REGIONAL TRAUMA NETWORK DEVELOPMENT

A guide for Ontario hospitals

Critical Care Services Ontario | May 2016

CCSO Critical Care Services Ontario

This document is a product of
Critical Care Services Ontario (CCSO).

The *Regional Trauma Network Development Guide* outlines steps to develop regional trauma networks (RTNs) in Ontario. The approach is based on identified best practices and the experiences of pilot RTNs in the Champlain and Central South Ontario regions.

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1. HOW TO USE THIS DOCUMENT

This document was compiled by Critical Care Services Ontario. It synthesizes numerous sources of information on trauma systems and, in particular, regional trauma network models, into a user-friendly easy-reference format. It should be used as a guide to develop regional trauma networks in Ontario and to begin to establish a quality-assurance process for trauma-care improvement locally, regionally, and provincially.

The trauma-system model is based upon public health models of trauma systems operating in Europe, North America, and Australia. These have proven efficacy in reducing death and disability from severe injury.

1.1 Purpose

The aim of this document is to provide information on trauma and trauma systems, and present a practical and evidence-based model suitable for developing regional trauma networks in Ontario. Its target audience includes, but is not limited to, hospital administrators, medical directors, administrative leads and trauma coordinators at Lead Trauma Hospitals and referring hospitals, transport providers and CritiCall Ontario.

1.2 Structure

This document contains five sections, which users may read sequentially or as stand-alone sections.

1. How to use this document (this section)	
2. Background	Background information on the Ontario trauma care system and the evidence for developing regional trauma networks
3. Goals and performance measurement	The objectives of an inclusive trauma system and of regional trauma networks, and data and metrics to gauge progress
4. Stakeholders	Stakeholders and how they can contribute to the development of a regional trauma network
5. Implementation guide	Recommended activities for phased development of regional trauma networks
References	A selection of peer-reviewed journal articles and other publications
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2. ONTARIO TRAUMA SYSTEM BACKGROUND

2.1 Critical Care Services Ontario

Critical Care Services Ontario (CCSO) is the managing body responsible for the overall program implementation of initiatives of the Critical Care Strategy and the Ontario Critical Care Plan 2015-2018. Originally established as the Critical Care Secretariat in June 2005, its work is the result of an on-going collaboration between critical care health care providers, hospital administrators, officials from the Ministry of Health and Long-Term Care, Emergency Medical Services, Local Health Integration Networks and other health system partners.

CCSO's mission is to lead the overall planning, implementation and evaluation of critical care services (including trauma, burns, neurosurgery, pediatric critical care) for the Province of Ontario through the vision of an accessible, integrated system of evidenced-based critical care services for Ontarians.

2.2 Ontario Trauma Advisory Committee

Expertise from stakeholder group representatives is crucial to the success of CCSO's initiatives. The Ontario Trauma Advisory Committee (OTAC) endeavors to guide a world-class trauma system, focusing on reducing death and disability related to injury. OTAC works collaboratively and transparently to ensure a quality-based trauma system that decreases the incidence and severity of trauma; ensures optimal, equitable, accessible, patient-centred care for Ontarians sustaining injuries; implements quality and performance improvement activities; ensures that designated facilities have appropriate resources to meet the needs of the injured; and provides appropriate rehabilitation and support services.

To support the initiatives of the OTAC, several sub-committees have been established to provide guidance and focus to various aspects of the trauma program. The OTAC Performance Improvement Sub-Committee provides a forum to identify a standardized set of performance metrics for all Lead Trauma Hospitals, regional trauma systems and a province-wide trauma system. In March 2014, the Performance Improvement Sub-Committee launched a *Performance Improvement Indicator Report* with key metrics in the areas of access, quality and system integration. Quarterly and annual performance results reports are sent to key stakeholders at all levels monitor and improve performance across the system.

2.3 Toward an inclusive trauma system

It is essential to deliver the 'right care' at the 'right time' in the 'right setting' by the 'right healthcare provider' in order to achieve the best possible health outcomes for injured patients. An inclusive trauma system leverages the capacity and capability among all providers that may be involved in the care of an injured patient. In Ontario, we can only achieve an inclusive trauma system when all parts of the trauma care system are organized, connected, and working collaboratively with other healthcare partners to develop a fully integrated system.

This approach aligns with priorities in Ontario's *Patients First: Action Plan for Health Care*, especially in terms of improving access (providing patients with faster access to the right care), and protecting our universal health care system (making decisions based on value and quality, to sustain the system for generations to come) by, for example, implementing more innovative approaches based on evidence. With repatriation initiatives associated with RTNs, there is also alignment to the principle of connecting services (delivering better coordinated and integrated care in the community, closer to home).

It is vital that an inclusive trauma system consider overarching strategies to assist in the implementation and sustainability of key priorities. A governance model that is comprehensive and transparent should clearly outline accountabilities for all Lead Trauma Hospitals and referring hospitals with agreed-upon best practices and principles.

Figure 1 below summarizes the structure and objectives of an inclusive trauma system in Ontario.

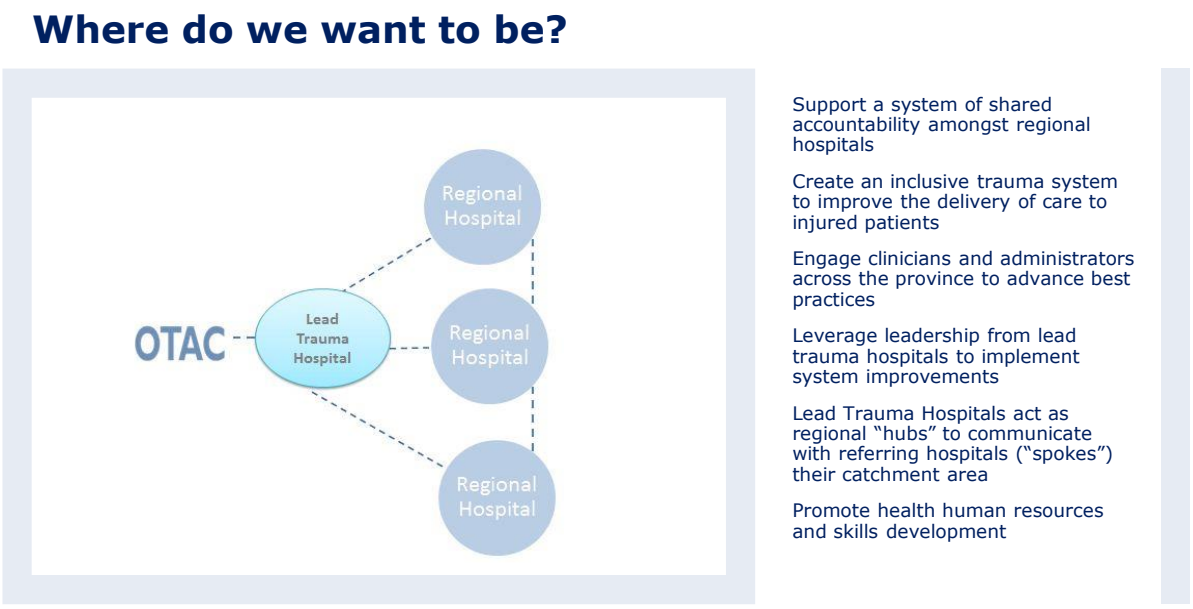


Figure 1: Toward an inclusive trauma system in Ontario
[Source: Lawless (2015), presentation at Trauma Association of Canada conference]

2.4 Lead Trauma Hospitals in Ontario

In the early 1990s, the Ministry of Health and Long Term Care designated eleven (11) hospitals as Lead Trauma Hospitals (LTHs) to provide coordinated trauma services across the province. Regional trauma networks (RTNs) will be established based on Ontario's LTH sites. These hospitals, listed below, are located across Ontario and serve to provide leadership and coordinated specialized care to moderately and severely injured patients.

