Hospital at Westmead (CHW) is part of the Children’s Hospital Network and Paediatric Major Trauma Service within New South Wales (NSW) and is located in metropolitan Sydney. It has primary responsibility for Nepean Blue Mountains Local Health District (NBMLHD), South Western Sydney Local Health District (SWSLHD), Western Sydney Local Health District (WSLHD), and Western NSW Local Health District (WNSWLHD). CHW is a statewide speciality service for spinal injuries and severe burns.
Data for 2014 (NSW Institute of Trauma and Injury Management [ITIM]: Major Trauma in NSW 2014) identified 68 major trauma admissions (peer average 56) to CHW with a case fatality rate of 17.6% (peer average 11.3%).

2. Model of Care:
   a. Presentation
      Patients arrive primarily via primary retrieval or secondary retrieval from a rural trauma service (RTS) with a small number of direct self-referrals. The majority of presentations originate from metropolitan Sydney. Pre-arrival notification occurs via ambulance radio for approximately 50% of presentations. There is no single trauma referral hotline number although the opportunity to provide this is currently being explored.
   b. Trauma Notification
      There is a three-tier, criteria-based, trauma call system in place: ‘Trauma consult’, ‘Trauma attend’ and Code Crimson.
   c. Trauma Response
      ‘Trauma attend’ requires immediate attendance and includes: ED Consultant, paediatric Surgical Registrar, Anaesthetics Registrar, Clinical Nurse Consultants (CNCs), Social Work And Radiology. The Surgical Registrar is usually the Team Leader with Consultant backup offsite after hours. The ED Consultant or Fellow is the Team Leader for trauma consults. There is an ED Consultant onsite between 0800 and 2400 hours and an ED Fellow overnight. Most ED medical staff are Fellows of the Australasian College for Emergency Medicine (FACEMs). The Surgical Registrar is onsite until 2330 hours.
   d. Trauma Admissions
      Patients are admitted under a trauma service bed card on weekdays between 0800 – 1700 hours. Outside these hours, they are admitted under the surgeon on call. If the surgeon operates on the patient they will retain responsibility for the episode of care otherwise patients are transferred to the trauma service or appropriate subspecialty following the tertiary survey. The tertiary survey can be undertaken by any clinical subspecialty.
      The trauma team provide case management which includes a weekly consultant-led multidisciplinary ward round, CNC follow up checks of patients transferred to subspecialties for single system injuries, case management of trauma team patients including, tertiary surveys and visits to trauma patients in intensive care unit (ICU) and the wards.
   e. Transfers
      There are a reasonable number of paediatric transfers from other metropolitan trauma centres as opposed to them coming directly to WCH. Secondary transfers are typically as a result of direct referral to general surgical, neurosurgery or ICU. Most transfers are facilitated by Newborn and Paediatric Emergency Transport Service (NETS).
   f. Rehabilitation
      There is early referral to rehabilitation and notification to brain injury service if required. There is a fully comprehensive rehabilitation trauma service which provides an additional 2 – 3 hours of intervention per day for patients accepted into the service. The rehabilitation service will transfer patients back to local settings but prefer, where possible, to continue to provide oversight. Patients will not be referred back to rural areas unless rehabilitation services are available.
including a rehabilitation physician to oversee the care. The rehabilitation service is currently piloting a day program for families who live within one hour of travel time from the hospital.

g. **Outpatient clinic / s**
   There is a four weekly trauma outpatient clinic with up to two year follow up.

h. **Outcome measures**
   The rehabilitation service use the Paediatric Functional Independence Measure (WeeFIM) to measure patient outcomes and have specific follow-up projects including patients with abusive head trauma. The near drowning five-year study has been extended for a further five years.

i. **Other**
   Paediatric trauma bypass is still an issue resulting in unnecessary secondary transfers and a 6 – 8-hour delay to definitive management.

3. **Workforce:**
   a. **Medical** (0.6 full time equivalent [FTE] Trauma Director, 0.6 FTE Deputy Trauma Director (vacant), 1.6 FTE Trauma Consultant)
      There is a Trauma Director (0.6 FTE) and 1.6 FTE Trauma Consultants / Staff Specialists. There are discussions about having a Fellow for the network, who could both support the Consultants and facilitate some research.
   
   b. **Nursing** (2.0 FTE Trauma Nurse Coordinator)
   
   c. **Data Manager** (1.0 FTE Trauma Data Manager)
   
   d. **Other** (0.5 FTE Trauma Service Administration Staff, 1.0 FTE Trauma Research Officer)
      There is no succession planning for medical, nursing or data staff and no agreed backfill to replace long service leave. Cover for medical staff can be provided by general surgeons with early management of severe trauma (EMST). In the past, there have been epidemiology and research positions but these are no longer funded.

4. **Quality and review:**
   There is a Hospital Trauma Committee and a Network Trauma Committee. The Hospital Committee has wide representation of those involved in caring for and supporting trauma patients and their families. The Network Committee addresses strategic issues across both facilities and involves administrative as well as clinical representation.
   There is a comprehensive program for morbidity and mortalities (M&Ms), grand rounds and associated clinical audit activities.

5. **Education and training:**
   CHW trauma service staff would like more time for trauma simulation training especially cross disciplines and departments. ED (3 – 4 per year), ICU and Surgery all do training within their departments. Anaesthetics do not do simulation training. CHW trauma services conduct Trauma for Tiny Tots twice per year, host an ITIM trauma event and conduct an annual seminar day. ED conducts an education program that includes wider referring facilities, Big Wednesday, that is well supported.

6. **Issues and opportunities:**
   CHW trauma service staff would like to see paediatric patients directly being admitted to a paediatric trauma centre without intermediate trauma centre admission wherever possible and development of a statewide paediatric rehabilitation service. Additionally they believe that research capacity should be part of resource standards across the entire trauma system. They would like improved integrated data systems that enable data to be easily generated without double entry. This would improve data quality as would the capacity to do meaningful analysis.
John Hunter Children's Hospital — Paediatric Trauma Service

1. Service Description:
   John Hunter Children’s Hospital (JHCH) is a paediatric major trauma service within New South Wales (NSW) and is located in Newcastle. It has primary responsibility for the Hunter New England Local Health District (HNELHD) but also receives patients from Northern NSW Local Health District (NNSWLHD) and Mid North Coast Local Health District (MNCLHD).
   Data for 2014 (NSW Institute of Trauma and Injury Management [ITIM]: Major Trauma in NSW 2014) identified 46 major trauma admissions (peer average 56) to JHCH with a case fatality rate of 2.2% (peer average 11.3%).

2. Model of Care:
   a. Presentation
      A small number of injured children also self-present via private transport. There is considerable amount of inter-hospital transfers by helicopter, fixed wing aircraft or road ambulance as JHCH are the only paediatric centre in the district. The paediatric model of care is a part of the broader trauma system response at John Hunter Hospital (JHH) and whilst it describes the detail of the paediatric trauma case the trauma pre-hospital advice, trauma call initiation and emergency management are all consistent with and dependent upon the JHH trauma system response; this is reflected in the strong relationship between the adult and paediatric clinicians involved in trauma case management.
   b. Trauma Notification
      There is a single-tier trauma notification system at JHCH. This is criteria based following pre-set mechanism of injury, injury, signs and symptoms, transport (MIST) criteria. There is an immediate response time to the trauma notification and set to the estimated time of arrival.
   c. Trauma Response
      Children admitted to the paediatric service as trauma patients are generally 16 years or younger unless they are already known to the service with a pre-existing condition. There is a Paediatric Registrar (Surgical Education Training [SET] 2 / 3) onsite available to respond to a trauma call during working hours. After hours there is a Registrar on call. The trauma call page for paediatrics includes the Paediatric Surgical Registrar and if they are unavailable, for example if they are in the operating theatre, the Paediatric Consultant will attend, after hours the Adult Surgical Registrar responds to the paediatric page.
   d. Trauma Admissions
      The Paediatric General Surgical Team assume admitting responsibilities for paediatric trauma patients. After the 24-hour tertiary survey has been completed by the Paediatric Surgical Registrar, care may then be transferred to a subspecialty (single system) or continue with the admitting surgical team. The assessment of paediatric trauma presentations incorporates social and family issues and includes social work involvement with special consideration given to non-accidental injury presentations.
      Trauma Clinical Nurse Consultants (CNCs) review patients on a daily basis on dedicated ward rounds with the Trauma Fellow. There is a pain team with a Paediatric Anaesthetist that conducts rounds of trauma patients seven days a week.
      The Paediatric Surgical CNC is also a wound care specialist. The Paediatric CNC and the Trauma CNC case manage paediatric patients between them and the model works well, in addition to consultation with the Paediatric Orthopaedic CNC, when required.
   e. Transfers
      It is rare for a need to transfer a child to Sydney and the preference is for children with burns to be managed at JHCH, with Children’s Hospital Westmead (CHW) or Royal North Shore Hospital (RNSH) as backup, if required. Some transfers to Sydney are made for social or family reasons.
f. Rehabilitation
There is a low threshold for referral to the paediatric brain injury rehabilitation service in addition to orthopaedic CNC follow up where appropriate.

g. Outpatient clinic/s
Follow up for children post-discharge is via a dedicated trauma clinic and/or individual surgery or subspecialty clinics. The Brain Injury Rehabilitation Team follow-up patients requiring brain injury rehabilitation with a low threshold for referral. There is also an outpatient department (OPD) trauma clinic providing follow-up, in addition to individual clinics providing outpatient care. There is long-term follow-up for orthopaedic cases and neurosurgical cases.

h. Other
The strength on the JHH/JHCH model is that they are able to manage the whole family on a single site where there is adult and paediatric involvement in trauma. There are no specific paediatric trauma outcome measures being assessed or recorded in clinics. The adult functional independence measure (FIM™) and Short Form (36) Health Survey (SF36) are not effective rehabilitation measures for paediatric cases.

3. Workforce:
   a. Medical (1.0 full time equivalent [FTE] Trauma Director, 1.0 FTE Deputy Trauma Director, 1.0 FTE Trauma Fellow)
      There is a fractional Paediatric Trauma Director 0.2 FTE.
   b. Nursing (2.0 FTE Trauma Nurse Coordinator, 1.0 Area Trauma Nurse Coordinator)
   c. Data Manager (0.4 FTE Data Manager)
   d. Other (1.0 FTE Trauma Research Officer, 1.5 FTE Trauma Service Administration Staff)
      There is limited plastics cover as it is understood that there is insufficient workload to establish a public service. Cover is provided by local visiting medical officers (VMOs). The facio-maxillary services manage some plastics and it is hoped to recruit a surgeon in the future.

4. Quality and review:
JHH review all trauma from a quality point of view both paediatric and adult; paediatric cases go through case review, morbidity and mortality (M&M), trauma committee death review. They would also be presented at the Paediatric Surgeon audit.

5. Education and training:
The paediatric trauma team provide education and support to smaller facilities as there is often very variable understanding of paediatric trauma care requirements in these facilities.
The Area Trauma CNC has successfully obtained funding via the mining sector to address education issues and is actively involved in providing support to Tamworth as a network rural trauma service (RTS).

6. Issues and opportunities:
There are currently four paediatric intensive care unit (ICU) beds (can use additional adult ICU beds, if required). New ICU beds are being built, which will increase capacity to provide 12 beds (with flex to 16 beds). The building design will enable future beds to be commissioned if the trauma load increases.
There is potential for collaborating further with the rehabilitation service regarding outcome measures.
1. **Service Description:**
Sydney Children’s Hospital (SCH) is part of the Children’s Hospital Network and Paediatric Major Trauma Service within New South Wales (NSW) and is located in metropolitan Sydney. It has primary responsibility for Southern NSW Local Health District (SNSWLHD), Murrumbidgee Local Health District (MLHD), Illawarra Shoalhaven Local Health District (ISLHD), South Eastern Sydney Local Health District (SESLHD), Sydney Local Health District (SLHD), Northern Sydney Local Health District (NSLHD) and Australian Capital Territory (ACT) Health. SCH is a statewide speciality service for spinal injuries.

Data for 2014 (NSW Institute of Trauma and Injury Management [ITIM]: Major Trauma in NSW 2014) identified 54 major trauma admissions (peer average 56) to SCH with a case fatality rate of 11.1% (peer average 11.3%).

2. **Model of Care:**
   
a. **Presentation**
   Patients arrive via primary retrieval (helicopter or ambulance); transfers / secondary retrieval and a small number of direct arrivals. The number of helicopter retrievals has increased in the last six months but there does not appear to be a consistent approach regarding which paediatric major trauma centre the retrievals are taken to. This can result in delay to definitive management. Pre-arrival information is provided by ambulance radio approximately 50% of the time.

b. **Trauma Notification**
   There is a two-tier criteria-based trauma call system in place: ‘Trauma standby’ and ‘Trauma attend’. The senior nurse or doctor can initiate a trauma call based on pre-hospital information.

c. **Trauma Response**
   The respondents to a trauma call include ED consultant and ED medical and nursing staff, surgical Registrar, Intensive Care Unit (ICU) registrar and Nurse, Anaesthetic Registrar, Social Worker, Porter, Radiographer, Trauma Clinical Nurse Consultant (CNC) and Clinical Nurse Specialist (CNS).
   After hours, the hospital Nurse Manager attends and the team is led by the ED Registrar with paediatric, ICU and Anaesthetic Registrar backup as required. The ED Consultant is onsite between 0800 – 2400 hours and on call overnight and is notified by telephone of incoming trauma. Radiology is close to the ED but computed tomography (CT) scanning is distant. There is a massive transfusion protocol in place.

d. **Trauma Admissions**
   Patients are admitted under the general surgeon of the day and can be handed over to the appropriate subspecialty for single system trauma following the tertiary survey.
   Case management is provided by the trauma CNC and CNS who do daily rounds of patients. There are insufficient resources to enable the trauma director to participate. The CNC and CNS identify trauma patients from FirstNet and ICU admissions and can self-refer patients to the trauma service. They liaise with the various subspecialty registrars and can escalate issues to General Surgery Consultants or the Trauma Director, if required. The trauma Director is onsite Monday and Tuesday each week.

e. **Transfers**
   Current transfer arrangements are not clear as there is no single point of contact for the Children’s Hospital Network and this can result in transfers being rejected due to incorrect referral pathways. There is an intention to address this issue across the network by providing a single hotline number. Newborn and Paediatrics Emergency Transport Services (NETS), when they are involved, can facilitate three way clinical discussions between the Paediatric Trauma Service (PTS), referring facility and retrieval and this works well.
f. **Rehabilitation**
There is a good brain injury rehabilitation program but no generic paediatric- or trauma-specific rehabilitation service. Consultation can be arranged with the adult rehabilitation service at Prince of Wales Hospital (POW). This is particularly difficult for paediatric spinal patients who may not be able to be admitted to the adult spinal unit at POW.

