St. Michael’s Hospital
Trauma Services
Annual Report 2006-07
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Introduction

Established with the regionalization of trauma care in 1992 in the city of Toronto, the St. Michael’s Hospital Trauma Program takes pride in serving the needs of the Greater Toronto Area and South Central Ontario. The institution plays a unique role in providing trauma care to vulnerable populations in the downtown core and has developed the medical and allied health expertise to care for the most challenging patients.

In the pages that follow, we describe the Trauma Service activities for the reporting period of April 01 2006 to March 31 2007. We have a commitment to trauma care, evident through three principal means: 1) access to care; 2) quality and accountability; and 3) regional leadership. The enthusiasm, flexibility and teamwork within the program provide opportunities to bring the care of the most severely injured patients to new heights through innovative strategies and alternative models of care.

Directors Message

We believe the trauma program at SMH provides the region with access to high quality trauma care and leadership. It pushes the envelope in all of these aspects; the rapid translation of evidence into practice; innovative models of care delivery to assure access and best practices; and leading trauma education and system development within South Central Ontario and throughout the Province.

Avery B. Nathens MD PhD FACS
Canada Research Chair in Systems of Trauma Care
Division Head General Surgery & Director of Trauma
Regional Role and Catchment Area

St. Michael’s Hospital (SMH), located in the heart of Canada’s largest metropolitan centre, has an impressive and longstanding tradition of service to its community. The institution’s status as a lead trauma hospital in the provincial trauma network reflects this tradition admirably. As a Level 1 trauma centre, our regional responsibilities include the provision of:

1. A leadership role in the provincial trauma system
2. A central role in the regional trauma system
3. Care to the majority of the multisystem trauma patients in the region (Southern GTA and South Central Ontario)
4. Complex and unique (quaternary) trauma services for the province
5. Academic leadership including trauma training and research programs

In fiscal 2006-2007, there were 614 activations of the trauma team, with 579 patients meeting criteria for major trauma, defined as an injury severity score (ISS) >15. Based on data from the Ontario Trauma Registry, this accounts for 1/3 of all patients with major trauma receiving care at a trauma centre in the region.

Patients come either directly from the scene of injury or are transferred from non-trauma centres. The local catchment area for direct SMH trauma admissions is South of St. Clair East to the 427 Highway and West to the Rouge Valley Line. Sixty three percent of 06/07 admissions were direct from the scene.
The transfer catchment area is from Barrie south to Lake Ontario, west to Oakville and east to Belleville. Thirty seven percent of trauma admissions in 06/07 were transfers from other facilities.

**Referral Source by Local Health Integrated Network (LHIN)**

![Referral Source Map]

LHIN 9 Central East  
LHIN 8 Central  
LHIN 5 Central West  
LHIN 12 North Simcoe Muskoka  
LHIN 6 Mississauga Halton  
LHIN 7 Toronto Central  
LHIN 13 North East  
LHIN 4 Hamilton Niagara Haldimand Brant  
LHIN 3 Waterloo Wellington  
LHIN 2 South West  
LHIN 11 Champlain  
LHIN 1 Erie St Clair

**How referrals are facilitated:**

Criticall is the province of Ontario’s emergency referral service facilitating the transfer of patients in need of critical care resources. Data from Criticall indicates that we have turned down only one of 300 transfers from within the region over the last year. At least one “trauma bed” is always available in the TNICU. Over the last 12 month period SMH was closed for transfers from our region for only two periods of six hours each. These closures were necessary to renovate the operating room ventilating system. In each case we continued to receive patients directly from the field with a plan to use an ambulatory operating room that had been adapted to accommodate patient needs.
SMH Patient Injury Characteristics
Injuries by body region (as a percentage of all injuries):

- Facial Injuries: 8%
- Head and Neck Injuries: 24%
- Abdominal Injuries: 12%
- Thoracic Injuries: 18%
- External Injuries: <1%
- Extremity Injuries: 20%

Serious injuries (AIS ≥ 3) by body region (as a percentage of all serious injuries):