Lead Trauma Hospital	Location	LHIN
1. Windsor Regional Hospital	Windsor	Erie St. Clair (LHIN 1)
2. London Health Sciences Centre	London	South West (LHIN 2)
3. Hamilton Health Sciences *(RTN pilot site)*	Hamilton	Hamilton Niagara Haldimand Brant (LHIN 4)
4. The Hospital for Sick Children	Toronto	Toronto Central (LHIN 7)
5. St. Michael's Hospital	Toronto	Toronto Central (LHIN 7)
6. Sunnybrook Health Sciences Centre	Toronto	Toronto Central (LHIN 7)
7. Kingston General Hospital	Kingston	South East (LHIN 10)
8. Children's Hospital of Eastern Ontario	Ottawa	Champlain (LHIN 11)
9. The Ottawa Hospital *(RTN pilot site)*	Ottawa	Champlain (LHIN 11)
10. Health Sciences North	Sudbury	North East (LHIN 13)
11. Thunder Bay Regional Health Sciences Centre	Thunder Bay	North West (LHIN 14)

Table 1: Lead Trauma Hospitals in Ontario

2.5 RTN pilots in Ontario

In 2013, as part of its regional system development work to improve system integration, CCSO in collaboration with OTAC, established an advisory committee to develop a framework of key components for implementing a RTN. From this work, CCSO collaborated with 2 LTHs to implement two pilot RTNs: Champlain and Central South. The Champlain RTN covers LHIN 1 (Champlain); the Central South RTN encompasses LHIN 3 (Waterloo Wellington), LHIN 4 (Hamilton Niagara Haldimand Brant), and the Halton portion of LHIN 6 (Mississauga Halton).

These networks use a hub-and-spoke model with the LTHs working in partnership with their referring hospitals and transport providers to improve patient access to an appropriate level of care. The aim of the RTNs is to assist in improving communication, standardizing referral and repatriation practices, and improving trauma service delivery throughout the province.

The timeline in Figure 2 below summarizes the activities undertaken over the past two and a half years leading up to and including piloting an RTN model in Ontario:

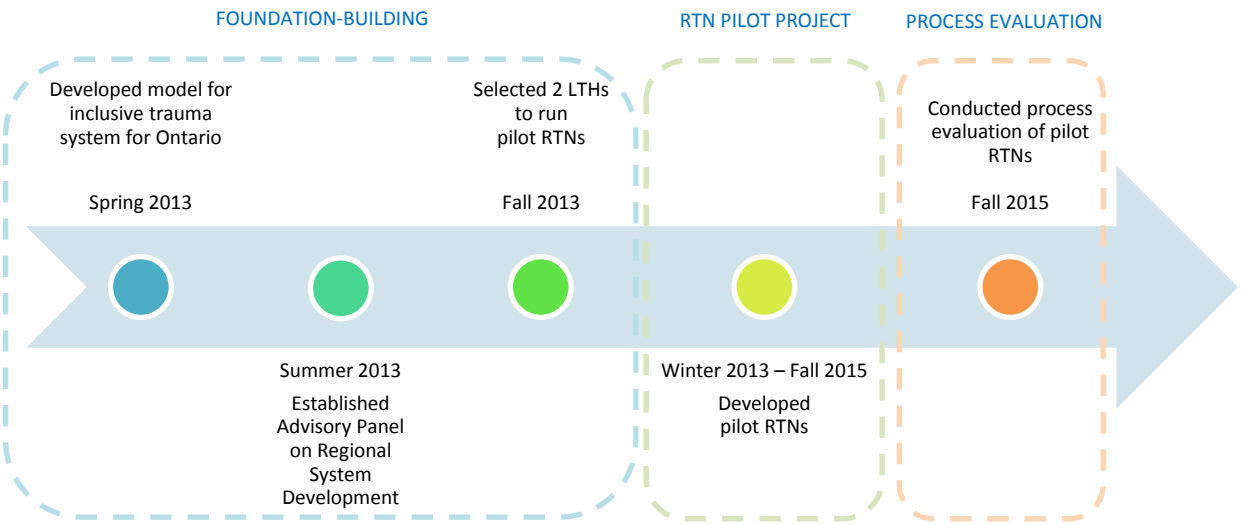


Figure 2: Ontario regional trauma network pilot initiative

2.5.1 Bespoke approach

Each pilot RTN used the framework developed by the Advisory Committee to guide its implementation efforts. As implementation progressed, key areas of focus for each RTN emerged. The framework was flexible to allow each RTN to focus its work on the areas of priority in its region. In both pilots, the composition of the RTN reflected natural referral patterns and partnerships. The local circumstances, such as the geography and proximity of referring hospitals to LTH and the complexity of existing LHIN relationships and cross-LHIN collaboration, determined whether the pilot RTN membership was comprehensive or selective. One of the most important differences between the two pilots was that The Ottawa Hospital catchment area encompasses one LHIN whereas the Hamilton Health Sciences catchment area encompasses three LHINs. For a detailed comparison of the experiences of the two pilot RTNs, see the slide deck '*A Tale of Two Pilots: Ottawa and Hamilton*' which was presented at 2015 annual conference of the Trauma Association of Canada. The slide deck is available at: https://www.criticalcareontario.ca/EN/Library/Pages/default.aspx.

2.5.2 Process evaluation

In October 2015, CCSO conducted a process evaluation of the experiences of the two pilot RTNs and drew the following findings:

1. The implementation plan should be simple and clear to all stakeholders. It is crucial to have widespread consensus about the plan's value among all stakeholders.

2. The chances of success are likely to be increased by strong leadership and active engagement of a broad range of implementers.
3. Membership should be based on referral patterns between and among the hospitals. For the RTN team to be effective, team representation should include both an administrator and a clinical representative from each hospital.
4. The implementation plan should be flexible and adaptable to the local situation. The plan should be open to include both opportunities to learn through action and a way to share lessons of experience in improving the ongoing implementation of the program. A phased scaling-up of the program provides opportunities to learn.

Based on these findings, CCSO will guide the establishment of RTNs in the remainder of Ontario throughout the 2016-2017 fiscal year.

3. GOALS

3.1 Regional trauma network objectives

The overall goal of a regional trauma system is to reduce death and disability following major trauma, which encompasses the following supplemental goals (Kaufmann, 2015):

- Decrease the incidence and severity of trauma
- Ensure optimal, equitable, and accessible care for all persons sustaining trauma
- Prevent unnecessary deaths and disabilities from trauma
- Contain costs while enhancing efficiency
- Implement performance improvement of trauma care throughout the system (benchmarking)
- Ensure awareness of all facilities with appropriate resources to meet the needs of the injured and that all facilities participate commensurate with their capabilities

3.2 Performance indicators

Data collection and reporting of performance indicators can assess whether the trauma system and its component sub-systems are achieving their goals. Performance monitoring can also identify areas for improvement.

3.2.1 Types of indicators

Indicators can span the patient care continuum, from injury prevention to critical care to recovery, and can be monitored at various levels of the trauma system, as shown in Figure 3 below.