**g. Outpatient clinic / s**
SCH nurses attend specialist outpatient clinics to review patients on an *ad hoc* basis — such as orthopaedics, plastics, general surgery. This is to reduce the number of clinic appointments that the patient and family have to attend, reducing the time, financial and logistical impact on the family.

3. **Workforce:**
   a. **Medical (0.0 full time equivalent [FTE] Trauma Director)**
The Trauma Director is substantively appointed in ED and accepts a managerial allowance to provide the trauma director role. There is no fractional time allocated to this but is worked in with the ED Consultant role. There is no Fellow but a shared Fellow across the network would be beneficial.
   
   b. **Nursing (0.6 FTE Trauma Nurse Coordinator, 0.6 FTE Trauma Case Manager)**
The Trauma CNC and Trauma CNS are both 0.6 FTE and work a roster that provides one day of overlap per week.
   
   c. **Data Manager (0.6 FTE Trauma Data Manager)**
   
   d. **Other**
Backfill is available if the trauma staff are away for two weeks or more but there is no succession plan in place. Lack of clinical psychology services is a significant gap for trauma patients. There are 2 x 0.5 FTE and 1 x 0.25 FTE Fellows of Australasian College for Emergency Medicine (FACEMs) in ED.

4. **Quality and review:**
There is no hospital trauma committee but trauma staff participate in the Network Trauma Committee which involves representation from Children’s Hospital Westmead (CHW) as well as Sydney Children’s Hospital (SCH). Trauma-specific morbidity and mortality (M&M) are conducted four times per year with a grand round allocated to trauma annually. Case review meetings are held with clinicians from subspecialties to discuss cases as required. Trauma cases are also discussed at ED and surgical M&M.

5. **Education and training:**
There is an established education program that includes four simulation days per year.
The CNC and CNS do not have time to provide education externally, but they provide telephone advice internally and externally

6. **Issues and opportunities:**
SCH trauma service staff would like to have an established statewide trauma hotline for paediatric trauma — this could be set up through retrieval with three telephone teleconferences as per the current NETS model.
SCH trauma service staff believe that there should be better capacity to provide support services to children and families after hours and in particular to those living in rural areas following discharge back to the local environment.
Additionally they believe that there should be an enhancement in paediatric rehabilitation services locally to include musculoskeletal and surgical rehabilitation in addition to the brain injury services, and an establishment of a database that would link with other databases and from which data could be easily retrieved for quality and research purposes.
Other opportunities could be a system-led increase in focus on injury prevention and building local capacity to participate in prevention initiatives and state standards that reflect resourcing requirements for trauma services.
Coffs Harbour Health Campus — Regional Trauma Service

1. Service Description:
Coffs Harbour Health Campus (CHHC) is a regional trauma service (RTS) within New South Wales (NSW) and is located in in the Mid North Coast Local Health District (MNCLHD). It has primary responsibility for MNCLHD and relates to John Hunter Hospital (JHH) as its referral major trauma service (MTS).

Data for 2014 (NSW Institute of Trauma and Injury Management [ITIM]: Major Trauma in NSW 2014) identified 57 major trauma admissions (peer average 67) to CHHC with a case fatality rate of 8.8% (peer average 11.0%).

2. Model of Care:
   a. Presentation
      Patients arrive by ambulance or self-present. There is a single point of contact for trauma and this is answered by the Emergency Department (ED) Consultant during business hours and the ED Senior Doctor out of hours.
   b. Trauma Notification
      CHHC has a two-tier trauma system. ‘Stable trauma’ based on mechanism of injury (MOI), and ‘Major trauma’ based on MOI and any injury or clinical criteria. There is an expected response time of less than 10 minutes to the trauma team activation.
   c. Trauma Response
      The Trauma Team Leader is the ED Consultant. Trauma call is attended by the ED Physician, ED Registrar, Surgical Registrar, Radiographers and Pathology. Intensive Care Unit (ICU) Registrar and Anaesthetics Registrar will attend during daytime hours. Surgical Registrar will contact Surgical Consultant. Computed tomography (CT) and laboratory is available 24/24. In the ED, there is a Fellow of Australasian College for Emergency Medicine (FACEM) until 2300 hours and then a Consultant on call, post-graduate Year (PGY) 4 Registrar after hours. The ED Consultant will call the Surgical Consultant, if required.
   d. Trauma Admissions
      The patient is admitted under the surgeon of the day; this is an informal process managed by registrars. If the patient has a single specific system (e.g. orthopaedic) then the patient can be admitted under orthopaedic. The tertiary survey is conducted the next day. There is better quality if this is done by the general surgery team and they are more likely to identify missed issues.
   e. Transfers
      CHHC support peripheral hospitals; they have a direct telephone line for trauma for advice and support and can retrieve if required; some local staff can intubate. Referring out can be problematic. There is a single system number but some specialists ring direct to their colleagues and this can result in delays and confusion. Patients will require retrieval for head injury, neurosurgical, spinal and spinal cord cardiothoracic and maxillary facial. Surgeons at CHHC will not manage significant injuries to pelvis, spine or hand.
      CHHC use JHH and the Newcastle retrieval system if the patient is time critical and one phone call establishes a three-way teleconference with retrieval, JHH and ED at CHHC. If the patient is non-urgent they call aero Medical Retrieval Service (AMRS), however, they will not find a bed unless the patient is on intermittent positive-pressure ventilation (IPPV) and CHHC Clinician will need to find a bed (AMRS say they are not resourced to do this, nor is CHHC ED). If JHH were involved in a conference call and they accept the patient then the system works. Newborn and Paediatric Emergency Transport Service (NETS) referrals work well. Burns / spinal cord injuries and hand injuries go to Royal North Shore Hospital (RNSH). Spinal patients can be transferred to JHH if there is no spinal cord injury.
   f. Rehabilitation
      JHH organise rehabilitation but patients can come back to CHHC on consultant-to-consultant referral. For rehabilitation the patient goes to Bellingen Hospital which has a rehabilitation specialist. Private hospital cover may assist in getting a rehabilitation referral.
g. **Outpatient clinic / s**
There is no trauma specific outpatient follow-up and no specific trauma outcome measures being assessed or collected via the surgical clinics.

h. **Other**
Some primary retrieval goes to Gold Coast University Hospital (Northern Region retrieval helicopter). Between 2300 – 0700 hours AMRS contacts can be problematic - they will not organise a bed or retrieval and it has to be done by the ED Registrar. There can be delays associated with patients waiting with ambulance at roadside for air retrieval to arrive. Northern region retrieval now has specialist paramedics at retrieval that can retrieve more complex trauma. Most primary retrievals go to JHH rather than North.

3. **Workforce:**
   a. **Medical (0.2 full time equivalent [FTE] Trauma Director)**
   The Trauma Director is also an ED Consultant and works on the ED roster with 0.2 FTE staff specialist trauma commitment.
   b. **Nursing (0.5 FTE Trauma Nurse Coordinator)**
   The Clinical Nurse Consultant (CNC) conducts data entry, education and case review. The role does not include a clinical role other than advisory if contacted.
   c. **Data Manager**
   There is no capacity for data entry – has to be done by CNC.
   d. **Other**
   There is no case management by the CNC or Trauma Director once patient leaves ED. Currently there is no succession planning for either position.

4. **Quality and review:**
CHHC conducts Trauma Committee attended by ED, surgery, anaesthetics, ICU and ambulance; there is no area committee; there are quarterly morbidity and mortality (M&M) meetings and monthly trauma breakfasts; there is no external peer review.

5. **Education and training:**
CHHC hold quarterly Emergency Medicine Education and Training (EMET) education and Trauma simulation on the run (conducted by CNC), which is rotated through the smaller facilities. All facilities participate in Trauma Team training bimonthly.

6. **Issues and opportunities:**
CHHC trauma service staff believe they could manage more patients locally, if they had neurosurgical services and/or an interventional suite and vascular services.
CHHC trauma service staff would like to see a functional AMRS from JHH which has the same capability as NETS and could find beds when required. Also for non-time critical patients who require tertiary services there should be a ‘one call’ acceptance system to build capacity to take rural patients.
CHHC trauma service staff also suggested that there should be more standardisation of what should be provided by a trauma service, this is done well by burns and ITIM could do so by articulating standards.
The T1 system in small rural sites has worked well but 1 – 1.5 hours is not realistic going to secondary hospitals.
1. **Service Description:**
Gosford Hospital (GDH) is a regional trauma service (RTS) within New South Wales (NSW) and is located on the central coast of NSW. It has primary responsibility for Central Coast Local Health District (CCLHD) and relates to Royal North Shore Hospital (RNSH) as its referral major trauma service (MTS).

Data for 2014 (NSW Institute of Trauma and Injury Management [ITIM]: Major Trauma in NSW 2014) identified 46 major trauma admissions (peer average 64) to GDH with a case fatality rate of 32.6% (peer average 11.0%).

2. **Model of Care:**
   a. **Presentation**
      Most trauma patients are bought to GDH, however some go to Wyong (especially if via private transport). Trauma presentations via NSW Ambulance have decreased with more patients going to John Hunter Hospital (JHH) or RNSH.
   b. **Trauma Notification**
      A two-tier trauma approach is used in both hospitals: ‘Trauma team alert’ and ‘Trauma team attend’. Approximately 70% of patients requiring a Trauma team alert are managed and discharged from emergency department (ED) and approximately 30% admitted (three per day).
   c. **Trauma Response**
      The Trauma Team Leader is the ED Physician (consultant-led roster 2 x 16 hours; 24 / 7). Full team alerts include ED, Surgery, Anaesthetics, Intensive Care Unit (ICU) and Pathology, Radiology and Social Work. The model does not include Orthopaedics due to workload issues. The Trauma Team response is good. Surgery, Anaesthetic and ICU Registrars are available 24 / 7 plus on call paediatric and Obstetric Consultants. There are no issues getting them if required. The model at GDH allows Surgical or ED Registrars to discharge ‘Alert call’ patients if needed.
   d. **Trauma Admissions**
      Patients requiring a ‘Trauma team attend’ are usually admitted (approximately one every ten days). All trauma patients are admitted under general surgery and subspecialties. If the trauma patient is admitted under general surgery, a tertiary assessment for referral to specialty is performed and this works well. GDH does not have resources for a trauma bed card model.
   e. **Transfers**
      If there is a neurosurgical or spinal trauma patient, GDH trauma service staff will consult with RNSH and continue to manage at GDH for many elderly patients (model is established and works well). If there is a paediatric trauma patient they can often be managed at GDH – general surgeons with input of the paediatricians are confident but sometimes age requires transfer rather than injury severity score (ISS).
   f. **Rehabilitation**
      The model at GDH works well except for rehabilitation, especially for younger patients returning to GDH. They have a good ortho-geriatric model for the elderly but very little for younger patients. If the patient is admitted initially to a MTS they can then progress to that MTS rehabilitation before returning to GDH. Consultant-to-consultant discussion is necessary for this to occur. The ortho-geriatric model is seen as a strength at GDH.
   g. **Outpatient clinic / s**
      There is no trauma-specific outpatient follow up and no specific trauma outcome measures being assessed or collected via the surgical clinics.
3. Workforce:
   a. Medical (0.2 full time equivalent [FTE] Trauma Director)
      The trauma director is also an ED Staff Specialist and believes his flexible approach to 0.2 FTE works and addresses the needs of the service.
   b. Nursing (1.0 FTE Trauma Nurse Coordinator)
      There is no case manager at GDH but the role is undertaken by the Trauma Director and Clinical Nurse Consultant (CNC) or the General Surgeons. The CNC would like more time sometimes but agrees the workforce allotment it is appropriate.
   c. Data Manager (0.5 FTE Trauma Data Manager)
      The data manager FTE is adequate and currently works well. The Trauma Data Manager has a nursing background and information technology (IT) skills.
   d. Other
      The major workforce issue is deskilling as a result of changes to the T1 Protocol and subsequent less trauma patients coming to GDH. This is predominantly a medical workforce issue and does not impact on nurse recruitment (stable nursing workforce who are mostly living in the Central Coast). There has been an increase in loss of senior registrar positions in recent years. GDH is currently negotiating with JHH regarding rotation opportunities to try to address the issue of less trauma experience but may still lose staff as they relocate to Newcastle or Sydney to get more experience. There is an emergency paediatric rotation already in place with Westmead.
      Having the ED Physician as the medical role is seen as working well at GDH – a general surgical visiting medical officer (VMO) role is thought to not work as well based on the belief it would restrict availability of service oversight.

4. Quality and review:
   The trauma service role in GDH is well established; it involves collecting data, monitoring all patients, feedback information to clinicians, and identifying cases for review. The CNC manages most issues and uses the TD for support, backup and medical engagement.
   GDH convene morbidity and mortality (M&M) meetings for big issues (cross disciplinary and department), and also use the Area Trauma Committee to discuss up to four cases quarterly. The trauma director has established an email information sharing system for feedback (as a PowerPoint presentation) and this works well.