- Facial Injuries: 3%
- Head and Neck Injuries: 30%
- Abdominal Injuries: 13%
- Thoracic Injuries: 29%
- External Injuries: <1%
- Extremity Injuries: 24%
<table>
<thead>
<tr>
<th>Trauma Team Activation Statistics (614 patients)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male/Female</td>
</tr>
<tr>
<td>73%</td>
</tr>
<tr>
<td>27%</td>
</tr>
<tr>
<td>Blunt/Penetrating</td>
</tr>
<tr>
<td>79%</td>
</tr>
<tr>
<td>21%</td>
</tr>
<tr>
<td>Transfer/Direct</td>
</tr>
<tr>
<td>63%</td>
</tr>
<tr>
<td>37%</td>
</tr>
<tr>
<td>Average Age (years)</td>
</tr>
<tr>
<td>39.6</td>
</tr>
<tr>
<td>Average Length of Stay (days)</td>
</tr>
<tr>
<td>13.9</td>
</tr>
<tr>
<td>Survival Rate</td>
</tr>
<tr>
<td>92%</td>
</tr>
</tbody>
</table>

![Cause Of Severe Injury (ISS ≥ 16)](image)

- Falls: 42%
- Motor Vehicle: 36%
- Intentional Injury: 12%
- Self Inflicted: 3%
- Pedal Cycles: 2%
- Caused by Machinery: 1%
- Other: 4%

Other: 1.7%
Natural and Environmental factors: 0.5%
Water transport: 0.3%
Railway Accidents: 0.2%
Fire: 0.2%
Cutting or Piercing: 0.2%

![Major Cause Of Injury Resulting in Death](image)

- Falls: 38%
- Motor Vehicle: 30%
- Intentional Injury: 19%
- Suicide: 8%
- Other: 5%
- Major Cause Of Injury Resulting in Death
The Trauma Care Pathway

Emergency Medical Services

Toronto Emergency Medical Services (EMS) is one of the world’s largest and most comprehensive pre-hospital emergency care systems and is the sole provider of emergency medical response for the City of Toronto. All Toronto EMS Ambulances are staffed with at least two highly skilled Paramedics trained to treat a wide variety of injuries and medical conditions, while providing supportive patient care and safe transportation to an appropriate medical facility.

Emergency Department (ED)

The St. Michael’s Hospital emergency department sees 55,000 patients annually and receives over 1,000 ambulance visits every month. The Hospital Volunteer Association rooftop helipad opened in November 2003. There is a non-stop elevator to bring trauma patients directly from the rooftop to the trauma resuscitation area. Whether the patient arrives by air or land ambulance, the patient is received in the emergency department by a skilled group of professionals. The on duty staff emergency physician assumes overall care of the trauma patient until the Trauma Team Leader arrives, in addition two emergency nurses attend to the care of the trauma patient. The dedicated trauma resuscitation area is equipped to efficiently and safely run two trauma resuscitations simultaneously. The ED trauma team consists of a trauma team leader MD (TTL) and trauma registered nurses (RN’s), a radiology technician, a registered respiratory therapist (RRT), and trauma residents from radiology, anaesthesia, orthopedics and general surgery. The 2006-07 roster of TTL’s included surgeons, emergency physicians, anaesthesiologists and intensivists.

<table>
<thead>
<tr>
<th>Post ED Disposition</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>TNICU</td>
<td>351</td>
<td>41</td>
</tr>
<tr>
<td>Inpatient Unit</td>
<td>262</td>
<td>31</td>
</tr>
<tr>
<td>Operating Room</td>
<td>150</td>
<td>18</td>
</tr>
<tr>
<td>Home</td>
<td>69</td>
<td>8</td>
</tr>
<tr>
<td>Death in ED</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>Other acute care hospital (non trauma centre)</td>
<td>4</td>
<td>.5</td>
</tr>
<tr>
<td>Other trauma centre</td>
<td>3</td>
<td>.4</td>
</tr>
</tbody>
</table>

Operating Room (OR)

There are 22 operating rooms supported by complete staff coverage at all hours, there is smooth transition of urgent cases between the ED and the OR allowing for timely response and delivery of OR services.
Diagnostic Imaging and Laboratories

There is excellent diagnostic imaging and laboratory support for the trauma program. There is a dedicated elevator in the ED for transporting trauma patients to the CT. A radiology resident is paged for all trauma team activations. Interventional radiologists are available 24/7 to assist in the immediate care of patients when required.

Trauma Neurosurgery In-Patient Care Unit

The close proximity of the 40-bed in-patient care unit assures seamless care as patients transition from the critical care area to the ward environment. The interdisciplinary health care team continues to provide expert care to patients and families from admission to discharge.