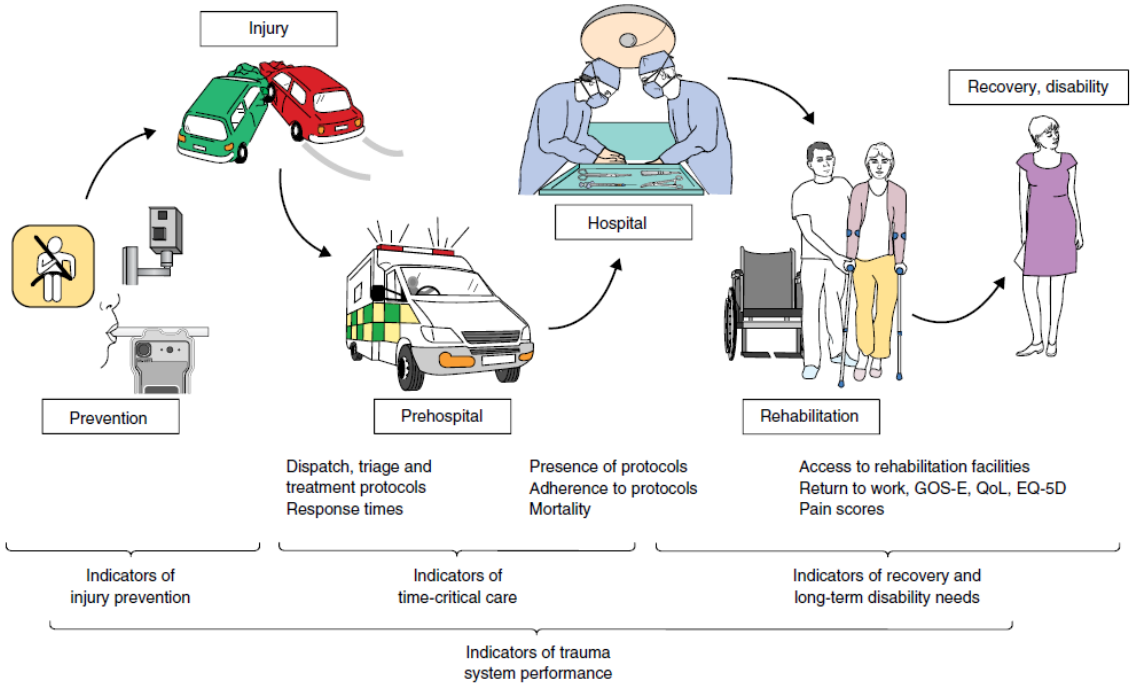


Figure 3: Types of indicators in a trauma system
[Source: Gruen *et al.* (2011)]

Across the phases of care along the continuum, indicators can assess structure, process, and outcome measures, as shown in the model in Table 2 below.

Phase of care	Structure	Process	Outcome
Prehospital	Dispatch criteria Training Prehospital triage	Total prehospital time with component parts	Prehospital deaths Long-term outcomes
Hospital	Massive transfusion protocol Head injury protocol	Appropriate activation of massive transfusion protocol Proportion of eligible patients receiving protocol-based management	Deaths due to haemorrhagic shock Risk-adjusted mortality for head injury GOS-E at 6 and 12 months after injury
Posthospital	Rehabilitation facility in community Standardized rehabilitation protocols	Time to rehabilitation consultations	Return to work, adjusted for severity
Prevention	Injury prevention activities	Proportion of eligible patients receiving alcohol screening and brief intervention	Proportion of patients returning with new alcohol- or drug-related injuries

Table 2: Conceptual model of performance measures in trauma care
[Source: Gruen *et al.* (2011)]

3.2.2 Proposed indicators for Ontario

Within the context of Ontario's trauma system, a comprehensive range of RTN effectiveness measures for trauma response, acute care, and post-trauma recovery care has been identified (Caro, 1997). However, the accessibility of data across these sectors can sometimes be a limiting factor to developing a complete description of the current state of access to trauma care in Ontario. In the interim, the following three (3) indicators are preliminary measures that can be used to reflect RTN effectiveness in Ontario:

(i) Referring hospital time-to-transfer

This performance indicator tracks the time between when a patient arrives at a referring hospital and when the patient departs that hospital to be transferred to a LTH, as illustrated in Figure 4 below. In Ontario, this indicator is currently included as part of the provincial trauma scorecard. The Central South pilot RTN has been examining the use of this indicator as an RTN effectiveness measure.

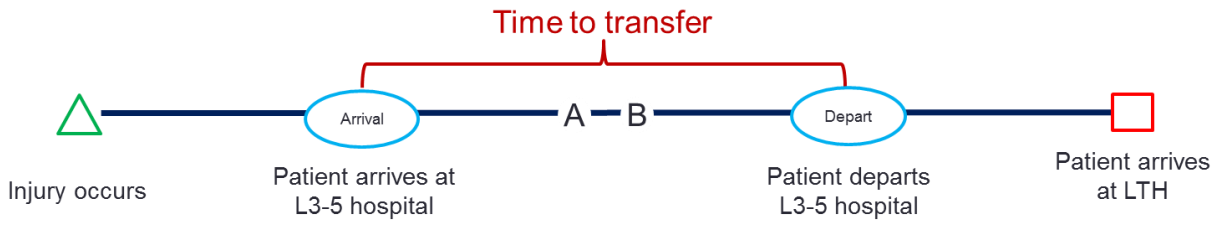


Figure 4: Referring hospital time-to-transfer performance indicator

(ii) Patient arrival to trauma team leader response time to bedside

The 'patient arrival to trauma team leader response time to bedside' indicator measures the time between when a patient arrives at an LTH and the arrival of the Trauma Team Leader to the patient's bedside. This indicator is also currently included as part of the Ontario trauma scorecard. The Performance Improvement sub-committee of OTAC reviewed this indicator in 2015-2016 to confirm current data collection methodology and to update the user guide to improve clarity.

(iii) Risk-adjusted mortality rate

The risk-adjusted mortality rate compares an LTH's in-patient mortality rate to the expected mortality rate, given specified risk factors in the patient population. A working group reporting to the Performance Improvement sub-committee of OTAC developed the methodology and definition for this indicator in 2015-2016 to report differences in mortality rates across trauma centres in Ontario.

Trauma Distinction program

Hospitals interested in attaining Trauma Distinction status should also consider the Accreditation Canada indicators, which are described in detail in the *Trauma Distinction Information Package*, available at: http://accreditation.ca/sites/default/files/trauma-distinction-info-en.pdf.

The program specifies performance thresholds for seven (7) core performance indicators:

1. Field triage
2. Wait time for rehabilitation
3. Trauma team activation
4. Emergency department length of stay
5. Length of stay in acute care
6. Complications during hospital stay
7. Trauma mortality

The program also lists nine (9) additional optional indicators, of which two (2) are required to be collected and submitted to attain and maintain Trauma Distinction status.

4. STAKEHOLDERS

There are several stakeholders in a regional trauma network. The following table summarizes the stakeholder organizations and identifies their respective contributions.

Stakeholder organization	Contribution
LTH	Implementation leadership; governance; decision-making; subject matter expertise; ensuring alignment along patient care continuum in an inclusive trauma system
Referring hospitals	Governance; decision-making; subject matter expertise; implementation
CritiCall Ontario	Subject matter expertise, ensuring alignment in an inclusive trauma system; tracking system data
EMS	Subject matter expertise; ensuring alignment in an inclusive trauma system
Ornge	Subject matter expertise; ensuring alignment in an inclusive trauma system
Rehabilitation	Subject matter expertise; ensuring alignment in an inclusive trauma system
Paediatric trauma care	Subject matter expertise; ensuring alignment in an inclusive trauma system
LHIN	Endorsement, governance, alignment within and across LHINs
OTAC	System-level strategy and direction; link to provincial table
CCSO	Central coordinating body, facilitation, research, policy guidance, support
MOHLTC	Strategic direction and provincial priorities; legislation, regulations, standards, policies, and directives; planning and guiding resources
Patients and families	Patient and caregiver voice

Figure 5 below depicts the stakeholder organizations within the RTN, as well as those that influence the RTN from a system-level perspective.