5. Education and training:
   GDH trauma service provides strong education programs locally which attract participants from other LHDs – this includes chest tube workshops, difficult airway management, retrieval ED day and utilisation of the Simulation Centre. All education is practically based.

6. Issues and opportunities:
   GDH trauma services staff believe that the time for calculating the T1 Protocol should revert to the time of injury not from ambulance assessment for outer metropolitan RTSs. This would increase trauma workload but there are skills existing to manage this and it would be more cost effective. This would also address potential deskilling issues.
   There is a need to project clinical requirements based on population growth and in particular an increase in neurosurgical and spinal capacity on Central Coast will be required (10+ years projection). JHH is under pressure already regarding these requirements. There is no data to support this view but GDH trauma services staff believe ITIM should be modelling for these future requirements.
   Additionally GDH trauma services staff believe that there is a need for interventional angiography at GDH - this would prevent some transfers (pelvic and solid organ trauma).
Lismore Base Hospital — Regional Trauma Service

1. Service Description:
Lismore Base Hospital (LBH) is a regional trauma service (RTS) within New South Wales (NSW) and is located in northern NSW. It has primary responsibility for Northern NSW Local Health District (NNSWLHD) but also receives patients from the border region of NSW and Queensland (QLD). The Gold Coast University Hospital (GCUH) located in QLD is the closest major trauma centre with spinal injuries with pathology being transferred to Princess Alexandra Hospital in Brisbane. John Hunter Hospital (JHH) in Newcastle is the default MTS in accordance with the NSW Trauma Plan.
Data for 2014 (NSW Institute of Trauma and Injury Management [ITIM]: Major Trauma in NSW 2014) identified 60 major trauma admissions (peer average 64) to LBH with a case fatality rate of 6.7% (peer average 11.0%).

2. Model of Care:
   a. Presentation
      Most patients arrive in emergency department (ED) via ambulance, some via helicopter and a small number present directly. The number of helicopter arrivals is due to the proximity of the helicopter base. The redevelopment of LBH will have a helicopter pad on top which may influence transfer decisions. Advance notice of arrival is given by ambulance and retrieval services.
   b. Trauma Notification
      A two-tier criteria based trauma call system is in operation: ‘Trauma alert’ and ‘Trauma attend’, with an additional ‘Multitrauma’ call notification available. The call can be issued on receipt of pre-arrival information if the patient meets criteria or following assessment by the ED Physician or Surgical Registrar. After hours, a single-tier system is used.
   c. Trauma Response
      The Team Leader is the senior ED Fellow of Australasian College of Emergency Medicine (FACEM) with the ED Registrar or Career Medical Officer (CMO) leading the team after hours. The trauma team notification includes anaesthetic registrar, surgical registrar, ICU registrar, ED FACEM, pathology, radiology, and ED nursing and medical staff. The hospital nurse manager is also notified. The ED Registrar issues the trauma call and the ED Consultant on call is notified.
   d. Trauma Admissions
      Patients are admitted under general surgery or subspecialty if a single system. The tertiary survey assessment is undertaken by the surgical registrar and the episode of care is managed until discharge by the clinical team. There is no clinical involvement from the trauma team and the CNC and trauma director do not have time to do ward visits.
   e. Transfers
      All patients with serious head injuries or unstable pelvic trauma are transferred to the GCUH after stabilisation. Patients with spinal cord injury are transferred to Princess Alexander Hospital in Brisbane. The Royal Brisbane Hospital is the burns referral hospital. Paediatric trauma patients go to Lady Cilento (Brisbane). Lismore trauma service staff are confident to manage chest injuries. Very few transfers go to Royal North Shore Hospital (RNSH) or JHH.
   f. Rehabilitation
      According to LBH trauma services staff general rehabilitation services are not always suitable for trauma rehabilitation. There is a general rehabilitation service at GCUH and patients are increasingly being referred to this service. Access to brain injury rehabilitation either in NSW or QLD is limited, in the NNSWLHD there is an outpatient service for brain injured patients that operates from Ballina Hospital.
   g. Outpatient clinic / s
      There is no trauma specific outpatient follow up and no specific trauma outcome measures being assessed or collected via the surgical clinics.
3. Workforce:
   
a. Medical (0.2 full time equivalent [FTE] Trauma Director)
   The Trauma Director is a visiting medical officer (VMO) with a 0.2 FTE contract and holds a 0.2 FTE contract with the University Simulation Centre and a 0.6 FTE appointment as the Deputy Director in ED.

b. Nursing (0.5 FTE Trauma Nurse Coordinator)
   The Clinical Nurse Consultant (CNC) role is split between The Tweed Hospital (TTH) and Lismore and given the travel and outreach requirements are not sufficient to enable the CNC to be involved in case management.

c. Data Manager (0.5 FTE Trauma Data Manager)
   There is currently a Trauma Data Manager in training. Previously there has been no capacity for data entry unless the CNC does it.

d. Other
   The trauma director does not currently have backfill from other ED Physicians and the CNC is not backfilled for leave either. The CNC and trauma director have no succession plans.

4. Quality and review:
   There is a monthly trauma meeting at which patients with injury severity score (ISS) >12 are discussed. These multidisciplinary meetings are well attended by clinicians and NSW Ambulance Service (NSWAS) and retrieval staff. The GCUH trauma service has attended on several occasions.
   The Trauma Committee is made up of trauma clinicians from the specialties involved in treating the patients. NSWAS representatives attend infrequently. The Committee review RCAs cross-border flow issues, develop protocols and guidelines.
   There are established relationships with the GCUH and Princes Alexandra in Brisbane, who provide advice and support at a clinical level.

5. Education and training:
   The focus of the education is multidisciplinary simulation at all the EDs across the LHD. This is seen as an opportunity to reinforce guidelines and review difficult case presentations.
   LDH have a mobile simulation van with a 3G simulation-man that is moulaged for trauma. Simulations are used to reinforce issues that are a current concern and as an opportunity to review a difficult case – using actual case presentations. The regular monthly simulations in Lismore are in association with FACEM and trauma directors. The trauma simulations are also in association with Emergency Medical Education Training (EMET) FACEMs in EDs across the Northern part of the LDH and EMET at University Centre for Rural Health in Lismore as a central location for smaller sites to do training.
   Nurse-specific education includes: regular in-service education, twice-yearly trauma triage, transition program, principles of emergency care, facilitation of Trauma Nurse Program (once a year in the area).

6. Issues and opportunities:
   NNSWLHD trauma services feel that the relationship with South East QLD trauma network is not reflected in the current 2009 NSW Trauma Plan. A trauma specific clinical pathway as well as a retrieval / transfer algorithm has been formulated for the transfer of trauma patients from Northern NSW into South East QLD Hospitals. The development of this clinical pathway has been in association with the NNSWLHD Planning and Performance Unit and involved extensive discussions with Aero Medical Retrieval Service (AMRS) and Retrieval Services Queensland (RSQ).
   LBH trauma service staff believe that there are insufficient resources available to provide the value add that a trauma service could provide through case management. Appointment of a trauma nurse practitioner could be one strategy that could assist.
   There should be a statewide approach to trauma rehabilitation that recognises the need for both brain injured and trauma specific rehabilitation.
Nepean Hospital — Regional Trauma Service

1. Service Description:
Nepean Hospital is a regional trauma service (RTS) within New South Wales (NSW) and is located in Western Sydney. It has primary responsibility for the Nepean Blue Mountains Local Health District (NBMLHD) but also receives patients from surrounding areas.
Data for 2014 (NSW Institute of Trauma and Injury Management [ITIM]: Major Trauma in NSW 2014) identified 72 major trauma admissions (peer average 64) to Nepean Hospital with a case fatality rate of 12.5% (peer average 11.0%).

2. Model of Care:
   a. Presentation
   Most patients (> 50%) arrive at Nepean via ambulance with 25% as transfers and a further 25% as self-presentation. If the patient arrives as a secondary transfer from one of the referral hospitals the Emergency Staff Specialist will receive a direct phone call if the patient requires complete trauma assessment. If a patient has a single system injury as a result from trauma, the referral hospital will speak directly to the team involved who accepts care, and the patient can bypass the Emergency Department (ED) and go straight to the speciality ward.

   b. Trauma Notification
   Nepean has a two-tier trauma call criteria-based system. Both tiers are based around mechanism of injury (MOI), Major Trauma Criteria with Tier 1 also including haemodynamic parameters. The Tier 1 Protocol is hospital-wide notification with the team composition inclusive of subspecialties. The Tier 2 response is an ED response. Activation of Tier 1 can come from pre-hospital notification (BAT call) based upon the information that is given. The Tier 2 Trauma Criteria is based upon the Triage Nurse obtaining the information from patient handover.

   c. Trauma Response
   The Team Leader is the ED Consultant during business hours for Tier 1 Trauma response. After hours, the most Senior ED, acute surgery unit (ASU), intensive care unit (ICU) and the Anaesthetics Doctor attend the trauma call with the Senior ED Doctor being Team Leader. ED, and ASU Consultants are always on call, and the Trauma Director is notified via switch. ED Consultants are onsite between 0700 and 2400 hours.

   d. Trauma Admissions
   There is an ASU which functions 24 hours a day, and they perform the tertiary survey. The ASU will admit multisystem patients and transfer single system to an appropriate subspecialty. The ASU has two Surgical Nurse Practitioners but there are not enough resources to perform specific trauma case management. Individual departments perform their own case management; there is no specific trauma case manager position.

   e. Transfers
   Nepean once utilised telemedicine to link with smaller facilities but this was discontinued when the contract expired. ED no longer have the resources to assist with an offsite resuscitation. If resources were available they would consider doing it again in the future; Hawkesbury and Blue Mountains now have trained consultants in the ED and this is a better model. Some transferred patients arrive without images but picture archiving and communication systems (PACS) can be used to gain remote access. There are some problems with quality of and access to computed tomography (CT) images from the private provider.

   f. Rehabilitation
   Traumatic brain injury patients are referred to the Nepean general rehabilitation unit as well as to brain injury rehabilitation providers as these tend to have long waiting lists. Nepean rehabilitation unit takes patients from trauma / surgery and acute services and provides a value-add service on top of what would normally be available at ward level; this is limited to a 10-patient case load. Many trauma patients are discharged before any rehabilitation ward beds are available.
g. Other
In previous years, the Nepean trauma service had the capacity to conduct case management rounds but no longer has the resources to do so. The CNC reviews FirstNet data on a daily basis to identify trauma patients and will follow-up onwards, liaise with Registrars and can escalate issues and concerns to the teams involved or Trauma Director, if required. Nepean Trauma Service does not currently have processes in place to measure patient outcomes. Some functional assessment is done within the rehabilitation service.

3. Workforce:
   a. Medical (0.2 full time equivalent [FTE] Trauma Director)
The Trauma Director is 0.2 FTE acting appointment with a substantive ICU appointment.
   b. Nursing (1.0 FTE Trauma Nurse Coordinator)
The CNC position is a 1.0 FTE. There currently is no trauma case manager within the department of trauma. Two or three years ago an opportunity was created for a case manager to be trialled for one year after which the trauma case manager position ceased.
   c. Data Manager (0.5 FTE Trauma Data Manager)
There is a 0.5 FTE data manager although these allocated hours are insufficient to do all the work in a timely manner. Although the Trauma Data Manger is funded 0.5 FTE, it is currently only worked at a 0.4 FTE.
   d. Other
There is no leave relief and no succession planning although staff could be identified who might be interested in the positions.

4. Quality and review:
There are monthly ED morbidity and mortality (M&M) meeting where trauma cases are presented. If the case requires a discussion / opinion or viewpoint from any other subspecialties, those specialities are invited to attend. Each department conducts their own M&M meetings and can refer the case to other departments if required.

Nepean Hospital conducts a Trauma Committee where cases are discussed. Trauma cases might be presented at both, ED and Surgical meetings and Trauma Committee meetings; reporting at separate committees can be problematic, however it is difficult to get everyone together. External peer reviews are only done through root cause analyses (RCAs). There is effective networking amongst the surgeons in the LHD who know each other allowing an informal review system that works well.

5. Education and training:
Nepean Hospital conducts Trauma Team Training on average five times a year. The Trauma CNC, ICU Nurse Educator, ICU Staff Specialist and education and training staff conduct the training. The Trauma CNC is involved and teaches many facets of education. Physicians provide some training at the smaller sites and also participate in clinical rotations.

6. Issues and opportunities:
Nepean is the trauma service for NBMLHD, however Nepean trauma service staff perceive that they are not seen as a trauma hospital because of the T1 Protocol. They believe that ambulance perception is that Nepean is not a MTS, and therefore by-pass the hospital, but they can reach a MTS whilst staying within the 60-minute time to definitive care rule. Volume is sporadic resulting in deskilling of staff and this is a source of frustration as Nepean feels that they have the population, demands and the service provision. Nepean would like to see changes made to the T1 Protocol to better reflect the trauma service role at their site. They would also like the capacity to provide case management service to improve outcomes and for changes to be made to enable data collection to be seamless and automatic via eMR.
Orange Health Service — Regional Trauma Service

1. Service Description:
Orange Health Service (OHS) is a regional trauma service (RTS) within New South Wales (NSW) and is located in Western NSW. It has primary responsibility for Western NSW Local Health District (WNSWLHD).
Data for 2014 (NSW Institute of Trauma and Injury Management [ITIM]: Major Trauma in NSW 2014) identified 78 major trauma admissions (peer average 64) to OHS with a case fatality rate of 5.1% (peer average 11.0%).