Head Injury Clinic (HIC)

The head injury clinic provides follow up care for patients that have sustained traumatic head injuries. The HIC provides innovative rehabilitation solutions addressing, as required, the behavioural, cognitive, communication, medical, physical, psychological, psychosocial and psychiatric components of traumatic brain injury.

Trauma Neurosurgery Intensive Care Unit (TNICU)

In January of 2007 the TNICU relocated from temporary facilities to a fully redesigned state of the art intensive care unit. Trauma and neurosurgery patients share this 17 bed unit and are cared for using an intensivist led closed unit model of critical care delivery. The expertise brought forth in dealing with neurosurgical patients is readily translated into high quality care of the trauma patient, many who suffer traumatic brain injuries. As a marker of quality of care, and the morale and enthusiasm of the nursing staff, the unit had a nursing turnover rate of < 3% in 06/07.

Trauma Service Model of Care

Recognizing the complex needs of patients with multi-system trauma, the model of care delivery was modified in October of 2006 when a dedicated Trauma Service was created. Polytrauma patients are admitted under the care of a trauma service physician and comprehensive trauma care is provided by a team of experts that includes: social work, physiotherapy, occupational therapy, pharmacy, dietitian, speech language pathology, bioethics and chaplaincy. The role of a dedicated Case Manager (CM) was added to the trauma service this year. The CM role has allowed for early identification of patient care needs, increased timeliness of internal referrals, and expedited transfers to rehabilitation or alternate care facilities as needed.

Trauma Service Communication

Daily morning rounds are attended by housestaff and the CM or Acute Care Nurse Practitioner (ACNP) who then update the nursing and allied health disciplines at daily bullet rounds. Once weekly, the entire trauma team, including the Trauma Service Physician, gathers for Interdisciplinary Trauma Rounds to conduct comprehensive reviews of all patients on the service.
Outreach

New Initiatives in Knowledge Translation

There are two mechanisms for bringing forth, developing and putting into practice new initiatives. The Knowledge Translation Committee is an interdisciplinary forum that ensures current best practices in trauma care through protocol development. Protocol dissemination and education occurs through the multidisciplinary Trauma Care Committee. Representation on these two committees overlaps sufficiently to allow a smooth and rapid transition from protocol development to implementation. Over the past year we have developed and implemented 8 new protocols for the care of trauma patients ensuring care standardization.

Family Centred Care

2006 saw the implementation of a trauma family pathway, a 24/7 service that ensures identified family members of newly admitted trauma patients are escorted to the TNICU and provided a brief orientation to the unit, processes and available resources.

Education

In keeping with SMH’s Culture of Discovery corporate focus, the Trauma Program includes a research and training program that is well integrated into care delivery. The Simulation Laboratory provides opportunities for residents and fellows to practice resuscitation, decision-making and team communication skills using simulated trauma scenarios. The laboratory sessions include the entire ED trauma resuscitation team including nurses and respiratory therapists to foster teamwork and support interprofessional education. Real-time faculty feedback is provided at these sessions. A weekly educational forum attended by medical students, residents and fellows rotating on general surgery services provides an opportunity for a case-based discussion of cases admitted over the prior week providing timely feedback on decision-making in the trauma bay and the operating room. A strong focus on interprofessional education (IPE) ensures that nurses and allied health services are engaged in state of the art trauma care delivery and team dynamics are optimized. A complete listing of internal education forums are listed in appendix B. Over the past year, we have had 2 trauma fellows who either have returned to their countries to set up regional trauma centres or achieved regional prominence after having benefited from both the administrative and clinical experience at SMH.
Research

The trauma program has a robust research sector. The Cara Phelan Centre for Trauma Research and the Injury Prevention Research Office conduct leading-edge research on trauma prevention, treatment and rehabilitation, with an emphasis on head injury. Additional areas of research include but are not limited to: resuscitation fluid use in blunt and penetrating trauma; understanding the role of pain in recovery following traumatic injury; the effect of stress on clinical performance in simulated scenarios; novel interventions to treat depression in patients traumatic brain injury; and treatments for acute lung injury.

Organ Donation

SMH has a full time in house Organ and Tissue Donation Coordinator from the Trillium Gift of Life Network (TGLN). In FY 2006-2007, 14 TNICU patients donated organs through the Trillium Gift of Life Program.