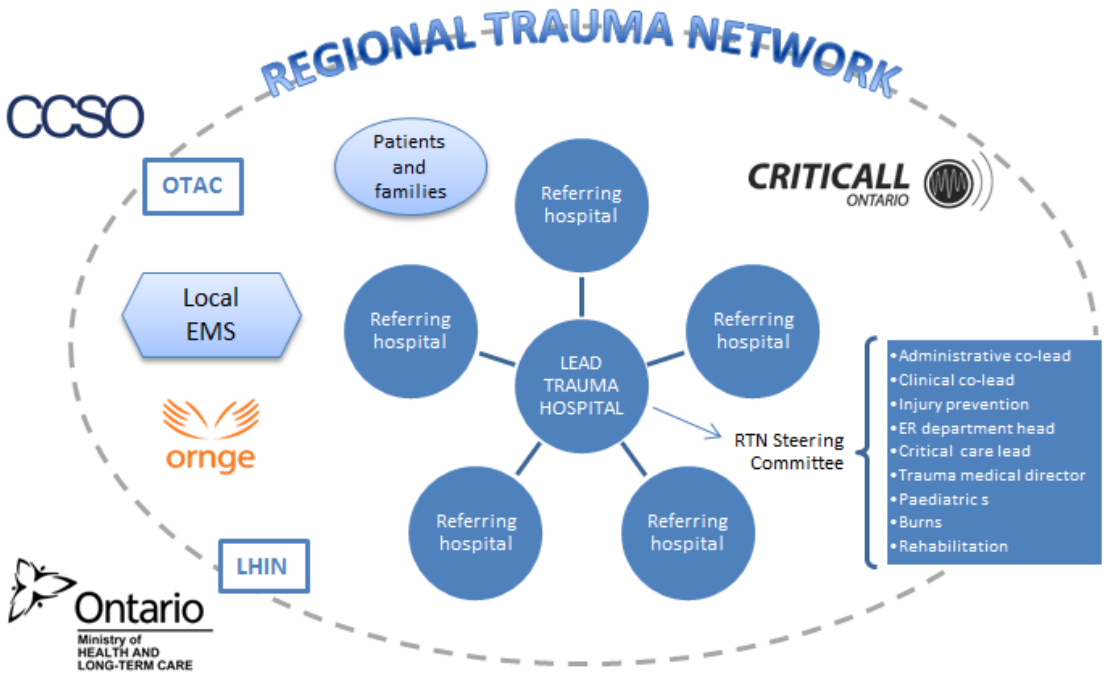


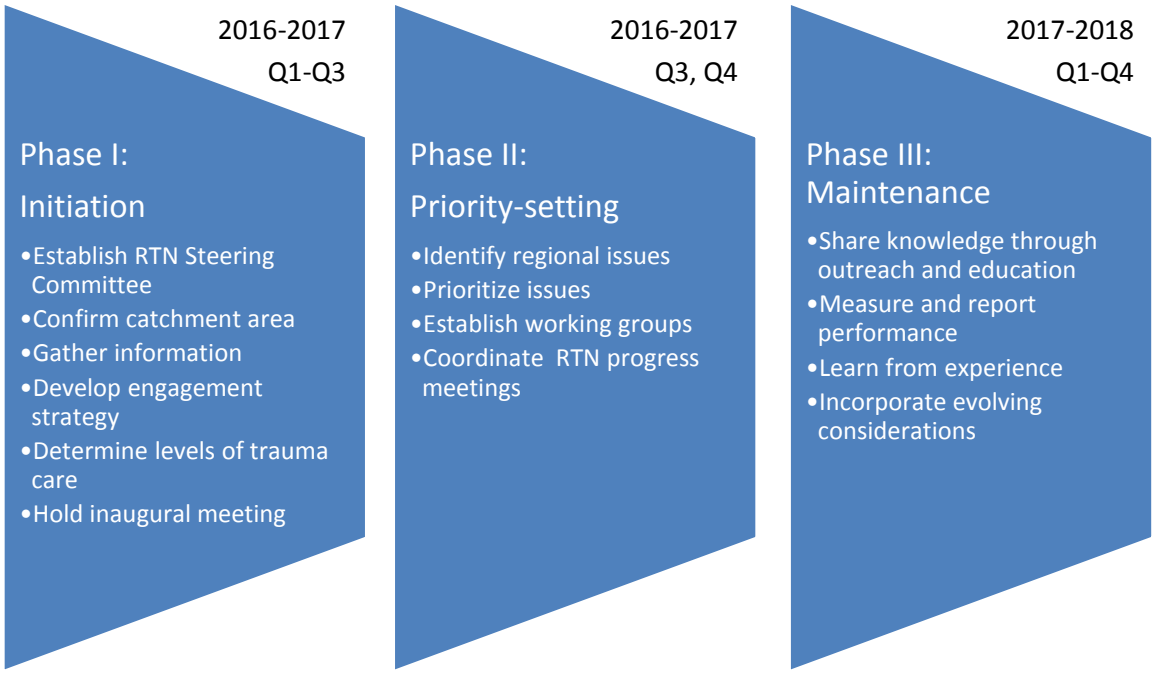
Figure 5: Regional trauma network stakeholders

5. IMPLEMENTATION GUIDE

A consistent theme in the RTN pilots' experience and the literature review is 'one size does *not* fit all' and, therefore, it is crucial to be cognizant of local circumstances and to determine local priorities. This was also a key finding of the process evaluation of the pilot RTNs. Therefore, instead of stipulating prescriptive implementation rules, this document provides high-level implementation guidelines that RTNs could tailor to their specific needs.

A good example of detailed implementation considerations can be found in a 2010 report by the United Kingdom's National Health Service (NHS) Clinical Advisory Groups, available at: https://www.criticalcareontario.ca/EN/Toolbox/Pages/Toolkits.aspx.

We recommend the following phased approach, to provide opportunities for learning and growth.



5.1 Phase I: Initiation

The first phase in developing an RTN is the initiation phase, in which there are six (6) main activities, as described below. This phase should last approximately six to nine months. For the development of new RTNs in Ontario, we expect this period to run from April to December 2016.

1. Establish RTN Steering Committee

As a starting point, each LTH should identify representatives from varying areas of expertise to form a committee to lead the development of the RTN in its catchment area. The composition of such a committee may vary across regions depending on local circumstances; however, it is recommended that an RTN Steering Committee should consist of:

- Two co-leads, as follows:
    - ***Administrative co-lead:***
      This person should be a senior executive at the LTH, with the authority to make, or effectively facilitate, decisions for the hospital
      (e.g., President and CEO; or Senior VP, Clinical Programs; or Senior VP, Medical Affairs, Quality and Performance);
    - ***Clinical co-lead:***
      This person should have an in-depth understanding of the trauma operations at the LTH, from a clinical perspective
      (e.g., Trauma Medical Director);

AND

- Members from among the following suggested roles, or other roles as appropriate for the LTH:
    - Trauma coordinator
    - Trauma services director
    - Injury prevention representative
    - Burns program representative
    - Paediatric surgery program representative
    - Rehabilitation program representative
    - Clinical Director, Surgery Program
    - Trauma surgeon
    - Critical care lead LHIN
    - ED LHIN representative
    - Emergency department lead
    - Emergency department physician
    - Advanced practice nurse
    - Nurse manager
    - Resident
    - Patients and families

The members of your RTN Steering Committee would be responsible for leading the development of the RTN within your catchment area and guiding system improvement initiatives in partnership with your referring hospitals and transport providers to improve patient access to an appropriate level of care.

2. Confirm catchment area

CCSO has worked with CritiCall Ontario to review referral patterns and propose catchment areas, as depicted in the Ontario RTNs map in Appendix B. CCSO will provide each LTH with its proposed catchment area, based on current referral patterns. One of the key findings from the process evaluation of the pilot RTNs was that membership should be based on referral patterns.

The LTHs should review their proposed catchment areas and confirm that it accurately captures its referring hospitals. To facilitate this process, LTHs may consult CritiCall Ontario's Provincial Hospital Resource System (PHRS), which contains information on the specific services that each hospital provides and the availability of critical and acute care beds. In addition, LTHs may opt to review volumes to determine referring hospital representation within their RTN.

3. Gather information

Each LTH should gather data about the stakeholder organizations in its catchment area prior to implementation of the RTN model. This step allows the LTH to assess the current status and to identify areas that may require attention.

LTHs may use the checklist provided on the following page to conduct this activity.