2. Model of Care:
   a. Presentation
      Most major trauma patients arrive at Orange via helicopter (50%) or ambulance, with few bought in by private vehicles. There is a helicopter retrieval base in Orange. Emergency department (ED) normally receives a BAT call / Code 3, which is answered by the senior ED Physician or Clinical Nurse Unit Manager on duty, either of whom can activate a trauma call based on mandatory criteria. If a patient arrives and meets the mandatory trauma criteria, the call can be made by the Triage Registered Nurse (RN) or other staff depending on the patient’s location within the ED models of care.
   b. Trauma Notification
      There is a two-tier system in operation: ‘Trauma attend’ and ‘Trauma alert’. The ED staff may additionally initiate a ‘Trauma attend’ call if concurrent trauma patients are arriving and ‘Stand down’ if no longer required. The trauma call is put out via the hospital tannoy as well as the paging system.
   c. Trauma Response
      The trauma call includes the Surgical Registrar (the Acute Surgical Unit [ASU] Consultant will often attend), Intensive Care Unit [ICU] Registrar, Anaesthetics Registrar, radiology, designated ED medical and nursing staff, and the Campus Nurse Manager). The Trauma Team is led by the Senior ED Physician.
      From 2400 – 0700 hours, the Surgical Registrar is Surgical Education and Training (SET) 1 – 3, there is a more senior SET Registrar on call. The Anaesthetic Registrar is a Year 4 / 5 and the ICU Registrar is a junior medical officer. The ED Consultant on call will be contacted for a trauma call between 2300 and 0800 hours and attend as needed. Initial implementation of Code Crimson is working well.
   d. Trauma Admissions
      Patients are admitted under the ASU. A Surgical Consultant covers the ASU on a weekly rotating basis. The tertiary assessment is done by the ASU Surgical Registrar and if appropriate, care handed over to a subspecialty team for single system injuries. The case management of trauma patients is the responsibility of the surgical team for admitted patients, until such time as care is transferred to a subspecialty team (e.g. orthopaedics, rehabilitation). There is multidisciplinary team input such as occupational therapy (OT, including post-traumatic amnesia [PTA] testing) and physiotherapy.
   e. Transfers
      Retrieval staff are clear about which cases OHS can manage. There are established pathways for referral for complex trauma neurosurgical, facial, plastics (Westmead), burns (Concord) and spinal (Royal North Shore Hospital, RNSH) and OHS is well supported by these services, particularly Westmead. This model works well. There is some use of telemedicine and an established process for providing clinical support to smaller facilities via remote cameras using the Patient Flow Unit, Critical Care Advisory Service or Retrieval Service.
   f. Rehabilitation
      OHS have good rehabilitation services (rehabilitation unit, physiotherapy, OT), but do not currently collect patient outcome data for rehabilitation.
g. **Outpatient clinic / s**

There is no trauma-specific outpatient follow-up (other than fracture clinic) and no specific trauma outcome measures being assessed or collected via the surgical clinics.

3. **Workforce:**

   a. **Medical (0.2 full time equivalent [FTE] Trauma Director)**

   The Trauma Director position is 0.4 FTE but the incumbent only occupies 0.2 FTE. There is no clinical work involved and the focus is on clinical review and policy and guideline development. This position extends beyond OHS to include the oversight of trauma patient care for the WNSWLHD. Registrar rotation through ED works well and there is a good level of Fellow of the Australasian College for Emergency Medicine (FACEM) cover.

   b. **Nursing (1.0 FTE Trauma Nurse Coordinator)**

   The Clinical Nurse Consultant (CNC) position is for the LHD, but the focus is predominantly at OHS. The CNC does some outreach visits to other sites, largely to provide education. The CNC collects the minimum data set in addition for Dubbo and Bathurst and reviews all of these cases and trauma transfers out of the LHD.

   c. **Data Manager (0.5 FTE Trauma Data Manager)**

   d. **Other**

   There is no backfill for the CNC and no succession planning. The CNC covers other hospital positions within the hospital on an *ad hoc* basis.

4. **Quality and review:**

   There are monthly morbidity and mortality (M&M) meetings which are conducted at the RTS and video-conferenced to interested LHD facilities, ambulance, Charles Stuart University and the local helicopter retrieval base. External peer review of cases occurs on referral to the ITIM Clinical Review Committee. There is no LHD trauma committee and no clinical stream for trauma within the LHD. The trauma director has used Twitter to share information from M&M, this has enhanced the engagement with clinical staff.

5. **Education and training:**

   There is a robust in-service education program for ED staff conducted twice-weekly, which is developed and overseen by the Trauma CNC. Whole team simulation training occurs on an *ad hoc* basis in Orange. The trauma director has visited smaller sites but there is limited capacity to do this within existing resources.

   Trauma Refresher & Update Education (TR&UE) is provided at Mudgee, Cowra, Parkes and Forbes. LHD Nurse Strategy funding has been arranged to support trauma nursing education. First-Line Emergency Care Course (FLECC) acts as supplemental education for smaller sites.

6. **Issues and opportunities:**

   The CNC identifies trauma patients by a time consuming process of analysis of information in FirstNet, eMR (PowerChart), Clinical Patient Folder (CPF – scanned paper records stored electronically), paper-based medical records and the ICU electronic information system (ICIP). Capacity to access and extract data and follow-up in the State repository ‘Collector’ and the software ‘Report Writer’ is a constant source of frustration.

   The system needs to focus on getting critical patients to the best care in the quickest possible time which could mean bypassing more facilities. Orange trauma service staff believe this could improve with the longer range helicopter being located at Orange. There are not strong relationships with Dubbo, although there is a significant volume of trauma that presents and is managed at Dubbo Base Hospital.

   There is also some confusion in smaller facilities about who they should phone for support and advice: Westmead, Dubbo, Orange or Critical Care Advisory Service. Referral patterns for trauma and non-trauma patients do not align, which exacerbates this confusion.

   There is consensus, at OHS, that paediatric trauma retrieval and transfers need to be undertaken by trauma trained staff working in the trauma arena.
Port Macquarie Base Hospital — Regional Trauma Service

1. Service Description:
Port Macquarie Base Hospital (PMBH) is a regional trauma service (RTS) within New South Wales (NSW) and is located in the Mid North Coast of NSW. It has primary responsibility for Mid North Coast Local Health District (MNCLHD) but also receives patients from Hastings Macleay Network of Port Macquarie-Hastings, Kempsey and the Greater Taree and Great Lakes areas in Hunter New England LHD. PMBH relates to John Hunter Hospital (JHH) as its referral major trauma service (MTS). Data for 2014 (NSW Institute of Trauma and Injury Management [ITIM]: Major Trauma in NSW 2014) identified 50 major trauma admissions (peer average 60) to PMBH with a case fatality rate of 12.0% (peer average 11.0%).

2. Model of Care:
   a. Presentation
   Most trauma patients present directly to PMBH via ambulance. There is variability in the trauma presentations to smaller sites in the PMBH referral facilities.

   b. Trauma Notification
   There is a two-tiered trauma system. ‘Stable trauma’ based on mechanism of injury (MOI), and ‘Major trauma’ based on MOI and any injury or clinical criteria. There is an expected response time of less than 15 minutes to the Trauma Team activation. The trauma call is advised by mobile phone text in addition to phone follow-up if required. Major transfusion criteria are written into the protocol and can be initiated pre-arrival. The same trauma call is used 24 / 24 but respondents may vary.

   c. Trauma Response
   Trauma Teams are Emergency Department (ED) Consultant-led between 0700 and 2400 hours. After 0000 until 0700 hours, it is led by the Senior Registrar (with Consultant backup). There are seven ED Consultants on the roster. The ED Consultant is the Team Leader and a trauma call includes laboratory, pathology, Surgical Registrar and Intensive Care Unit (ICU) Registrar. An anaesthetist is not involved unless specifically called. Those less injured are managed in ED with / without a subspecialty referral. Between 1800 and 0800 hours, the Surgical Registrar (Surgical Education and Training [SET] 4 / 5) may be offsite; radiology and pathology are 24 / 24 onsite.

   d. Trauma Admissions
   Trauma patients are admitted under general surgery; non-critical or single system will often go to a subspecialty only.

   e. Transfers
   Patients with severe head injuries are sent to JHH. They will go directly to JHH from Kempsey Hospital if their injuries are time critical. Most thoracic injuries are managed at PMBH where access to operating theatres is good. Specific transfers to JHH are patients with acetabulum fractures, multiple fractures, severe orthopaedic injuries, severe thoracic trauma and some plastics (fascio-maxillary). Coffs Harbour Health Service sends some plastics to PMBH. Paediatric patients are referred to Newborn and Paediatric Emergency Transport Service (NETS) – this works very well. Patients with burns or spinal cord injuries go to Royal North Shore Hospital (RNSH).

   f. Rehabilitation
   There is no real access to rehabilitation. Wauchope has some rehabilitation but this is mainly for palliative care patients. Orthopaedic rehabilitation is done in the wards.

   g. Outpatient clinic / s
   There is no trauma-specific outpatient follow-up and no specific trauma outcome measures being assessed or collected via the surgical clinics.
3. Workforce:
   a. Medical (0.2 full time equivalent [FTE] Trauma Director)
      The Trauma Director is 0.2 FTE visiting medical officer (VMO) surgeon.
   b. Nursing (0.5 FTE Trauma Nurse Coordinator)
      The Clinical Nurse Consultant (CNC) is the key contact point for ambulance liaison and case feedback.
   c. Data Manager
      There is no data support officer so this is performed by the CNC.
   d. Other
      Trauma team resources are stretched. The Trauma Director and CNC tend to cover each other for chairing meetings if one is on leave.
      There is variance in Surgical Registrar skills (level and experience) which can be an issue at trauma calls. There is a variance between the quality of the tertiary survey between the surgeons and subspecialties (especially orthopaedics) as the subspecialists do not always identify issues that would be picked up through active trauma service case management.

4. Quality and review:
   The Trauma Director chairs the monthly Trauma Clinical Services Committee that involves ICU, Ambulance and ED. The Committee focus on finding solutions to system issues. The trauma service conducts case reviews and education every 4th week, with a Friday 0700 hours breakfast meeting. This is open to all clinicians and has an average attendance of 65. The trauma service try to ensure that those involved in cases are in attendance. Any external peer review is conducted at these meetings. There is some Director of Medical Services engagement and attendance at monthly meetings. Clinical indicators are collected and reported on monthly, the trauma service would like to do more quality benchmarking with other services.

5. Education and training:
   PMBH conduct departmental in-services second-monthly, skills training annually and quarterly team training. They also provide a mobile simulation ‘on the run’ at PMBH and Kempsey District Hospital monthly.

6. Issues and opportunities:
   Surgeons at PMBH want advice and backup from neurosurgery at JHH. They would like clarity regarding who can be looked after at PMBH and more importantly consistency in advice and response from JHH neurosurgical staff which could include a model for shared care with neurosurgeons at JHH and formalisation of how transfers can occur. Lack of clinician continuity at the tertiary service level can be problematic when updates are required. The idea of a JHH network of which PMBH is a part of, together with other RTSs is appealing, if it can address communication and transfer issues.
   There are issues with offsite radiology reporting quality (outsourced provider is Primary Health Care Limited [Primary HC]) and the interventional radiology service is poor, and is three years into a five-year contract with Primary HC. There is no support to provide service at PMBH by hospital management although have they have an interventional radiologist and vascular surgeon in town interested. They have a fully-equipped interventional theatre at the hospital.
   There has been an increase in bariatric patients requiring more equipment and resources.
Tamworth Rural Referral Hospital — Regional Trauma Service

1. Service Description:
Tamworth Rural Referral Hospital (TRRH) is a rural trauma service (RTS) within New South Wales (NSW) and is located in the New England region. It has primary responsibility for the upper section of the Hunter New England Local Health District (HNELHD), but also receives patients from northwest geographical area of NSW. TRRH relates to John Hunter Hospital (JHH) as its referral major trauma service (MTS).
Data for 2014 (NSW Institute of Trauma and Injury Management [ITIM]: Major Trauma in NSW 2014) identified 47 major trauma admissions (peer average 64) to TRRH with a case fatality rate of 6.4% (peer average 11.0%).

2. Model of Care:
   a. Presentation
   Patients mostly arrive by ambulance, but with the helicopter retrieval team based at Tamworth, more patients are arriving by helicopter. Some patients are self-referred. NSW Ambulance (NSWA) do not necessarily advise the emergency department (ED) if the patient is coming as they have already advised retrieval services.
   b. Trauma Notification
   There is a two-tier trauma activation and notification system which involves the switchboard ringing those on the list to advise them via their mobile phones. There is a limited paging system in place. The ED Nurse Unit Manager (NUM), may initiate the trauma call based on pre-admission information from ambulance, otherwise the call is made following an assessment by an ED Physician.
   c. Trauma Response
   Response to the trauma call is patchy, but the Surgical Registrar usually attends together with pathology, radiology and ED medical and nursing staff. The ED Physician is the Team Leader and responsible for airway. There is an ED Consultant in ED from 0700 – 2300 hours 7 days per week. Registrar cover currently does not fill all available shifts. The ED Consultant is advised of expected trauma presentations and is on call between 2400 and 0700 hours.
   d. Trauma Admissions
   The patient is admitted under the general surgeon of the day. The trauma Clinical Nurse Consultant (CNC) will visit in the intensive care unit (ICU) and follow-up some patients Monday to Friday on the ward; but there is no other case management from the trauma service. Tertiary assessments are done by the Surgical or Orthopaedic Registrar and are checked by the trauma CNC.
   e. Transfers
   All patients with head injury are transferred to JHH, as are chest, pelvic, and multitrauma patients. The General Surgeons are confident managing most children, however, if transfer is necessary they use Newborn and Paediatric Emergency Transport Service (NETS) noting that some NETS retrievalists are not confident with older children with trauma.
The retrieval service is working well at Tamworth; it is tasked by ambulance and their workload has doubled. The model works well as retrievalists are also ED staff specialists at Tamworth.
   f. Rehabilitation
   If a patient requires rehabilitation they are transferred to the rehabilitation unit at the hospital. There is capacity to take JHH trauma patients back for rehabilitation. If brain injury rehabilitation is needed referral is made early.
   g. Outpatient clinic / s
   There is no trauma-specific outpatient follow-up and no specific trauma outcome measures being assessed or collected via the surgical clinics.
h. Other

There is a single phone number to ring at the hospital which has menu choices, one of which is ‘Retrieval’. This call is routed to ED and, if not answered in 30 seconds, is re-routed to Retrieval, and if not answered in 60 seconds, re-routed to Aero Medical Retrieval Service (AMRS) in Sydney.