Performance Improvement

In January 2007 a trauma Quality Assurance coordinator was hired and a Trauma Quality Assessment and Performance Improvement (QA/PI) Plan (Appendix C) was developed as a means to evaluate our internal processes and outcomes. The service trends trauma quality indicators, enabling the program to establish baselines and benchmarks for care. In 2006-07 we reviewed compliance with protocols including C/T/L spine clearance, blood alcohol screening, screening for blunt cerebrovascular injury, and trauma team activation criteria.

Injury Prevention SMH ThinkFirst, PARTY Later… (TFPL)

TFPL is a program coordinated by SMH staff that provides young people aged 15-18 years with information about traumatic injury. The program is a synthesis of two pre-existing injury prevention programs, ThinkFirst for Teens from the ThinkFirst Foundation of Canada and the P.A.R.T.Y. program (Preventing Alcohol and Risk Related Trauma in Youth). The on-site program offers tours of the trauma resuscitation area, TNICU, and inpatient unit in addition to educational forums to disseminate information about traumatic injury and its consequences. The program is taught by an interprofessional team that includes nurses, physicians, Toronto Police Services, Mothers Against Drunk Drivers and a VIP (Voice of Injury Prevention). A VIP is an individual that has sustained a brain or spinal cord injury, the VIP provides a first hand account of their catastrophic injury and emphasizes the key injury prevention message of the program; helping young people to recognize potential injury producing situations, make prevention-oriented choices and adopt behaviours that minimize unnecessary risk.
Appendices

A Trauma Service Personnel 2006-2007
B Internal Education Forums
C Trauma Performance Improvement Plan
Appendix A Trauma Service Personnel 2006-2007

Trauma Service

Medical Director of Trauma- Dr. Avery Nathens
Assistant Medical Director of Trauma- Dr. Najma Ahmed
ATLS Director- Dr. Jameel Ali

Trauma Team Leaders (TTL) and
Trauma Surgeons/Trauma Service Physicians (TS)

Dr. Najma Ahmed TTL/TS
Dr. Robert Mustard TTL/TS
Dr. Avery Nathens TTL/TS
Dr. John Marshall TTL/TS
Dr. Bernard Lawless TTL/TS
Dr. Glen Bandiera TTL
Dr. Robert Chen TTL
Dr. Talat Chughtai TTL
Dr. Michael Dihn TTL
Dr. Jason Falk TTL
Dr. Jeremy Hall TTL
Dr. Martin Horak TTL
Dr. David MacKinnon TTL
Dr. Michael McKee TTL
Dr. Jeffery Wasserman TTL

Trauma Fellows

Dr. Khaled Al-Ahmadi
Dr. Olivier Monneuse
Dr. Adnan Al Ghamdi

Head Injury Clinic

Medical Director of Head Injury Clinic – Dr. Donna Ouchterlony

PARTY Program Coordinators

Julie Mauceri
Liz Butorac
**Trauma Office Staff**

Trauma Coordinator - Vineeta Kalia  
Data Analyst - Janet Cooperberg  
Data Analyst - Michael Waligora  
Administrative Assistant - Lorna Doberstein  
Quality Assurance Coordinator - Amanda White McFarlan

**Research Staff**

Clinical Researcher - Jane Topolovec-Vranic  
Research Coordinator - Mary Ann Pollmann  
Research Coordinator - Marlene Santos  
Research Coordinator - Yangmei Li  
Research Coordinator - Megan Mahabir  
Statistician - Wei Xiong
Appendix B Internal Education Forums

**Trauma Conference:** This is a weekly multi-disciplinary conference with faculty, nurses and house-staff and participation from general/trauma surgery, emergency medicine, orthopedics, neurosurgery and occasional visiting speakers. The rotating schedule includes a 1.5 hour workshop in the Simulation Laboratory every 12 weeks, during which residents and fellows practice resuscitation, decision-making and team communication skills with real-time faculty feedback. These simulated trauma resuscitations include the entire trauma resuscitation team in the ED including nurses and respiratory therapists to foster teamwork and support IPE.

**Trauma Case Reviews:** This weekly forum is a case-based discussion with emphasis on decision-making in the trauma bay and the operating room. The focus is on cases admitted over the prior week and provides an opportunity for timely feedback to medical students, residents and fellows rotating on general surgery services.

**City-Wide Trauma Journal Club** Four city-wide events were held in 2006-2007. The format included review of two recent papers, each presented by a resident followed by a discussion about the content, methodology, relevance and applicability of the paper. Attendees included faculty, nurse-managers, QA coordinators, fellows, residents and medical students from both Toronto-based adult trauma programs.