TOOL: Pre-implementation information gathering checklist

PRE-IMPLEMENTATION INFORMATION GATHERING CHECKLIST

Trauma System Component	Information to gather
RTN partnership/goal setting	• What are the objectives for each organization within the RTN? Each organization's goal should demonstrate how the organization will contribute to the development an inclusive trauma system. • What are the relationships between and among all of the healthcare partners in the RTN? An organization chart can be a useful visual depiction.
Trauma care facilities	• Which hospitals are within the catchment area for the RTN? What is the capability of each hospital to manage injured patients? What would the trauma level designation be for each hospital? • What should be the roles and responsibilities of each hospital? • What are the services provided by each hospital?
Triage, transport and destination	• What field triage/ trauma guidelines and procedures will be used within the RTN? How will they incorporate CCSO/CritiCall's Trauma Centre Consultation Guidelines (Appendix H)? • How will EMS systems ensure availability of EMS resources during periods of minimum staff availability, high transfer volumes, high call volumes, etc.? • What air ambulance services are there within the catchment area for the RTN? What protocols, if any, are there?
Inter-hospital/facility transfers	• What inter-facility transfer agreements, if any, are there between Lead Trauma Hospitals and referring hospitals within the RTN?
Public information, education & prevention	• What injury prevention initiatives are there? • Which organizations are involved in injury prevention? • What opportunities are there for patient and family engagement?
Data collection and trauma system evaluation	• What trauma data can be used to measure performance and process improvement? • What mechanism(s) will the RTN use for feedback of data to OTAC?

Human resources	• How many personnel with roles or responsibilities to the trauma system are there within the RTN? What are their positions? These may include, but are not limited to, personnel from:
	  ○ Dispatch centres/base hospitals
	  ○ EMS agencies
	  ○ Lead Trauma Hospitals
	  ○ Rehabilitation centres

Trauma System Component	Information to gather
Rehabilitation	• What rehabilitation facilities are there within the catchment area? • What rehabilitation facilities are being utilized outside of the catchment area? • Are rehabilitation specialists integrated into the trauma system planning? • Are there inter-facility agreements between hospitals and rehabilitation centres? • What arrangements, if any, are there for the repatriation of patients back to community/hospital closest to home? • What is the patient/family experience in terms of rehabilitation? What is working/not working from a patient's perspective?

4. Develop engagement strategy

A key finding of the process evaluation of the pilot RTNs was that chances of success are likely to be increased by strong leadership and active engagement of a broad range of implementers. The relationships and communication channels between and among healthcare partners may vary across RTNs. The LTH in a proposed RTN should consider the existing relationships and develop customized approaches to build upon current relationships and encourage partners to collaborate to establish the RTN. For example, the Champlain pilot RTN was able to leverage pre-existing relationships within the Champlain LHIN and included all of its referring hospitals in its RTN. In contrast, the Central South pilot RTN, which spanned three LHINs and a widespread catchment area, had a less developed pre-existing network and opted to select referring hospitals with higher referral volumes to form the initial membership of its RTN.

The pilot RTNs took the following steps to develop their respective stakeholder engagement strategies:

(i) Send introductory letters

The LTH should initiate the process of establishing its RTN by sending introductory letters. One of the key findings from the process evaluation of the pilot RTNs was that membership should include both administrative and clinical representation from each hospital in the network. As such, it is strongly recommended that introductory letters be directed towards both administrative and clinical representatives at referring hospitals. Appendix C contains a sample communications package, including introductory letters.

(ii) Agree Terms of Reference

A key finding of the process evaluation of the pilot RTNs was that it was crucial to have widespread consensus about the value of the RTN implementation among all stakeholders and to ensure that the implementation approach was simple and clear to all members. To create and formalize a common understanding of the roles and responsibilities of an RTN's members, LTHs should obtain sign-off from members on the network's terms of reference. Appendix D contains a sample terms of reference agreement.

TOOL: Responsibility assignment matrix

At this stage, a responsibility assignment matrix (or 'RACI' chart) may be helpful to determine the level of involvement of various stakeholders. A 'RACI' chart can help to map RTN members to tasks and specify levels of responsibility. Below is an example of a simple RACI chart for a working group.

Task	R Responsible – Person working on the activity	A Accountable – Person with decision authority	C Consult – Person who should be included in decision or work activity	I Inform – Person who needs to know of decision or action
Develop work plan	Working group lead	RTN co-leads	Subject matter experts	Working group members, stakeholders
Gather information	Working group members	Working group lead	Subject matter experts	RTN co-leads
Formulate solution	Working group members	Working group members	Subject matter experts, end users	RTN co-leads
Test solution	End users	Working group lead	Working group members	RTN co-leads, working group members

Figure 6: Sample RACI chart and definitions

5. Determine trauma levels of care

The process evaluation of the pilot RTNs revealed that it is crucial to identify and/or update the level of trauma care classification of all hospitals in the network, to facilitate an understanding of each referral hospital's service level for the management of injured patients. This information forms the foundation for assessment of whether RTN referral patterns are appropriate for an effective inclusive trauma system.

The pilot RTNs reviewed the trauma classification of hospitals using the Trauma Association of Canada (TAC) guidelines. The LTHs distributed the following documents to their referring hospitals and asked them to review their current trauma classification:

i TAC criteria for trauma systems/centres
ii Blank form of the TAC criteria to be filled out by each referring hospital
iii Hospital Service Inventory in CritiCall Ontario's Provincial Hospital Resource System (PHRS)

LTHs collaborated with referring hospitals to identify capacity and capabilities informed by TAC guidelines and PHRS. Once referring hospitals were classified as Level 3, Level 4 or Level 5, results were reviewed by the RTN members. The pilot RTNs are currently collaborating with referring hospitals to identify operational efficiencies in managing trauma patients.

Along with the above-mentioned documents, LTHs may also provide the guidelines formulated by the American College of Surgeons (COT-ACS) to assist the referring hospitals in the classification process. Referring hospitals and LTHs should collaborate to develop and sign a Memorandum of Understanding (MOU) to ensure commitment, accountability and intention by the referring hospital to maximize the functional and operational capabilities of the latter. Refer to Appendix E for sample MOU.

It is worthwhile to note that creating an inclusive trauma system entails more than simply designating hospitals according to their different levels of capability to manage injured patients. Designation is only

a small part of the process and, by itself, is meaningless without the coordination of services across the health economy (NHS, 2010).

6. Hold inaugural meeting

After the membership of the RTN has been decided, the LTH should hold an inaugural meeting, ideally face-to-face, to introduce members to each other and to determine how to proceed with the development of the RTN. A sample agenda for an RTN inaugural meeting is in Appendix C. CCSO will attend each RTN's inaugural meeting, schedules permitting.

5.2 Phase II: Priority setting

The second phase in developing an RTN is the priority-setting phase, in which there are four (4) main activities, as described below. This phase should last approximately four to six months. For the development of new RTNs in Ontario, we expect this period to run from September 2016 to March 2017.

1. Identify regional areas of focus

LTHs should collaborate with RTN members to assess the existing situation as a precursor to identifying areas of focus and commencing implementation. The information gathering form in Section 5.1 provides a list of questions to ask regarding each trauma system component.

The Central South pilot RTN developed and distributed a questionnaire to identify areas of focus within its region. See Appendix F for a copy of that questionnaire.

2. Prioritize areas of focus

After the RTN members have identified the issues that they wish to address in their region, they should prioritize the issues using appropriate criteria. The pilot RTNs used a consensus approach to prioritize the issues to address in their respective regions. An important consideration should be the availability and commitment of local subject matter experts to address the issues. RTN member hospitals should also include the patient and family experience as a prioritization factor. Later this year, CCSO will be launching a framework and toolkit to facilitate patient-centred care considerations.

3. Establish working groups

RTN members may volunteer to lead and/or participate in working groups to address the trauma care areas of focus within their RTN. The support and endorsement from senior hospital leaders is important to raise the profile of the RTN initiative and to encourage subject matter experts to become actively involved.