3. Workforce:

a. Medical (0.5 full time equivalent [FTE] Trauma Director)

There is no appointed Trauma Director at Tamworth although the ED Director is assuming some aspects of the role. The position has been unfilled for two years.

b. Nursing (1.0 FTE Trauma Nurse Coordinator)

There is an ED Nurse Practitioner at Tamworth but she is not rostered to trauma and works in Fast Track. Previously there were two Nurse Practitioners, across seven days.

c. Data Manager

There is no Data Officer and any data entry must be done by the CNC. FirstNet is not in use and all data records are manually collated or information gathered from paper files.

d. Other

There are 5.8 FTE funded for ED with two more FTE currently advertised for Fellow of the Australasian College for Emergency Medicine (FACEM) positions. Four staff also work on the retrieval roster.

The Emergency Medicine Training Network from JHH allocates Registrars and this is sometimes seen as not enough. The hospital is four staff short in covering the ED and ICU roster. Lack of middle range registrars after hours is an issue.

There is no succession planning for the medical or nursing positions.

4. Quality and review:

It is planned to establish a bimonthly Trauma Committee involving ED, trauma, surgery, ICU, anaesthetics, retrieval and ambulance. There are ED and surgery case reviews that involve trauma patients but not trauma case reviews.

5. Education and training:

The CNC provides education at Tamworth, Armidale and the smaller sites.

The retrievalists are planning to use non-clinical time from March to provide education in smaller sites about who to contact, when and why and what support is available.

6. Issues and opportunities:

Referrals through the single point of contact works well for RNSH but does not work effectively at JHH. If the phone is not answered, the ED Registrar contacts JHH ICU as an alternative. As a helicopter is at Tamworth, retrieval can be easily organised.

Tamworth trauma services staff believe that the clinical stream for trauma needs has to be reviewed for the LHD and should include retrieval; this could greatly improve network development, support and communication.

Medical staffing after hours needs to be improved (minimum standard at least) as the only medical staff onsite are junior (Years 1 – 3, or pre-Surgical Education and Training [SET]). The ED Registrar (Years 4 / 5) covers the hospital.
The Tweed Hospital — Regional Trauma Service

1. Service Description:
The Tweed Hospital (TTH) is a regional trauma service (RTS) within New South Wales and is located in the North of New South Wales (NSW), on the border with Queensland. It has primary responsibility for the Northern NSW Local Health District (NNSWLHD). Due to its proximity to Queensland, patients may live in either Northern NSW or Queensland. The Gold Coast University Hospital is the closest major trauma service (MTS) and patients with spinal injuries with pathology are transferred to Princess Alexandra Hospital in Brisbane.

Data for 2014 (NSW Institute of Trauma and Injury Management [ITIM]: Major Trauma in NSW 2014) identified 51 major trauma admissions (peer average 64) to TTH with a case fatality rate of 13.7% (peer average 11.0%).

2. Model of Care:
   a. Presentation
      Patients predominantly arrive at TTH via ambulance with a smaller proportion as self-presenting. There are very few helicopter arrivals due to its proximity to MTS in Queensland, where major trauma patients will be flown directly. NSW Ambulance Service (NSWAS) or Queensland Ambulance Service (QAS) provide pre-hospital notification of major trauma arrivals and a trauma call can be initiated based on this information.
   b. Trauma Notification
      TTH has a single-tier trauma call system that is criteria-based. There is a single number in the emergency department (ED) to ring, which may be answered by an emergency physician or nurse. They call the hospital switchboard to initiate the trauma call including a loud page. An informal modified call within the ED will initiate the assembly of a pre-arranged resuscitation team.
   c. Trauma Response
      The Trauma Team is led by the ED Fellow of the Australasian College for Emergency Medicine (FACEM) in-hours (until 2300 hours), and an ED Registrar outside hours. The trauma call response team include: ED FACEM / Consultant, Anaesthetic Registrar, Surgery Registrar, Intensive Care Unit (ICU) Registrar / Consultant, Pathology, Radiographer, Nurse Manager and allocated ED medical and nursing staff. After hours, the ED FACEM / Consultant will be called in. If other subspecialties are required they will be notified.
   d. Trauma Admissions
      Patients are admitted under the general surgeon of the day or subspecialty if single system only with the tertiary survey being undertaken by the Surgical Team. There is no ward round / review by the Trauma Team, as there is no capacity for case management. However, the communication between the specialist Visiting Medical Officers (VMOs) is good and works well. The admitting team are responsible for care until discharge.
   e. Transfers
      All patients with serious head injuries, pelvic fractures and some vascular trauma are transferred to the Gold Coast University Hospital. Patients with spinal cord injury are transferred to Princess Alexander Hospital in Brisbane. The Royal Brisbane is the burns referral hospital. Paediatric trauma patients go to Lady Cilento (Brisbane).
   f. Rehabilitation
      Rehabilitation is a developing service being led by a General Rehabilitation Physician at Murwillumbah District Hospital. Referral to brain injury rehabilitation is difficult, as Brisbane do not have capacity and Sydney is too far away. There is a rehabilitation service at Gold Coast University Hospital and patients are increasingly being considered for this service. Ballina has an outpatient brain injury service.
   g. Outpatient clinic / s
      There is no trauma-specific outpatient follow-up and no specific trauma outcome measures being assessed or collected via the surgical clinics.
3. **Workforce:**

   a. **Medical (0.2 full time equivalent [FTE] Trauma Director)**
      The Trauma Director is a 0.2 FTE appointment as a Staff Specialist and holds other fractional VMO appointments within TTH as an Intensivist.

   b. **Nursing (0.5 FTE Trauma Nurse Coordinator)**
      The Clinical Nurse Consultant (CNC) role is split between TTH and Lismore. Given the travel and outreach requirements is not sufficient, the CNC is not able to be involved in case management.

   c. **Data Manager (0.5 FTE Trauma Data Manager)**
      There has been no capacity to do data entry (unless the CNC does it) until recently, when some fractional clerical hours have been identified.

   d. **Other**
      There is no annual leave cover for either the trauma director or the CNC and no succession planning.

4. **Quality and review:**

   The Trauma Director’s focus is predominantly on quality assurance (QA) activities including Morbidity and Mortality (M&M), case audit, presentations and monitoring major cases. He will follow-up with other specialists as required and is flexible in utilising his allocated trauma hours.

   There is no local trauma committee or LHD trauma committee.

5. **Education and training:**

   The focus of the education is multidisciplinary simulation at all of the EDs across the LHD. This is seen as an opportunity to reinforce guidelines and review current concerns and present difficult case presentations.

   LHD has a mobile simulation van with a 3G simulation-man that is utilised and moulaged for trauma. There are regular monthly simulations in Tweed Emergency, in association with FACEM / Trauma Directors. The trauma simulations are also in association with Emergency Medicine Education and Training Program (EMET) FACEMs in EDs across the northern part of the LHD.

   Nurse-specific education includes: regular in-service education, twice-yearly trauma triage, transition program, principles of emergency care, facilitation of Trauma Nurse Program (once a year in the area).

6. **Issues and opportunities:**

   The critical mass for trauma service staffing appears to be at the bottom of the RTS range due to a combination of service fragmentation and role erosion.

   Northern NSW is supported as part of the South-eastern Queensland trauma network with established relationships and the development of a trauma specific clinical pathway. TTH and LHD staff participates in the monthly Gold Coast University Hospital trauma meetings and there are VMOs with appointments in both facilities. The LHD is working with Gold Coast University Hospital to establish more formalised arrangements for transfer of complex cases.

   NNSWLHD trauma services feel that the relationship with South-east Queensland trauma network is not reflected in the current 2009 NSW Trauma Plan. A trauma specific clinical pathway as well as a retrieval / transfer algorithm has been formulated for the transfer of trauma patients from northern NSW into south east Queensland Hospitals. The development of this clinical pathway has been in association with the NNSWLHD Planning and Performance Unit and involved extensive discussions with Aero Medical Retrieval Service (AMRS) and Retrieval Services Queensland (RSQ).

   The ability to communicate directly with QAS to discuss the patient is beneficial as compared to the NSW model, in which all calls go through the ambulance communications centre rather than directly to the ambulance.
Wagga Wagga Rural Referral Hospital — Regional Trauma Service

1. Service Description:
Wagga Wagga Rural Referral Hospital (WWRRH) is a rural trauma service (RTS) within New South Wales (NSW) and is located in the South West NSW. It has primary responsibility for Murrumbidgee Local Health District (MLHD). WWRRS relates to St George Hospital as its referral major trauma service (MTS).

Data for 2014 (NSW Institute of Trauma and Injury Management [ITIM]: Major Trauma in NSW 2014) identified 72 major trauma admissions (peer average 64) to WWRRH with a case fatality rate of 4.2% (peer average 11.0%).

2. Model of Care:

a. Presentation
The primary admission pathway is via NSW Ambulance with a small but increasing number of helicopter retrievals. There are a few direct self-presentation. Ambulance may call emergency department (ED, Code 3) with the call being taken by clerical, triage, nursing or medical staff. SouthCare helicopter (medical retrieval) service operates in MLHD taking patients directly to The Canberra Hospital (TCH). SouthCare cannot cover the whole of MLHD without refuelling.

b. Trauma Notification
There is a two-tier, criteria-based, trauma call system in place: ‘trauma alert’ and ‘trauma attend’. The decision to put out a trauma call is criteria-based and can be made by triage, ED physician or the ED nurse in charge. The call is sent out by the ED clerical staff.

c. Trauma Response
The trauma alert involves the ED medical and nursing staff with the Surgical Registrar attending. The Team Leader is an ED Consultant from 0700 – 2400 hours and an ED Registrar between 2400 – 0700 hours. The trauma attend notification includes intensive care unit and Anaesthetic Consultants / Registrars within hours and may include junior medical staff after hours, although the Division of Surgery tries to roster Surgical Education and Training (SET) 4 / 5 Registrars after hours. Pathology are onsite 24 / 7, and radiology, until 2400 hours. The angio-embolism service is planned but is not established, although there is some interventional radiology capability currently.

d. Trauma Admissions
Patients are admitted under the acute surgical unit (ASU, consultant weekly rotation), who do the tertiary survey and transfer care to subspecialists if single system post-survey. The trauma service have not been auditing or following-up cases due to lack of resources. The ASU model operates as a de facto trauma model with the Consultant, Fellow, Registrar, Nurse Unit Manager (NUM), Clinical Nurse Consultant (CNC) and intern case managing the trauma patients.

e. Transfers
NSW trauma plan is in contradiction to the NSW critical care retrieval plan. There is no integral aero medical retrieval service (AMRS) provider in MLHD, previously WWRRH had provided a road retrieval model which is now no longer active.

The current referral process is to call St George Hospital trauma hotline, but there has been some recent issues in regards to advice given. St George Hospital provides a one call, non-refusal policy. Second phone call is to the aeromedical control centre (ACC) / AMRS after the patient has been accepted at St George. There is some confusion about who should make the call to ACC / AMRS in the LHD. Smaller hospitals surrounding WWRRH send patients to WWRRH via road ambulance after discussion with ED Registrar / Consultant for acute or ASU / subspeciality especially for orthopaedics otherwise the patients go to St George (St Vincent’s and TCH to lesser degree) via Rotary Wing and Fixed Wing retrieval. There currently are five variations in trauma referral models in MLHD. Referrals to Concord (burns), Royal North Shore Hospital (multitrauma and burns), and Prince of Wales (spinal) and Newborn and Paediatric Emergency Transport Service (paediatrics) all work effectively when required. Critical care advisory service / patient flow unit, available between hours of 0700 – 1900 hours, established in MLHD 2015 is used by smaller sites for critically ill or injured patients. One part of this service is to link sites using telehealth, with intensivist support at WWRRH. The second part is organising transfers and an accepting facility.
f. **Rehabilitation**

Care remains with the surgical teams and rehabilitation is organised with the rehabilitation physician – there is a rehabilitation ward with an acute and a chronic end, although neither may be ideal for trauma patients. There is a brain injury satellite in Wagga Wagga with inpatient beds available at Albury.

g. **Outpatient clinic / s**

There is no trauma specific outpatient follow-up and no specific trauma outcome measures being assessed or collected via the surgical clinics.

3. **Workforce:**

   a. **Medical (0.2 full time equivalent [FTE] Trauma Director)**

   The Trauma Director is 0.2 FTE and not located in Wagga Wagga or holding any other fractional appointments within MLHD. The Trauma Director’s role is not clinical, however is an administrative role involving trauma governance which extends beyond WWRRH to include the oversight of trauma patient care for the MLHD.

   b. **Nursing (0.5 FTE Trauma Nurse Coordinator)**

   The trauma CNC position is 0.5 FTE for the whole LHD which is challenging given the size and number of facilities and does not allow for all aspects of the role to operate fully to improve trauma care in MLHD. The position was vacant for more than 18 months and had previously been a 1.0 FTE covering both Southern NSW LHD (SNSWLHD) and MLHD.

   c. **Data Manager (0.5 Trauma Data Manager)**

   The data officer is 0.5 FTE and is responsible for entering both MLHD and SNSWLHD data.

   d. **Other**

   The ED has had only one Fellow of Australasian College for Emergency Medicine (FACEM) in the past but is currently recruiting to 4 positions.

4. **Quality and review:**

It is planned to establish a Local Trauma Committee and re-establish the Regional Trauma Committee. Currently morbidity and mortalities (M&Ms), involving trauma patients, are discussed within the Division of Surgery with no input from trauma services. Every 8 weeks the Division focus on trauma cases with cases brought forward by the Surgical Fellow. WWRRH would like more local data regarding trauma so they can better understand and manage their services.