**TEAM – Trauma Evaluation and Management (TEAM)** part of the required curriculum for third year medical students at the University of Toronto focuses on the basics of trauma evaluation and management.

**ATLS:** Four Advanced Trauma Life Support (ATLS) courses were conducted in 2006-2007. Dr. Jameel Ali has promulgated ATLS throughout the world and was honoured as the 2007 Fraser Gurd Lecturer at the Trauma Association of Canada Annual Scientific Meeting for his achievements in this regard.

**ATOM:** The Advanced Trauma Operative Management (ATOM) Course is sited at St. Michael’s Hospital and embedded in the PGY-4 curriculum for all General Surgery residents at University of Toronto. Additionally, our instructors have trained Faculty at other Canadian sites.

**Educational Programs for Pre-hospital Care Providers:** SMH is a core site for the training of Toronto Emergency Medical Services (TEMS) land paramedics.

**Trauma Day with Students:** The Trauma Day for nursing students provides for a broad overview of trauma care. This educational opportunity culminates with a resuscitation demonstration in our high fidelity simulator. This successful program has contributed to the rating of SMH Emergency Department as the first choice for student placement.

**Trauma Nursing Core Course (TNCC):** TNCC is sponsored by the Emergency Department and offered onsite twice per year. Last year 18 new staff nurses received initial certification.
Appendix C
Trauma Performance Improvement Plan

St. Michael’s Hospital

Trauma Quality Assessment and Performance Improvement Plan

Introduction and scope

St. Michael’s Hospital (SMH) is an adult Lead Trauma Hospital (LTH) committed to providing high quality care for injured patients, from resuscitation to post-acute care. As laid out by the Ministry of Health and Long Term Care, St. Michael’s is part of a regional system designed to ensure that severely injured patients have access to an appropriate level of quality care in a timely fashion. Given that severely injured patients have little input into the choice of providers, lead trauma hospitals need to incorporate a means to evaluate their own processes and outcomes to assure an appropriate level of accountability for this responsibility.

Continuous quality improvement and patient/staff safety became a corporate direction in the St. Michael’s Hospital 2004 strategic plan and a corporate objective on the St. Michael’s Hospital Balanced Scorecard of 2006. The Corporate Balanced Scorecard was developed in order to establish indicators of clinical outcomes, quality of service and achievement of desired outcomes consistent with quality goals (best practices), our mission and values, our strategic plan and the requirements of the Canadian Council on Health Services Accreditation. This Trauma Quality Assessment and Performance Improvement (QA/PI) Plan provides a mechanism for implementing trauma performance improvement goals within the broader context of the hospital-wide quality improvement program. Further, by focusing on patients, internal processes, financial and growth indicators, this plan integrates well into the Balanced Scorecard framework.

The Trauma QA/PI Plan is closely linked to the Trauma Program Goals and Objectives document as well as the Trauma Implementation Plan. The Trauma QA/PI Plan outlines the process to assure the SMH Trauma Program meets its goals in providing high quality care with appropriate resource utilization while ensuring patient and family satisfaction. An ongoing, comprehensive, multidisciplinary, evidence based quality assessment and performance improvement process combined with feedback and process modification will allow for the monitoring and evaluation of the provision of trauma care. Opportunities for improvement in patient care processes and subsequent strategies to leverage these opportunities will be facilitated through this process improving the overall quality of the Trauma Program.

One product of this process will be a Trauma Quality Assessment and Performance Improvement Report (TQAR). TQAR will follow trends and establish benchmarks and thus provide a baseline and provide goals to achieve best practices and optimize patient outcome and satisfaction in the most cost-effective manner. The report will include aspects of trauma centre processes that improve or impede quality; generate data associated with major quality initiatives; and where necessary, educate the public,
media, and other stakeholders to assure accountability with due regard for confidentiality. The TQAR will also track current approved policies and procedures directly pertinent to the evaluation and management of the major trauma patient so that a quick reference to existing policies can be made.

**Mandate**

The Trauma QA/PI Plan applies to trauma care across the continuum from pre-hospital care to post acute care and pertains to the full scope of trauma service including resuscitation and evaluation, operative and diagnostic interventions, intensive care, short-term acute care, follow up and ultimately re-integration back into the community.