The Champlain pilot RTN formed three working groups based on a prioritization of the issues that its members identified: (i) Massive Transfusion Protocol; (ii) Trauma Resuscitation; and (iii) Transfer Documentation. Each working group ideally comprised five to six persons. Each member of the RTN was requested to participate in at least one working group.

The Central South pilot RTN formed four working groups: (i) Standardized Documentation/Protocols Working Group; (ii) Repatriation across the Border (part A) Working Group; (iii) Repatriation Inter-LHIN (part B) Working Group; and (iv) Physician Feedback Working Group.

TOOL: Work Planning

The LTH should play a lead role in organizing the working groups and ensuring that they develop and follow work plans. Refer to Appendix G for a sample work plan.

4. Coordinate RTN progress meetings

The pilot RTNs opted to have quarterly progress meetings. It is recommended that the frequency of RTN progress meetings be at least quarterly to maintain momentum. Continued engagement and participation of referring hospitals are essential to foster collaboration and cooperation for system development and enhancements. The process evaluation of the pilot RTNs highlighted the importance of getting buy-in and long-term commitment from the RTNs stakeholders, especially the referring hospitals.

Another important consideration for RTN progress meetings, especially for regions that span a wide geographical area, is how to enable members to participate effectively in meetings without having to travel long distances. Videoconferencing services (such as OTN) and SharePoint are two of the suggestions raised by members of the pilot RTNs.

5.3 Phase III: Maintenance

The third phase in developing an RTN is the maintenance phase, in which there are four (4) main activities, as described below. This phase should last approximately twelve months. For the development of new RTNs in Ontario, we expect this period to run from April 2017 to March 2018.

1. Share knowledge through outreach and education

An important feature of a well-functioning trauma system is that it keeps its trauma care professionals knowledgeable and current on developments in the field (Kaufmann, 2015).

(i) Knowledge transfer

There is scope for leveraging incremental, renewing, and regenerative learning in trauma care and transferring knowledge gained between and among hospitals in the system, and beyond. It may also be useful to consider the role of teaching hospitals in this process.

Both of the pilot RTNs identified a need for the LTH to lead education and outreach efforts to meet the needs of referring hospitals to implement best practices, standards, and guidelines in trauma care. They are using site visits, webinars, online and printed documentation, and Regional ED Councils as vehicles for knowledge transfer in their regions.

(ii) Sharing of best practices

Although local circumstances play a significant role in the design of regional trauma care, there is merit in understanding what works well in other jurisdictions. Regular jurisdictional scans and sharing of best practices among different regions and countries can serve to improve trauma care across the board.

2. Measure and report performance

RTNs should track their performance on the preliminary set of proposed performance indicators in section 3.2. As the Ontario trauma system continues to develop, the ability for individual hospitals to report on a more comprehensive set of indicators should increase. In phase 3, RTNs should consider what indicators are meaningful within their local context and what it would take to be able to measure and report those indicators. RTNs should consider patient-reported measures, and metrics around patient satisfaction and the patient and family experience.

3. Learn from experience

The process evaluation of the pilot RTNs emphasized that the RTN model facilitates opportunities to learn through action and provides ways to feed the lessons of experience into improving the ongoing implementation of the model. It also highlighted that a phased scaling-up of the program provides the opportunity to learn. RTNs should identify and apply such opportunities for learning.

4. Incorporate evolving considerations

There are some important questions to consider about the future of trauma care. For instance, what can be done to motivate the next generation of trauma surgeons (Jurkovich, 2012)? What is the impact of RTNs and LTHs on surgical training (Gray *et al.*, 2015)? As the Ontario RTNs mature and evolve, addressing questions like these will be pivotal in paving the way for trauma care in the decades to come.

TOOL: Managing change

There is a wealth of resources on change management. While there is some variability in the change models from a host of experts, there is broad agreement on basic steps to transforming an organization, including:

1. Establish urgency.
2. Build a guiding team.
3. Frame vision and strategy.
4. Messaging and communication.
5. Navigating bumps in the road to change.
6. Focus on short term wins.
7. Make the change sticky.

To support the implementation of regional trauma networks across the province, CCSO will host a series of monthly webinars from July 2016 through March 2017; details available from RTN Co-Leads. CCSO will maintain and periodically update this guide based on frequently-asked questions from the webinar series, as well as feedback from health partners throughout the Ontario trauma system.

Thank you for using this guide.

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APPENDICES

Appendix A: Regional trauma networks – concept and history

1. What is a regional trauma network?

A regional trauma network (RTN) serves a population in a defined geographical area to reduce death and disability following injury. The trauma system includes public health, injury prevention, emergency medical services, patient transport, all trauma-receiving hospitals, Lead Trauma Hospitals, rehabilitation services, research, education and systems governance.

The RTN optimizes the use of resources to treat a trauma patient in the right place, at the right time, by the right specialists. Trauma patients are treated at the nearest hospital that is equipped to treat their injuries. Major trauma patients are treated at Lead Trauma Hospitals (LTHs). LTHs will also manage a certain proportion of trauma patients who are not major trauma. These patients come from the LTH's local catchment area or from over-triage of trauma patients to the LTH.

This approach requires optimization of pre-hospital triage, bypass protocols, development of trauma unit emergency management protocols and rapid inter-hospital LTH transfer capability. Acute rehabilitation services and repatriation pathways allow targeted patient rehabilitation in trauma units or dedicated rehabilitation facilities close to the patient's home.

As part of an inclusive trauma system, it also requires an active injury prevention program to reduce the overall burden of injury for a population. The system should be underpinned by ongoing research and education activities. There should be a robust public system performance improvement program, which monitors the health of the trauma system, develops new policy and assures implementation. Inclusive regional trauma systems combined with the designation of high-volume LTHs can reduce mortality from major trauma by 40% (Cameron *et al.*, 2008).

The goal of RTNs is to reduce mortality and morbidity from traumatic injuries for a specific region by promoting primary and secondary trauma prevention, by ensuring the effective provision of appropriate and timely trauma care services, and by effectively rationalizing and coordinating trauma care services on a regional level. These activities span the patient care continuum. As shown in Figure A1.1 below, RTN systems can be thought of as being composed of four regional subsystems:

1. An injury prevention and control subsystem,
2. A trauma response subsystem,
3. A trauma critical care subsystem, and
4. A post-trauma recovery subsystem.

> *"The 'ideal' RTN is a complex all-inclusive system of trauma-related services, from prehospital care through to acute care and rehabilitation. It affects and is affected by numerous patient and healthcare-related parameters, as well as legislation and finances."*
>
> Kanakaris and Giannoudis (2011)