Cases for review are reviewed by the Rural Trauma CNC, Trauma Director and Clinical governance. Peer review of the trauma cases are conducted by the ITIM Clinical Review Committee. The CNC also provides subject matter expert advice on root cause analyses with reports, and cases are also shared at the monthly critical care meeting with the Director of Critical Care services.

5. **Education and training:**

The trauma service, in conjunction with the MLHD clinical education and training unit, provides a wide variety of rural specific trauma education, and trauma in-service within the current CNC limited capacity. These programs utilise a mobile simulation van ‘RivSim’ and video conferencing accessible across MLHD. The registrar training rotation position from St George is not currently approved and WWRRH feel unsupported by their MTS network in addressing both the registrar shortage and the training program. There is currently exploratory work with TCH and SouthCare to establish better communication and support.

6. **Issues and opportunities:**

The inconsistency between the state trauma plan and the more recent critical care plan leads to confusion especially in the small facilities as to who they should be contacting. This is a systemwide issue.

There are no local transfer guidelines, meaning that knowledge of what services are available where and who to contact is necessary for effective referral. Surgical or ED Registrars are usually left to locate beds / liaise with facilities. The implementation of the critical care referral may help to address some of these issues. This may also assist in increasing the use of telemedicine to support smaller sites and / or provide expert advice.
Wollongong Hospital — Regional Trauma Service

1. Service Description:
Wollongong Hospital is a regional trauma service (RTS) within New South Wales (NSW) and is located in Wollongong. It has primary responsibility for Illawarra Shoalhaven Local Health District (ISLHD) and is related to St George Hospital, as its referral major trauma service (MTS).
Data for 2014 (NSW Institute of Trauma and Injury Management [ITIM]: Major Trauma in NSW 2014) identified 105 major trauma admissions (peer average 64) to Wollongong Hospital with a case fatality rate of 13.3% (peer average 11.0%).

2. Model of Care:
   a. Presentation
     Patients mostly arrive by ambulance or self-present. Ambulance use the BAT phone to advise of their arrival and the phone is answered by a Senior Nurse or Senior emergency department (ED) Physician. Whoever takes the call in ED can initiate a trauma call based on the information provided by ambulance and if meeting the appropriate criteria.
   b. Trauma Notification
     There is a two-tier trauma call activation system in place with most calls being initiated as ‘trauma standby’ and approximately three per week being initiated as ‘trauma attend now’. Code Crimson is an escalation to a subgroup of the ‘trauma attend now’ patients (on average about seven activations per year).
   c. Trauma Response
     The Team Leader is an ED Physician with an ED Consultant as leader between 0800 – 2400 hours and an ED Registrar between 2400 – 0800 hours. Radiology, the intensive care unit (ICU), anaesthetics and Surgical Registrars respond together with ED medical and nursing staff, to all ‘Trauma attend now’ and Code Crimson calls regardless of time of day. ‘Trauma standby’ calls are managed by ED and result in an automatic General Surgical Registrar consultation within 30 minutes of activation. The trauma Clinical Nurse Consultant (CNC) and social worker attend all calls during business hours. After business hours, Social Work is on call if deemed a requirement by clinicians. The after-hours Anaesthetic Registrar is usually Year 4 / 5. There is consultant backup offsite between 2400 – 0800 hours.
   d. Trauma Admissions
     The patient is admitted under the general surgeon of the day. If they have a single system injury, they can be transferred to a subspecialty after completion of the tertiary survey by the surgical registrar. The trauma CNC uses FirstNet to generate a list of trauma patients within the hospital and will make contact with patient management teams to discuss clinical management issues, or escalate more difficult concerns to the Trauma Director as required. Neither the Trauma Director nor the Trauma CNC undertake trauma rounds or case management due to regional role expectations.
   e. Transfers
     Where there is a need to transfer patients, the calls are made by the ED or Surgical Registrar with follow-up calls after acceptance at St George to Aero Medical Retrieval Service (AMRS) or Newborn and paediatric Emergency Transport Service (NETS). The St George trauma hotline works well. The NETS Team take too long onsite to retrieve patients. All referrals to Royal North Shore Hospital (RNSH, spinal, burns and multitrauma) and Prince of Wales (POW, spinal) work well. Ambulance will bypass Wollongong for St George with appropriate patients.
   f. Rehabilitation
     There is a good acute pain service and acute rehabilitation team, including after-hours cover, with facilities in the LHD for managing brain injuries, hand rehabilitation as well as general rehabilitation.
   g. Outpatient clinic / s
     Follow-up orthopaedic, fracture and other subspecialty clinics will see trauma patients but there is no specific follow-up trauma clinic. The trauma CNC reviews discharge plans for all trauma team activations and patients with injury severity score (ISS) > 12.
3. **Workforce:**
   a. **Medical (0.2 full time equivalent [FTE] Trauma Director)**
      The Trauma Director is a Career Medical Officer (CMO) in anaesthetics and whilst the position is 0.5 FTE, it is remunerated at 0.2 FTE. As he has an appointment as a CMO he is able to be flexible about his commitment to trauma role requirements.
   b. **Nursing (1.0 FTE Trauma Nurse Coordinator)**
      The Trauma CNC has an LHD-wide role and no longer has time to case manage at Wollongong although he will consult with ICU Liaison Nurses regarding some patients.
   c. **Data Manager (0.5 FTE Trauma Data Manager)**
      There is a data manager for 20 hours per week but this not sufficient to complete the degree of quality assessment and analysis that is required for the trauma service. The Trauma CNC has to undertake this work.
   d. **Other**
      There is difficulty in backfilling the Trauma CNC position to cover leave but staff have been identified previously to backfill the nursing trauma position when required. Having resources for a Trauma Case Manager (part-time) at Wollongong would address the case management issues.

4. **Quality and review:**
   St George Hospital will initiate some case reviews with Wollongong. There are two trauma-specific mortality and morbidity (M&M) meetings allocated per year within the general surgery M&M program. There is a monthly Trauma Committee meeting that discusses high acuity patients, data, clinical and policy issues. District ED physicians, district orthopaedic surgeons, ICU, district neurosurgery, district general surgery, rehabilitation, ambulance, social work and the district surgery manager are involved in The Committee. The Team works well together but is frustrated by the lack of resources to undertake some quality and research activities that could lead to improvements in the service.

5. **Education and training:**
   The trauma director and CNC do an annual road trip to all smaller facilities and the CNC tries to visit each facility on a monthly basis to run a workshop and discuss cases / transfers. There are monthly ED in-service sessions that include trauma education. A burns course is run through the simulation centre and bimonthly simulations and case reviews with an ED trauma focus are undertaken with ED Registrars. The ITIM sponsored trauma evenings work well. There are four junior medical officer (JMO) education sessions per year, run in conjunction with the University Of Wollongong Graduate School of Medicine.

6. **Issues and opportunities:**
   Registrar experience is very variable with only pre-Surgical Education and Training (SET) registrars for general surgery available in hours with backup Consultant onsite. After 2400 hours there is a SET Surgical Registrar available with onsite Consultant on call. The experience of the ICU and Anaesthetics Registrars is also variable and the Year 4 / 5 Anaesthetic Registrar, who is available between 2400 – 0800 hours, may be committed in the operating theatre.
   Wollongong trauma services believe there should be minimum staffing standards for trauma services and having some capacity to provide case management from the Trauma Team at Wollongong would enhance the value of the service. The trauma CNC undertook this role before the position became an LHD-wide position. They also believe that there should be a statewide commitment to review patient outcomes following the trauma episode of care and capacity to audit and analyse data across facilities within the LHD.
Appendix C: Transport or Retrieval Missions
Medical retrieval for acutely or critically injured patients is undertaken in NSW as primary missions, secondary primary retrievals, or secondary transfers.

**Primary missions** are performed by paramedics and / or physician / paramedic teams with the injured patient being transported by road or rotary wing from the scene of their injury or via rendezvous with a pre-hospital team and subsequently to a hospital.

**Secondary primary retrievals** are performed from a non-designated trauma facility to a designated trauma facility and can sometimes include secondary transport of an unstable / under resuscitated child from an ED.

**Secondary transfers** are performed by physician / paramedic teams or physician / nurse teams, as well as nurse only retrievals and paramedic only transfers. Inter-hospital transfers occur typically from a smaller facility to one capable of providing definitive care to the critically injured patient. Transport modes include both road and air with aeromedical retrievals provided by either rotary or fixed wing aircraft.

Primary and secondary retrieval teams have specific training, equipment and transport capability to provide advanced life support and interventions for critical trauma patients.
Appendix D: Medical Retrieval Service Providers

The three main medical retrieval service providers currently providing the majority of paediatric trauma retrieval services in New South Wales (NSW) are:

1. **NSW Ambulance Service (NSWAS):**
   - The vast majority of aeromedical and medical retrieval in NSW is conducted by the NSWAS through use of its own assets or contracted services. Coordination of these services is conducted through the Aeromedical Control Centre (ACC) and is divided into two sectors.
   a. The Northern Region consists of 3 contracted services:
      - Hunter Retrieval Service (HRS) located at Newcastle provides two retrieval teams consisting of a physician / paramedic team for primary responses and a physician / nurse team for secondary transfers. The HRS conducts retrieval by helicopter, road and occasionally fixed wing. Newborn and Paediatric Emergency Transfer Services (NETS) provides backup for all paediatric secondary transfers.
      - Tamworth Rural Referral Hospital Retrieval Service provides one retrieval team consisting of a physician / paramedic team based at Tamworth airport, responding by helicopter and road (infrequent) for primary missions and secondary transfers.
      - Northern NSW Medical Retrieval Service provides a single physician / paramedic team based at the Lismore airport, responding by helicopter and road (infrequent) for primary missions and secondary transfers.
   b. The Southern Region consists of NSW Ambulance assets plus contracted services:
      - The Greater Sydney Area Helicopter Emergency medical Service (GSA HEMS) is the largest retrieval service in NSW and is directly operated by NSW Ambulance. It consists of five physician / paramedic teams located at Sydney, Wollongong and Orange. They conduct primary missions and secondary transfers by helicopter or road.
      - Snowy Hydo Southcare consists of a single physician / paramedic team servicing the Australian Capital Territory (ACT) and south eastern NSW. They conduct primary missions and secondary transfers by helicopter or road.
      - NSW Ambulance also conduct fixed wing medical retrieval using NSW Air Ambulance assets located in Sydney and Royal Flying Doctor Service assets located in Dubbo. They provide physician/nurse and nurse only medical retrieval teams for fixed wing secondary transfers.

2. **CareFlight:**
   - Provides physician / paramedic teams for primary missions only via rotary wing, operating in the Sydney metropolitan basin only.

3. **Newborn and Paediatric Emergency Transport Service (NETS):**
   - Provides physician / nurse teams for secondary missions; only via road, helicopter or fixed wing in some cases. They operate out of a main base in Sydney, with satellite bases in Canberra, Newcastle and Wagga Wagga equipped for road retrievals.
Appendix E: Paediatric Trauma Admissions by Primary Missions

Of the 256 paediatric trauma patients in the NSW Trauma Registry 2015.

- 146 were admitted directly from the scene, of which, 124 missions were via service providers and 22 admissions via private vehicle
  - 96 (66%) patients were direct admissions to a paediatric trauma service (PTS),
  - 13 (9%) patients were direct admissions to a major trauma service (MTS), and
  - 37 (25%) patients were direct admissions to a regional trauma service (RTS).

- Primary retrieval services are provided by NSW Ambulance and CareFlight
- Primary retrieval transfers for paediatric trauma patients in NSW by transport providers and mode direct from scene to PTS, MTS or RTS are shown in Figure 6.1

Figure 6.1 Number of primary missions by transport provider direct from scene to either PTS, MTS or RTS (n = 146) (Source Approved access to NSW Trauma Registry, 2015 MDS, NSW ITIM / ACI)

*Indicates one case involving road, rotary wing, and fixed wing assets to transport a patient to a PTS.

Secondary Transfers

In 2015, there were 108 paediatric patients in the NSW Trauma Registry classified as severely injured and requiring secondary transport for definitive management to a designated trauma service.

- Of the 108 patients:
  - 100 patients were transferred to a PTS (51 were transferred from a local non-trauma designated facility and 49 were transferred to a PTS from a MTS or RTS)
  - 4 patients were transferred to a MTS
  - 4 patients were transferred to a RTS from a non-trauma designated facility
• 6 patients required two transfers before arriving at definitive care
  o 4 of these patients were transferred from a non-trauma designated facility to an RTS or MTS, and then to a PTS
  o 2 of these patients were transferred from a non-trauma designated facility to a non-trauma designated facility, and then to a PTS

• Secondary transport between facilities is undertaken by:
  o Newborn and Paediatric Emergency Transport Service (NETS)
  o NSW Ambulance
  o other (includes transport that may have been undertaken by an identified provider but cannot be confirmed from the database information)

• Secondary retrieval transfers for paediatric trauma patients in NSW by transport providers and mode are shown in Figure 6.2

![Figure 6.2 Secondary transfers to PTS by transport provider and mode of transport (n = 108) (Source Approved access to NSW Trauma Registry, 2015 MDS, NSW ITIM / ACI)](image)
*Indicates patients transferred between two PTSs.
• Transfers from a local (non-trauma designated) hospital transferring a patient to a paediatric trauma hospital, by inter-hospital transfer provider and mode of transport is shown in Figure 6.3

Figure 6.3 Secondary transfers from local hospital to PTS by transport provider and mode of transport (n = 52) (Source Approved access to NSW Trauma Registry, 2015 MDS, NSW ITIM / ACI)

• Transfers from a trauma hospital (MTS / RTS / PTS) transferring a patient to a paediatric trauma hospital, by inter-hospital transfer provider and mode of transport is shown in Figure 6.4

Figure 6.4 Secondary transfers from trauma hospital to PTS by transport provider and mode of transport (n = 53) (Source Approved access to NSW Trauma Registry, 2015 MDS, NSW ITIM / ACI)
Appendix F: Trauma Site Visit Questions

These questions guided the site visit conversations but do not reflect the precise questions that were discussed at each site.