**Goals**

The goals of the Trauma QA/PI Plan are:

1. To provide a mechanism for peer review, oversight, and evaluation of all aspects of adult trauma care.
2. To utilize outcome measures to assist in ensuring the provision of quality care and service consistent with a LTH to trauma patients, their families, referring providers and medical centres in the region.
3. To design, measure, assess and improve patient care processes and organizational functions of trauma care within the system.
4. To evaluate and improve satisfaction of patients, families and staff by measuring the quality of important functions of trauma care at St. Michael’s Hospital.
5. To provide a forum that encourages disclosure of errors or near misses and opportunities for improvement that is protected from legal disclosure, but made available to all health care providers, with the goal of system improvement.

**Objectives**

1. To integrate and coordinate all trauma quality assessment and performance improvement activities under the direction of the Trauma/Neurosurgery Program Council as they pertain to care of the severely injured patient.
2. To develop standards of quality of care for adult trauma patients.
3. To identify variations in care.
4. To provide a process to measure compliance with standards and identify barriers or gaps.
5. To evaluate specific cases or problems identified in the monitoring process by peer review at scheduled multidisciplinary trauma conferences held every second month.
6. To use comparative data to benchmark performance of adult trauma care with that of other trauma centres and programs.
7. To utilize results from internal and external data collection measurement activities (e.g. audit filters) to study and improve processes and outcomes.
8. To provide a forum to develop processes for correcting problems or deficiencies.
9. To analyze and evaluate the effect of quality improvement initiatives to address deficiencies.
10. To identify, and evaluate transitional and long-term outcomes of trauma care.
11. To identify, evaluate and address regional trauma quality assurance issues.

**Accountability and Integration**

The TQAR will be made available for review quarterly at Trauma Program Council, the Trauma and Neurosurgery Safety and Quality Clinical Care Committee and the Quality Committee of the Board of Directors.

The Joint Perioperative Services Critical Care Patient Safety Committee and the TNS Knowledge Translation Committee offer additional forums for examining quality assurance activities. As the Trauma QA/PI Plan identifies policy and procedure initiatives, input of these committees and others as appropriate may be solicited.

**Process and Outcomes Improvement Methods**

Clinical and process indicators for each aspect of care derived from either the trauma registry or requiring primary data collection are included in Appendix A. Rates are reviewed annually and a selection of indicators are identified for 100% case review (sentinel indicators) or agreed upon filtering criteria as determined through input from either the TNS Program Council or the Trauma Care Committee. Indicators will be re-evaluated for utility on an annual basis and appropriate modifications, addition, or deletions will be carried out at the beginning of each fiscal year.

Indicators will be reviewed in the most appropriate forum to address the appropriate stakeholders including TNS Program Council, Trauma Care Committee, and TNS Knowledge Translation Committee. Chart review required for sentinel events will be assigned by the Medical Director of Trauma.

Where necessary, the Medical Director of Trauma will bring quality concerns to other stakeholders including the Emergency Department Medical Director, Division Heads, Clinical Leader Managers, the Chair of the Medical Advisory Committee, or the Chair of the Quality of Care Committee. These concerns will be addressed in writing. A written response from the appropriate stakeholder will be requested to assure loop closure. Modes of corrective action which might be implemented include protocol, clinical pathway or guideline implementation or changes, staff education, peer review, enhanced resources, facilities or communications, process improvement teams, counseling, changes in privileges/credentialing, intensive reviews or root cause analyses.

**Documentation**

The Trauma QA Coordinator will keep a record of the TQAR, chart reviews for sentinel events as listed in Appendix A; concerns raised, and any action taken. Rate based indicators will be tracked on a quarterly basis by the Trauma Coordinator. Records of concerns raised and action taken based on these indicators will be recorded by the Trauma QA Coordinator. These records will be maintained in accordance with hospital and legislative requirements.

The information provided in the TQAR will be safeguarded in accordance with the *Personal Health Information Protection Act, 2004* (PHIPA). "Quality of care information", as defined in QCIPA, will be maintained in accordance with the *Quality of Care Information Protection Act, 2004* (QCIPA).
The cohort of interest for these indicators are all TTL activations. This cohort represents the denominator for all rate based events unless otherwise specified.