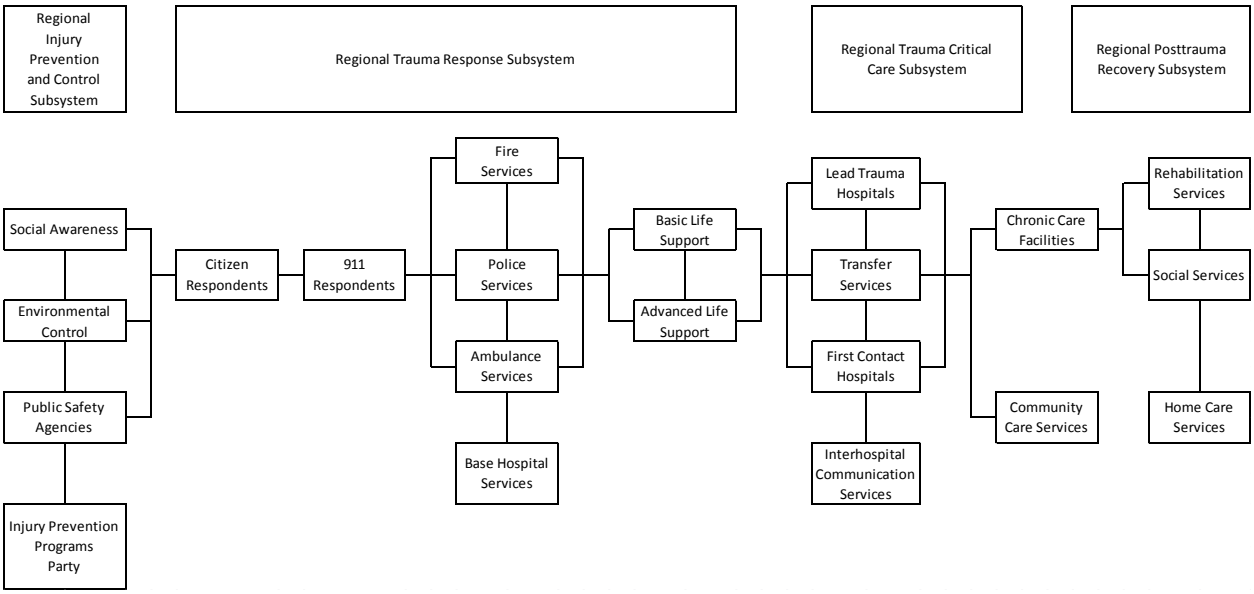


Figure A1.1: The four subsystems of a regional trauma network
[Source: Caro (1997)]

The major trauma patient pathway is sometimes described as a 'trauma chain of survival'. Trauma patients' lives are saved by immediate pre-hospital interventions and then transfer to specialist surgical facilities in which bleeding can be controlled, traumatic brain injury managed and specialist critical care instituted. The trauma chain of survival therefore depends on an optimized pathway that includes pre-hospital care, emergency departments, specialist operating teams and critical care facilities. The chain continues into a phase of reconstruction, in which injuries are repaired and rebuilt, followed by rehabilitation and reintegration into society.

Therefore, the priorities in the trauma chain of survival include:

- identifying major trauma patients at the scene of the incident who are at risk of death or disability;
- immediate interventions to allow safe transport;
- rapid dispatch to LTHs for surgical management and critical care;
- coordinated specialist reconstruction; and
- targeted rehabilitation and repatriation.

The key components of a regional trauma system are:

RTN partnership/goal setting	• A philosophy that the injured patient anywhere in the region is the clinical responsibility of the trauma system and that clinicians have a clinical responsibility that extends outside their traditional boundaries. • A culture of integrated multi-disciplinary teams working across specialist and professional groups, with trauma care seen as a specialist area of expertise. • A responsibility towards research into trauma and its effects, to continuously improve care and outcomes following injury. • A communication network (at all levels of the trauma system)
Trauma care facilities	• A network of hospitals designated as trauma centres and LTHs, each with defined capability and capacity, and predetermined transfer agreements for optimizing patient flow. • A specialist LTH that has responsibility for the management of all major trauma patients in the region.
Triage, transport and destination protocols	• A regional system integrating hospital and pre-hospital care to identify and deliver patients to a place of definitive care quickly and safely. • A pre-hospital care system closely integrated into the trauma system, with defined triage, bypass and inter-hospital transfer protocols.
Inter-hospital/facility transfers	• Transfer agreements and a transport system to support patient flow and repatriation.
Injury surveillance, reporting and prevention	• An active injury prevention program to reduce the burden of injury for the population the network serves. • Integration with emergency preparedness and the ability to implement a system-wide response to disaster and mass casualty incidents.
Rehabilitation	• Acute rehabilitation services to improve outcomes and reintegrate patients back to productive roles in society.
System-wide quality assurance	• A continuous process of system evaluation, governance and performance improvement across the network. • Data collection and quality assurance monitoring
Human resources	• Ongoing training and education for all pre-hospital, hospital and community healthcare professionals involved in the care of injured patients. • Planning and development, administrative and clinical teamwork
Leadership (at all levels of trauma care delivery)	• Education-prevention public awareness (information on the trauma system, communication pathways with primary care and the public) • A clinical and administrative structure to oversee system activities, led by a clinician.

2. RTN history

Worldwide, trauma constitutes a massive public health problem. Approximately 5.8 million people die annually as a result of injury, representing 10% of the world's deaths. Those who die as a result of trauma represent only a fraction of those injured. Every year, approximately 50 million people suffer moderate or severe disability, resulting in the loss of 180 million disability–adjusted life years. The management of the consequences of trauma consumes a significant proportion of public funds worldwide. In the US in 2009, the total cost of unintentional injuries (economic and healthcare costs) was estimated to be $693.5 billion. Therefore, as a disease, trauma places a significant socioeconomic burden on society (Lendrum and Lockey, 2013).

The huge economic and societal burden that trauma exerts worldwide has driven significant developments in the infrastructure required to manage these patients effectively over the past 45 years. There has been improved understanding of the pathophysiology of trauma-related disease as well as progress in pre-hospital and emergency department (ED) care, imaging, trauma surgery and critical care that has improved major trauma survival. However, the effectiveness of treatment may be reduced if interventions are not available promptly [6]. This principle has been pivotal in the international drive to develop formal trauma systems.

"As early as the 1970s, it became evident that centralisation of resources and expertise could reduce the mortality rate from serious injury and that organisation of trauma care delivery into formal systems could improve outcome further. Internationally, trauma systems have evolved in various forms, with widespread reports of mortality and functional outcome benefits when major trauma management is delivered in this way" (Lendrum and Lockey, 2013).

Appendix B: Ontario RTN Map

CCSO has developed an interactive Google map of the LHINs, LHIN offices, LTHs, and referring hospitals in Ontario. Each set of data is in a separate layer to enable users to control the level of detail. This map is intended to be a living document that will evolve as trauma classifications and referral patterns emerge as the Ontario RTN system matures.

The link to the map is:
https://www.google.com/maps/d/edit?mid=zwNKOlHA0ZeE.k6JQAN2FHye0&usp=sharing

Appendix C: Communications Package

The following is a sample introductory letter that the Lead Trauma Hospital would send to the referring hospitals in its RTN catchment area.

[Date]

Dear [Referring hospital CEO]:

This letter is to inform you of a province-wide initiative to implement a regional trauma system of care in Ontario. This plan stems from the work of the Ontario Trauma Advisory Committee (OTAC), which in 2012, made recommendations to strengthen trauma care by implementing system improvements and establishing regional trauma networks (RTNs). To guide the development of these RTNs, OTAC formed an Advisory Panel on Regional System Development to advise on the implementation of an effective, sustainable and inclusive Ontario-wide regional trauma system of care.

The RTNs will be based on a hub-and-spoke model in which Lead Trauma Hospitals (hubs) work in partnership with their catchment area hospitals (spokes) to streamline trauma services and will serve as a forum to discuss system issues, clarify and strengthen roles and responsibilities, exchange protocols and best practices, allow for opportunities to involve other key players and to further network development.

Our hospital is enthusiastic for the opportunity to participate in this endeavor. As a partner hospital and key stakeholder, we are inviting you to take part in the planning phase of this initiative. We will be hosting a meeting on mmm dd, yyyy. To confirm your hospital's participation, please reply to XXXX at XXX by mmm dd, yyyy.

For your information, please see the attached *Regional Trauma Network Development: A Guide for Ontario Hospitals* from Critical Care Services Ontario.

We appreciate your time and thank you for your consideration.

_____

[CEO, Lead Trauma Hospital]

cc: [RTN Co-Lead]
cc: [RTN Co-Lead]
cc: Dr. Bernard Lawless, Provincial Lead, Critical Care Services Ontario
cc: [LHIN CEO]

The following is a sample invitation letter to an RTN's inaugural meeting. The Lead Trauma Hospital would send this letter to the referring hospitals in its RTN catchment area.