The questions and explanatory sentences were provided to those being interviewed in advance. The points under the questions are for our use and are neither exhaustive, nor all require answers from everyone. Their primary purpose was to help keep the conversation focused and obtain consistent information from those interviewed.

1. **How does the trauma model of care work in your organisation?**
   a. To develop understanding of what actually happens, who patients are managed by, how specialist teams are involved (includes paediatrics).
   b. What are the strengths /challenges of the local model and where are the opportunities for improvement.

2. **How does the secondary transfer process work?**
   a. Opportunity to clarify what may have been said in the audit response and to better understand the detail of how / who organises the transfer, which providers are used (who decides) and how any issues that arise are reviewed / addressed.

3. **How effective is your relationship with your MTS / RTS / preferred hospitals?**
   a. Opportunity to clarify what may have been said in the audit response and to better understand the detail of how / who organises the transfer, which providers are used (who decides) and how any issues that arise are reviewed / addressed but for a PTS this may include all the above.

4. **Are there any workforce issues in your facility with respect to trauma services?**
   a. Build upon audit responses but critically we need to understand whether they relate to specific professions, timeframes of issues, the reasons and strategies to address the issues (these may be system rather than local).

5. **What are the top three things you would like to see changed in trauma services as a result of this review?**
   a. Broader vision is to try to get focus on the real priorities and hence where at a strategic level there could be support for change. Example of prompts included technology advances, applications, different structures, funding models.

6. **What barriers are there to achieving these changes?**

7. **Anything else to share? Comments?**
Appendix G: Trauma Service Audit Questions

The purpose of the audit was to establish the current baseline description for resources and resourcing components of the NSW trauma services and other hospitals that receive major trauma. The audit was a part of the consultation process with trauma services that will assist in identifying gaps and areas for future development and investment. The audit was sent via email to each MTS, PTS, RTS and a modified audit to T1 preferred hospitals. Below are the core questions from the audit.

1. What is your hospital's capacity in ED to receive trauma?
   Notes: Access to a resuscitation bay, equipment and staff suitable for trauma resuscitation
   a. How many resuscitation beds?
      i. Any dedicated to trauma?
      ii. Any dedicated to paediatrics?
   b. Comments?

2. Does your hospital have 24-hour access to a helipad?
   Notes: Select from the dropdown list
   Answers: Yes – Onsite, Yes – Offsite, No
   a. If so, what is the capacity of the helipad?
      Notes: Number of helicopters that can occupy the helipad at one time

The following questions assess your institution's response during specified time periods.

3. What is the most senior level of ON SITE Emergency Department medical staff?
   Answers: Consultant, Postgraduate Fellow, Senior Registrar (SET4–5), Junior Registrar (SET1–3), Prevocational Registrar, CMO, Resident
   a. Weekday in hours (0700–1800)
   b. Weekday after hours (1800–2400)
   c. Weekday overnight (2400–0700)
   d. Weekend and public holiday in hours (0700–1800)
   e. Weekend and public holiday after hours (1800–2400)
   f. Weekend and public holiday overnight (2400–0700)
   g. Comments

4. Does your hospital have immediate access to plain film X-ray services?
   Notes: Immediate access is defined as <5 minutes
   Answers: Yes / No
   a. Weekday in hours (0700–1800)
   b. Weekday after hours (1800–2400)
   c. Weekday overnight (2400–0700)
   d. Weekend and public holiday in hours (0700–1800)
   e. Weekend and public holiday after hours (1800–2400)
   f. Weekend and public holiday overnight (2400–0700)
   g. Comments

5. Does your hospital have rapid access to angioembolisation services?
   Notes: Rapid access to angioembolisation is defined as <30 minutes. Select from dropdown list
   Answers: Yes / No
   a. Weekday in hours (0700–1800)
   b. Weekday after hours (1800–2400)
   c. Weekday overnight (2400–0700)
   d. Weekend and public holiday in hours (0700–1800)
   e. Weekend and public holiday after hours (1800–2400)
   f. Weekend and public holiday overnight (2400–0700)
   g. Comments
6. Does your hospital have rapid access to CT services?
   Notes: Rapid access to CT is defined as <30 minutes. Select from dropdown list
   Answers: Yes / No
   a. Weekday in hours (0700–1800)
   b. Weekday after hours (1800–2400)
   c. Weekday overnight (2400–0700)
   d. Weekend and public holiday in-hours (0700–1800)
   e. Weekend and public holiday after hours (1800–2400)
   f. Weekend and public holiday overnight (2400–0700)
   g. Comments

7. Does your hospital have rapid access to a dedicated emergency operating theatre and staff capable of surgical haemorrhage control?
   Notes: Rapid access to operating theatre is defined as <30 minutes
   Answers: Yes / No
   a. Weekday in hours (0700–1800)
   b. Weekday after hours (1800–2400)
   c. Weekday overnight (2400–0700)
   d. Weekend and public holiday in-hours (0700–1800)
   e. Weekend and public holiday after hours (1800–2400)
   f. Weekend and public holiday overnight (2400–0700)
   g. Comments

8. Does your hospital have an onsite blood bank service?
   Answers: Yes / No
   a. Weekday in hours (0700–1800)
   b. Weekday after hours (1800–2400)
   c. Weekday overnight (2400–0700)
   d. Weekend and public holiday in-hours (0700–1800)
   e. Weekend and public holiday after hours (1800–2400)
   f. Weekend and public holiday overnight (2400–0700)
   g. Comments

9. Does your hospital have a massive transfusion capability?
   Answers: Yes / No
   a. Weekday in hours (0700–1800)
   b. Weekday after hours (1800–2400)
   c. Weekday overnight (2400–0700)
   d. Weekend and public holiday in-hours (0700–1800)
   e. Weekend and public holiday after hours (1800–2400)
   f. Weekend and public holiday overnight (2400–0700)
   g. Comments

10. What is the most senior level of ONSITE surgical cover for trauma?
    Answers: Consultant, Postgraduate Fellow, Senior Registrar (SET4–5), Junior Registrar (SET1–3), Prevocational Registrar, Resident
    a. Weekday in hours (0700–1800)
    b. Weekday after hours (1800–2400)
    c. Weekday overnight (2400–0700)
    d. Weekend and public holiday in-hours (0700–1800)
    e. Weekend and public holiday after hours (1800–2400)
    f. Weekend and public holiday overnight (2400–0700)
    g. Comments
11. What is the level of the first-on call OFFSITE surgical cover for trauma?
   Answers: Consultant, Postgraduate Fellow, Senior Registrar (SET4–5), Junior Registrar (SET1–3), Prevocational Registrar, Resident
   a. Weekday in hours (0700–1800)
   b. Weekday after hours (1800–2400)
   c. Weekday overnight (2400–0700)
   d. Weekend and public holiday in-hours (0700–1800)
   e. Weekend and public holiday after hours (1800–2400)
   f. Weekend and public holiday overnight (2400–0700)
   g. Comments

12. Which of the following specialties are available in your institution for trauma surgical intervention?
   Notes: Select the most accurate level of response from the dropdown list for the given specialty and time period
   i. General surgery
   Answers: Onsite cover, On call cover, Not available
   a. Weekday in hours (0700–1800)
   b. Weekday after hours (1800–2400)
   c. Weekday overnight (2400–0700)
   d. Weekend and public holiday in-hours (0700–1800)
   e. Weekend and public holiday after hours (1800–2400)
   f. Weekend and public holiday overnight (2400–0700)
   g. Comments

   ii. Vascular surgery
   Answers: Onsite cover, On call cover, Not available
   a. Weekday in hours (0700–1800)
   b. Weekday after hours (1800–2400)
   c. Weekday overnight (2400–0700)
   d. Weekend and public holiday in-hours (0700–1800)
   e. Weekend and public holiday after hours (1800–2400)
   f. Weekend and public holiday overnight (2400–0700)
   g. Comments

   iii. Cardiothoracic surgery
   Answers: Onsite cover, On call cover, Not available
   a. Weekday in hours (0700–1800)
   b. Weekday after hours (1800–2400)
   c. Weekday overnight (2400–0700)
   d. Weekend and public holiday in-hours (0700–1800)
   e. Weekend and public holiday after hours (1800–2400)
   f. Weekend and public holiday overnight (2400–0700)
   g. Comments

   iv. Urology
   Answers: Onsite cover, On call cover, Not available
   a. Weekday in hours (0700–1800)
   b. Weekday after hours (1800–2400)
   c. Weekday overnight (2400–0700)
   d. Weekend and public holiday in-hours (0700–1800)
   e. Weekend and public holiday after hours (1800–2400)
   f. Weekend and public holiday overnight (2400–0700)
   g. Comments
v. Orthopaedic surgery
**Answers: Onsite cover, On call cover, Not available**
   a. Weekday in hours (0700–1800)
   b. Weekday after hours (1800–2400)
   c. Weekday overnight (2400–0700)
   d. Weekend and public holiday in-hours (0700–1800)
   e. Weekend and public holiday after hours (1800–2400)
   f. Weekend and public holiday overnight (2400–0700)
   g. Comments

vi. Neurosurgery
**Answers: Onsite cover, On call cover, Not available**
   a. Weekday in hours (0700–1800)
   b. Weekday after hours (1800–2400)
   c. Weekday overnight (2400–0700)
   d. Weekend and public holiday in-hours (0700–1800)
   e. Weekend and public holiday after hours (1800–2400)
   f. Weekend and public holiday overnight (2400–0700)
   g. Comments

vii. Ophthalmology
**Answers: Onsite cover, On call cover, Not available**
   a. Weekday in hours (0700–1800)
   b. Weekday after hours (1800–2400)
   c. Weekday overnight (2400–0700)
   d. Weekend and public holiday in-hours (0700–1800)
   e. Weekend and public holiday after hours (1800–2400)
   f. Weekend and public holiday overnight (2400–0700)
   g. Comments

viii. Maxillofacial surgery
**Answers: Onsite cover, On call cover, Not available**
   a. Weekday in hours (0700–1800)
   b. Weekday after hours (1800–2400)
   c. Weekday overnight (2400–0700)
   d. Weekend and public holiday in-hours (0700–1800)
   e. Weekend and public holiday after hours (1800–2400)
   f. Weekend and public holiday overnight (2400–0700)
   g. Comments

ix. Hand surgery
**Answers: Onsite cover, On call cover, Not available**
   a. Weekday in hours (0700–1800)
   b. Weekday after hours (1800–2400)
   c. Weekday overnight (2400–0700)
   d. Weekend and public holiday in-hours (0700–1800)
   e. Weekend and public holiday after hours (1800–2400)
   f. Weekend and public holiday overnight (2400–0700)
   g. Comments

x. Plastics
**Answers: Onsite cover, On call cover, Not available**
   a. Weekday in hours (0700–1800)
   b. Weekday after hours (1800–2400)
   c. Weekday overnight (2400–0700)
   d. Weekend and public holiday in-hours (0700–1800)
   e. Weekend and public holiday after hours (1800–2400)
   f. Weekend and public holiday overnight (2400–0700)
   g. Comments
13. What is the most senior level of ONSITE Intensive Care Services medical staff?
   Answers: Consultant, Postgraduate Fellow, Senior Registrar (SET4–5), Junior Registrar (SET1–3), Prevocational Registrar, Resident

14. Do you have the following services available for the assessment and treatment of injured children?
   Notes: Select the most accurate level of response from the dropdown list for the given specialty and time period

   i. Paediatric consultant surgeon
      Answers: Yes / No
      a. Weekday in hours (0700–1800)
      b. Weekday after hours (1800–2400)
      c. Weekday overnight (2400–0700)
      d. Weekend and public holiday in-hours (0700–1800)
      e. Weekend and public holiday after hours (1800–2400)
      f. Weekend and public holiday overnight (2400–0700)
      g. Comments

   ii. Paediatric surgical registrar
      Answers: Yes / No
      a. Weekday in hours (0700–1800)
      b. Weekday after hours (1800–2400)
      c. Weekday overnight (2400–0700)
      d. Weekend and public holiday in-hours (0700–1800)
      e. Weekend and public holiday after hours (1800–2400)
      f. Weekend and public holiday overnight (2400–0700)
      g. Comments

   iii. Anaesthetic consultant credentialed for paediatric anaesthetic
      Answers: Yes / No
      a. Weekday in hours (0700–1800)
      b. Weekday after hours (1800–2400)
      c. Weekday overnight (2400–0700)
      d. Weekend and public holiday in-hours (0700–1800)
      e. Weekend and public holiday after hours (1800–2400)
      f. Weekend and public holiday overnight (2400–0700)
      g. Comments

15. What are the criteria for trauma team activation in your facility?
    Notes: List your criteria or attach a document containing the criteria and return to ITIM with this audit

16. Is your trauma team notification system one-, two- or three-tier?
    Notes: Example - Trauma Attend and Trauma Alert

17. Who is on the trauma team notification list?
    Notes: List the roles / positions, not the names
    a. Is there any difference between in hours and out-of-hours? Describe.

18. What are the expected response times to a trauma team activation?
    a. Is there any difference between in hours and out-of-hours? Describe.

19. Who usually leads the trauma team?
    a. Is there any difference between in hours and out-of-hours? Describe.

20. Any other issues with trauma team activation / response in your facility.

21. What criteria are used as a basis for determining inter-hospital trauma transfers to a regional trauma service (RTS)?
    Notes: List your criteria or attach a document containing the criteria and return to ITIM with this audit

22. What criteria are used as a basis for determining inter-hospital trauma transfers to a paediatric major trauma service (MTS)?
    Notes: List your criteria or attach a document containing the criteria and return to ITIM with this audit

23. What criteria are used as a basis for determining inter-hospital trauma transfers to an adult major trauma service (MTS)?
    Notes: List your criteria or attach a document containing the criteria and return to ITIM with this audit
24. Is a single point of contact for trauma referral (trauma hotline) available in your LHD / network?
   a. If yes, who answers it?
   b. Is there any difference between in hours and out-of-hours? Describe.