### Programmatic
- TTL activations per quarter
- Number of patients with ISS >15 per quarter
- Number of patients with ISS \(\geq 12\) per quarter
- Transferred patients (rate-based) per quarter
- Penetrating injuries (rate-based) per quarter

### Prehospital
- No EMS report in chart (rate-based)
- Scene time available (rate-based)
- Ambulance scene time >20 minutes (rate based)
- Surgical airway (needle or open) performed in field or emergency dept. (sentinel)
- Time from arrival at referring hospital ED to transfer >6 hours (sentinel)

### Emergency Department
- Difficult intubation, intubated or intubation attempted in field and ED (sentinel)
- Altered consciousness (GCS < 13), with head injury (AIS >2) and no CT scan within 1 hr (rate-based)
- ED stay greater than 30 min and SBP < 90 mmHg in ED, and discharged to OR (rate-based)
- ED visit or admission within 72 hours of initial trauma team activation (rate-based)
- Trauma Team not activated prior to arrival for patient that meets activation criteria (sentinel)
- Delay in attending/service response to trauma team activation (>30 min) (rate-based)
- Initial time in resuscitation bay >1 hr (rate-based)
- Spine clearance plan documented on TTL sheet (rate-based)
- ED disposition is ward (rate-based)
- Time from ED arrival to OR, ICU bed or ward bed >2 hrs (exclusive of ED deaths, rate-based)
- Trauma team activation with ISS <9 (rate-based)
- No BAL screen (rate-based)
- Comatose trauma patient (GCS \(\leq 8\)) leaving emergency department before mechanical airway is established (rate-based)
- Absence of hourly chart documentation for any trauma patient, including sequential neurological documentation of trauma patient with a diagnosis of skull
fractures, intracranial injury, or spinal cord injury on ED record beginning with arrival in ED, including time spent in radiology, up to admission to the OR or ICU, death or transfer to another hospital (rate-based)

Inpatient

- Admitted to non-surgical service with ISS ≥12 (rate-based)
- Decubitus ulcer developed during hospital stay (rate-based)
- Deep vein thrombosis developed during hospital stay (rate-based)
- Pulmonary embolism occurred during hospital stay (sentinel)
- Required laparotomy not done within 2 hrs (sentinel)
- GSW to abdomen treated non-surgically exclusive of ED deaths (rate-based)
- Femoral fracture treated by non-fixation exclusive of deaths within 24 hrs of admission (sentinel)
- Open long bone fracture (femur, tibia-fibula, humerus, ulna, radius) without initial operation within 8 hrs exclusive of deaths within 24 hrs of admission (sentinel)
- VAP (rate-based)
- Bacteremia (rate-based)
- Unplanned return to the operating room (sentinel)
- In-hospital mortality exclusive of DOA (rate-based)
- ED-mortality exclusive of DOA (rate-based as a proportion of all deaths)
- Dead on arrival (sentinel)
- Death with expected probability of survival >50% (sentinel)
- Unplanned re-admission within 30 days of discharge (rate-based)
- LOS>30 days and ultimate hospital disposition is death (rate-based)
- FIM recorded at discharge (rate-based)
- Organ donation among those meeting brain death criteria (rate-based)
- Unplanned return to ICU after discharge (rate-based)
- CCRT activation (rate-based)
- Surgical site infections (rate-based)
- Cardiac arrest (unexpected) requiring CPR or electrical cardioversion (rate-based)

Protocol adherence

- Cervical spine clearance within 48 hrs of admission (among those with no C-spine injuries)
- CT angiogram among those meeting criteria for BCVI screening (rate-based)

Resource utilization

- Cost per weighted case
- Cost per patient day in ICU and ward
- Mean LOS
- BELOS (rate-based)
- ALC days (rate-based)
• ALC days >7 (rate-based)
• FVIIa use outside of clinical trial (sentinel)
• Initial ICU admission outside of the TNICU (rate-based)

Patient Satisfaction

• Information, education and feedback
• Physical comfort
• Emotional support and involvement of family and friends
• Continuity and transition
• Respect for patient preferences
• Coordination of care
• FIM recorded at six months (rate-based)

Protocols and Procedures

1. Admission and discharge policy, trauma and neurosurgery - ICU (01/07/98)
2. Screening for blunt cerebrovascular injury (15/12/06)
3. Criteria for trauma team activation (16/01/07)
5. Clinical Practice Guidelines (CPG) for the management of TBI currently under development
6. Clinical Practice Guidelines (CPG) for prophylaxis of venous thromboembolism in trauma (01/10/02 Revised: 01/10/05) currently under review
7. Cervical/Thoracic/Lumbar Spine clearing guidelines (01/10/02 Revised: 01/10/06)
8. CPG for Penetrating Torso Injuries currently under development