25. What is the most common way paediatric trauma patients access your facility as primary presentations?
   Notes: Select from dropdown list
   Answers: Private vehicle, Road ambulance, Rotary wing, Fixed wing

**Non Paediatric Trauma Services only:**

26. Does your facility accept secondary transfers of paediatric trauma patients? If yes:
   Answers: Yes / No
   a. Do you have set criteria for the acceptance of paediatric trauma patients?
   b. Who are they admitted under?
   c. Are they admitted to a ward or department specifically designed and equipped for children?*

27. Does your facility have:
   i. Paediatric physiotherapy?
      Answers: Yes / No
   ii. Paediatric occupational therapy?
      Answers: Yes / No
   iii. Paediatric speech therapy?
      Answers: Yes / No
   iv. Paediatric rehabilitation?
      Answers: Yes / No

The following questions are in relation to the coordination and monitoring of trauma patients.

28. Do you have a trauma admitting service (trauma bed card)?
   Answers: Yes / No
   a. If so, how long are they typically admitted for before care is transferred to a specialty?
   b. If so, how many beds (if any) are dedicated to the trauma admitting service?

29. Does your facility have a dedicated trauma ward / unit?
   Notes: A location where all ward trauma patients go
   Answers: Yes / No

30. Does your trauma service conduct individual case management?
   Answers: Yes / No

31. How often does your trauma service conduct case management rounds?
    Notes: Include differences between mid-week and weekends
    a. Who attends the trauma round?
       Notes: Multidisciplinary? List the roles that typically conduct the trauma round
    b. Who leads the trauma rounds?
       Notes: Include differences between mid-week and weekends

32. Do you have a Hospital Trauma Committee?
    Answers: Yes / No
    a. If so, which specialties are members of the committee?

33. Do you have an Area Trauma Committee?
    Answers: Yes / No
    a. If so, which specialties are members of the committee?
    b. If so, are all hospitals in your LHD represented?

34. Does your facility conduct trauma grand rounds/case reviews/clinical audits/morbidity and mortality (M&M) meetings?
    a. If so how frequent?
    b. Do you invite external independent peer review to these meetings?

35. List the trauma clinical indicators you collect on.
    a. How often are these indicators reported on / discussed?
The following questions are in relation to trauma education.

36. Please outline which trauma courses your trauma service medical staff have completed in the last 5 years?

Notes: Indicate ratio of staff completed for each role (e.g. 3 / 4 Registrars)

i. Early Management of Severe Trauma (EMST / ATLS)
   a. Consultant
   b. Fellow
   c. Registrar

ii. Definitive Surgery for Trauma Course (DSTC)
   a. Consultant
   b. Fellow
   c. Registrar

iii. Advanced Trauma Operative Management (ATOM)
   a. Consultant
   b. Fellow
   c. Registrar

iv. Advanced Surgical Skills for Exposure in Trauma (ASSET)
   a. Consultant
   b. Fellow
   c. Registrar

v. Emergency Management of Severe Burns (EMSB)
   a. Consultant
   b. Fellow
   c. Registrar

vi. Care of the Critically Ill Surgical Patient (CCrISP)
   a. Consultant
   b. Fellow
   c. Registrar

vii. AIS Injury Coding course
    a. Consultant
    b. Fellow
    c. Registrar

ix. Major Incident Medical Management and Support (MIMMS) course
   a. Consultant
   b. Fellow
   c. Registrar

ix. Advanced Paediatric Life Support (APLS) course
   a. Consultant
   b. Fellow
   c. Registrar

x. Paediatric Life Support
   a. Consultant
   b. Fellow
   c. Registrar

xi. Other (please specify)
   a. Consultant
   b. Fellow
   c. Registrar
37. Please outline which trauma courses your trauma service nursing staff have completed in the last 5 years?
   Notes: Indicate ratio of staff completed for each role (e.g. 1 / 2 CNCs)
   i. Trauma Nursing Core Course (TNCC)
      a. CNC
      b. CNS
      c. Other
   ii. Trauma Nursing Program (TNP)
       a. CNC
       b. CNS
       c. Other
   iii. International Trauma Life Support (ITLS) formerly BTLS
       a. CNC
       b. CNS
       c. Other
   iv. Emergency Management of Severe Burns (EMSB)
       a. CNC
       b. CNS
       c. Other
   v. AIS Injury Coding course
       a. CNC
       b. CNS
       c. Other
   vi. Major Incident Medical Management and Support (MIMMS) course
       a. CNC
       b. CNS
       c. Other
   vii. Advanced Paediatric Life Support (APLS) course
       a. CNC
       b. CNS
       c. Other
   viii. Paediatric Life Support
        a. CNC
        b. CNS
        c. Other
   ix. Other (please specify)
        a. CNC
        b. CNS
        c. Other

38. Please outline which trauma courses your trauma service data management staff have completed?
   i. AIS Injury Coding course
   ii. Other (please specify)
39. What trauma education does the trauma service provide in your institution, how often and where?
   i. Department in-services
      a. Frequency
      b. Department(s)
   ii. Skills training
      a. Frequency
      b. Department(s)
   iii. Team training
      a. Frequency
      b. Department(s)
   iv. Contribute to orientation programs (such as in ED etc.)
      a. Frequency
      b. Department(s)
   v. Registrar training
      a. Frequency
      b. Department(s)
   vi. Other (please specify)
      a. Frequency
      b. Department(s)

40. What trauma education does the trauma service provide in your LHD, how often and where?
   i. Department in-services
      a. Frequency
      b. Facility(s)
      c. Department(s)
   ii. Skills training
      a. Frequency
      b. Facility(s)
      c. Department(s)
   iii. Team training
      a. Frequency
      b. Facility(s)
      c. Department(s)
   iv. Registrar training
      a. Frequency
      b. Facility(s)
      c. Department(s)
   v. Other (please specify)
      a. Frequency
      b. Facility(s)
      c. Department(s)

41. Do any of your staff do clinical rotations at RTS/MTS?
   a. If so what specialties?
MTS only

42. As an MTS, what trauma education does the trauma service provide in your networked rural LHD(s), how often and where?

i. Department in-services
   a. Frequency
   b. Facility(s)
   c. Department(s)

ii. Skills training
   a. Frequency
   b. Facility(s)
   c. Department(s)

iii. Team training
   a. Frequency
   b. Facility(s)
   c. Department(s)

iv. Registrar training
   a. Frequency
   b. Facility(s)
   c. Department(s)

v. Other (please specify)
   a. Frequency
   b. Facility(s)
   c. Department(s)
Appendix H: Trauma Survey

This survey was designed to enable staff caring for injured patients in NSW and the ACT to contribute to the current consultation being conducted about the resources and resourcing components of the NSW trauma system.

1. Organisation
2. Local health district
3. Profession
   a. Medical
   b. Nursing
   c. Allied Health
   d. Paramedical
   e. Administration / management
   f. Student
   g. Other
4. Position / role
5. Speciality / department
   a. Trauma services
   b. Emergency
   c. Intensive care / high dependency
   d. Pre-hospital
   e. Retrieval
   f. Anaesthetics
   g. Perioperative
   h. Medical ward
   i. Surgical / trauma Ward
   j. Physiotherapy
   k. Burns / plastics
   l. Spinal
   m. Rehabilitation
   n. Other
6. Optional – Please complete the following details to enable us to contact you to discuss your comments
7. Please list in priority order the top 5 issues impacting on the delivery of the quality trauma care in your organisation
8. Are there formal or informal arrangements for secondary trauma transfers in your organisation
   a. Yes – formal
   b. Yes – Informal
   c. No
   d. Unknown
   e. N/A
   f. If yes, please describe
9. Who usually organises the secondary trauma transfer in your organisation
   a. Receiving hospital
   b. Referring hospital
   c. Retrieval services
   d. Different for each case
   e. Unknown
   f. N/A
10. Please identify which of the following services are provided in your organisation (if applicable)
   a. Pharmacy services onsite
   b. Access to CT services onsite
   c. Pathology / blood services are onsite
   d. 24-hour access to onsite operating theatres is available
   e. 24-hour access to onsite interventional radiology (angiography) is available
   f. 24-hour access to onsite radiology is available
   g. Trauma Consultant is available onsite in hours
   h. Trauma Consultant is available on call after hours

11. Please describe your currently level of access to the following
    Answers: easy access, little or difficult access, no access
    a. Local trauma knowledge training
    b. Local trauma skills training
    c. Local trauma simulation training
    d. Support from higher trauma service (if applicable)
    e. Supervision and mentoring
    f. Funding for trauma education and training
    g. Trauma quality / case review and audits
    h. Documented trauma clinical practice guidelines

12. How are trauma patients identified in your organisation?
    a. Pre-hospital notification
    b. At ambulance handover
    c. By clinician in ED
    d. On ED information system (EDIS etc.)
    e. Meet criteria list
    f. Not known
    g. Other

13. How is trauma care managed (coordinated) in your organisation?
    a. By a trauma team
    b. By ED staff
    c. By ward staff
    d. Depends on admitting doctor
    e. Trauma care is not coordinated in my organisation
    f. Not known
    g. Other (please describe)

14. How do you feel the following aspects of trauma care is managed in your organisation?
    Answers: Very good, good, average, poor, very poor, N/A
    a. Resuscitation
    b. Acute clinical care (non-surgical)
    c. Acute clinical care (surgical)
    d. Case management
    e. Communication
    f. Rehabilitation
    g. Post-discharge follow-up

15. What is your vision for trauma services for the next 5 – 10 years in your area / facility

16. Any other comments
Appendix I: Paediatric Transport Providers Site Visit Questions

Site visit questions for paediatric trauma retrieval / transport providers

1. Service profile:
   a. What does the annual profile for retrieval look like (by age / number)
   b. Is there data on response time to retrieval / transport
   c. What proportion of overall work is paediatric trauma

2. Who are the team members: (intent is to understand the differences across the providers)
   a. Breakdown by position, numbers and qualifications
   b. Is paediatric expertise available in the team
   c. Flexibility / policy etc.

3. What paediatric backup services are available: (intent is to understand how the process works)
   a. What pre-dispatch planning occurs
   b. Is there paediatric telephone backup and how is it accessed
   c. Where does AMCC / MRU fit into process

4. Equipment requirements (intent is to understand any variance in capability)
   a. Are equipment resources available for all paediatric contingencies
   b. Can lack of equipment impact ability to undertake retrieval.
   c. Are there equipment standards that are required / met

5. Quality review processes (intent is to understand how processes work)
   a. How are cases reviewed
   b. Who is involved in case review (internal / external)
   c. How are cases selected
   d. How are outcomes shared
   e. What outcome measures / KPIs are in place
   f. Are these reported against
Appendix J: Paediatric Case Audit

1. ID / MRN
2. Age
3. Diagnosis
4. Outcome
5. 1st facility information
   a. Facility name
   b. Mode of arrival
   c. Provider
   d. Date of admission
   e. Time of admission
   f. Time of discharge
6. What treatment / investigations occurred at facility 1 (non-PTS). Enter time, unknown or leave blank
   a. Primary survey
   b. Secondary survey
   c. Radiology- plain films and/or CT scanning
   d. Pathology
   e. Airway management
   f. Appropriate management of potential C spine injury
   g. Management of traumatic brain injury
   h. Intubation
   i. Ventilation
   j. Provision of analgesia
   k. IV access and judicious volume and blood product resuscitation
   l. Management of lone bone fractures
   m. Management of burn injury
   n. Psychosocial support
7. 2nd facility information
   a. Facility
   b. Mode of arrival
   c. Retrieval provider
   d. Date of admission
   e. Time of admission
   f. Time of discharge
8. What treatment / investigations occurred at facility 2 (non-PTS). Enter time, unknown or leave blank
   a. Primary survey
   b. Secondary survey
   c. Radiology- plain films and/or CT scanning
   d. Pathology
   e. Airway management
   f. Appropriate management of potential C spine injury
   g. Management of traumatic brain injury
   h. Intubation
   i. Ventilation
   j. Provision of analgesia
   k. IV access and judicious volume and blood product resuscitation
   l. Management of lone bone fractures
   m. Management of burn injury
   n. Psychosocial support
9. 3rd facility information
   a. Facility
   b. Mode of arrival
   c. Retrieval provider
   d. Date of admission
   e. Time of admission
   f. Time of discharge

10. What treatment / investigations occurred at facility 3 (non-PTS). Enter time, unknown or leave blank
    a. Primary survey
    b. Secondary survey
    c. Radiology- plain films and/or CT scanning
    d. Pathology
    e. Airway management
    f. Appropriate management of potential C spine injury
    g. Management of traumatic brain injury
    h. Intubation
    i. Ventilation
    j. Provision of analgesia
    k. IV access and judicious volume and blood product resuscitation
    l. Management of lone bone fractures
    m. Management of burn injury
    n. Psychosocial support

11. Is there evidence of documented handover between services?

12. On arrival at PTS, time and date documented?
    a. Initiation of trauma call
    b. Who was included on the trauma page
    c. How was it initiated
    d. What was the trauma call criteria (single- or two-tiered)
    e. Handover from ambulance or retrieval service providers
    f. Primary survey
    g. Secondary survey
    h. Tertiary survey
    i. When were general surgical team involved
    j. What referrals were made
    k. How were referrals communicated
    l. any other investigations etc. that should be checked for

13. If care was under trauma team when was it handed over to:
    a. general surgery?
    b. neurosurgery?
    c. plastics?
    d. orthopaedics?

14. Is there evidence of handover at intersections in care?
    a. ED to ICU
    b. ICU to ward
    c. Gen Surg to subspecialty / rehab

15. Was psychosocial care was offered to the child and family during the inpatient phase?
    a. Yes / No
    b. Comments?

16. Was a Discharge Summary available?
References


NSW Institute of Trauma and Injury Management. Approved us. Sydney: NSW Agency for Clinical Innovation, 2015.