[Date]

Dear [Referring hospital CEO/VP]:

In 2012, the Ontario Trauma Advisory Committee (OTAC) recommended strengthening trauma care throughout the province and implementing system improvements by establishing regional trauma networks (RTNs). RTNs are based on a hub-and-spoke model in which Lead Trauma Hospitals (hubs) work in partnership with their catchment area hospitals (spokes) to streamline trauma services throughout the region.

To guide the development of these RTNs, the Advisory Panel on Regional System Development was formed to advise on the implementation of an effective, sustainable and inclusive Ontario-wide regional trauma system of care. In, 2014, the Advisory Panel selected two pilot Lead Trauma Hospitals – Hamilton Health Sciences and The Ottawa Hospital – that provided an opportunity to understand critical relationships, identify lessons learned, and share best practices in developing the system of regional trauma networks in the province. Based on the experience of these pilots, Critical Care Services Ontario (CCSO) is working with the province's Lead Trauma Hospitals to guide the establishment of RTNs in the remainder of Ontario throughout the 2016-2017 fiscal year.

As part of ____ catchment area, we are extending an invitation to your hospital to participate in building our RTN. We request the membership of your [designate(s)] to participate in meetings and consultations to inform and improve trauma activities in our region. Your hospital's participation will facilitate the work of OTAC to support a system of shared accountability among regional hospitals.

Some of the objectives of implementing RTNs include sharing best practices of patient flow, patient safety, and other protocols to improve timely access to care and meet service level expectations; to enhance communication and trauma education around trauma protocols and guidelines; to ensure existing resources are appropriately utilized to improve patient care; and to strengthen the coordination of care in a patient's journey, including patient acceptance, transfer, and repatriation across the region and trauma system.

Your hospital's participation is the first step in the advancement of our RTN and an opportunity in building a comprehensive and inclusive provincial trauma system.

The first meeting of the XXX RTN will be held on [date] at [time]. To confirm your hospital's participation, please reply to XXX at XXX.

We appreciate your time and thank you for your consideration in this important endeavor.

_____	_____
[CEO, Lead Trauma Hospital]	[RTN Co-Lead]
_____	_____
Dr. Bernard Lawless, Provincial Lead, CCSO	[RTN Co-Lead]

The following is a sample agenda for an RTN's inaugural meeting:

Meeting Agenda

Name	____ Regional Trauma Network Inaugural Meeting		
Date		***Meeting Time***	
Location			
Invitees			

Objectives
•

Time	***Topic/Activity***	***Presenter***
15 min	**1. Welcome & introductions**	RTN Co-Leads
15 min	**2. Overview of Critical Care Services Ontario (CCSO), the Ontario Trauma Advisory Committee (OTAC), and the provincial Regional Trauma Networks initiative**	CCSO
30 min	**3. Regional Trauma Network Development** • Terms of Reference • Trauma Consultation Guidelines • Patient Flow Practices	RTN Co-Leads
30 min	**4. Regional Issues** • Strategic planning	RTN Co-Leads
15 min	**5. Summary and Next Steps**	RTN Co-Leads

Appendix D: Terms of Reference for Regional Trauma Networks

1. **PURPOSE**

The Regional Trauma Network (RTN) aims to implement system improvements through shared accountability amongst regional hospitals. Leveraging leadership from Lead Trauma Hospitals (LTHs) as "hubs," LTHs will support regional hospitals ("spokes") within their catchment areas through the engagement of clinicians, administrators, EMS and other trauma service representatives. Activities of each RTN will include – but are not limited to – communication of best practices, expanding quality improvement and education initiatives, examination of transportation and referral practices as well as regional challenges. The goals of the RTN will support an effective, sustainable, and inclusive Ontario-wide regionalized trauma system of care. The RTN will utilize the most effective approaches to coordinate and collaborate on the region's trauma services.

2. **MEMBERSHIP**

Membership for the RTN will include:

- Senior administrator from LTH – as RTN Co-Lead
- Medical Director from LTH – as RTN Co-Lead
- Trauma Coordinator/Injury Prevention representative from LTH
- Base hospital representative
- EMS from local municipality
- Regional CritiCall representative
- Senior administrator from each referring hospital
- ED LHIN representation
- Ornge representation

Additional *ad hoc* members (such as data analysts) may be requested for expertise on a needs basis in the development of policies, guidelines or other documents.

3. **OBJECTIVES**

- To apply the framework of an inclusive Regional Trauma Network across the trauma continuum of care, including pre-hospital, acute health, and rehabilitation services.
- To share best practices of patient flow, patient safety, and other protocols to improve timely access to care, system capabilities and meet service level expectations, and identify priorities to meet system evaluation and performance improvement criteria.
- To demonstrate a commitment to patient- and family-engagement.
- To enhance communication and trauma education leading to increased uptake, utilization, and sharing of protocols and guidelines (e.g., Trauma Centre Consultation Guidelines).
- To strengthen the coordination of care in a patient's journey, including patient acceptance, transfer, repatriation and addressing bed capacity issues across the region and trauma system.
- To ensure existing resources are appropriately utilized to improve patient care.
- To ensure accountability of Lead Trauma Hospitals to regional centres in establishing and sharing benchmark data.

4. **REPORTING REQUIREMENTS**

- RTNs will report bi-annually to the Ontario Trauma Advisory Committee (OTAC). Members of the RTN are encouraged to seek input from others in their professional environment, and beyond, to maximize the engagement of the broader trauma community.
- Summary updates or minutes from RTN meetings will be shared broadly and regularly with OTAC and its membership, through Critical Care Services Ontario (CCSO).

5. **VOTING AND QUORUM**

If necessary, decision-making within the RTN will be made by consensus whenever possible. If voting is required, all members will have one vote. A quorum of at least 50 per cent of members is required to authenticate a vote. Members who have been absent for all discussions and not able to review all background documentation will not be permitted to vote in advance of meetings or calls. An abstention will count as a neutral vote. Where there is a tie, the LTH representative will cast the deciding vote.

6. **MEETINGS**

The RTN will meet quarterly in person or via teleconference. Meetings will be scheduled at the discretion of the LTH. Additional *ad hoc* meetings may be called as needed.

6.1 Attendance

Members assume the responsibility for attending all meetings. If a meeting is missed, background material will be provided on issues discussed and the member will be expected to be prepared for the next meeting. Delegates are not recommended. If a member is unable to attend 75% of the meetings, he or she will be replaced.

6.2 Meeting Minutes

Minutes will be captured for each meeting by an appointed representative. Once reviewed by the RTN Co-Leads, records of the minutes will be maintained by the RTN Steering Committee.

7. **PRIVACY OF INFORMATION**

Matters discussed at the meeting are confidential and should not be discussed by members in public unless they are so permitted by the RTN Co-Leads. Reports to respective associations by liaison members should be in general terms only and should be maintained in confidence by that member's organization. In the event that it would be useful to share information with specific groups for feedback, the RTN Co-Leads should be consulted.

Appendix E: Sample Memorandum of Understanding for Level 3 trauma care

The following is a sample Memorandum of Understanding (MOU) that should be executed between the Lead Trauma Hospital and each referring hospital identified as Level 3 trauma centre.

Memorandum of Understanding (MOU)
Between
[Lead Trauma Hospital]
and
[Referring hospital identified as Level 3 trauma centre]
[date]

Purpose

This document outlines the terms of understanding between [Lead Trauma Hospital] and [Referring hospital identified as Level 3 trauma centre]. The purpose of this MOU is to foster an accountability, commitment and intention by the referring hospital to function as a Level 3 trauma centre within the Regional Trauma Network. The referring hospital is expected to undertake maximum utilization of its functional and operational capabilities to fulfill its role as a Level 3 trauma centre.

Organizational Accountabilities

[This section may be populated based on the existing functional and operational capabilities of the referring hospital identified as Level 3 trauma centre. It may include any process improvement initiatives planned to be undertaken and agreed upon between the Lead Trauma Hospital and the referring hospital that may enable to it to function as a Level 3 trauma centre].

Maintaining the MOU

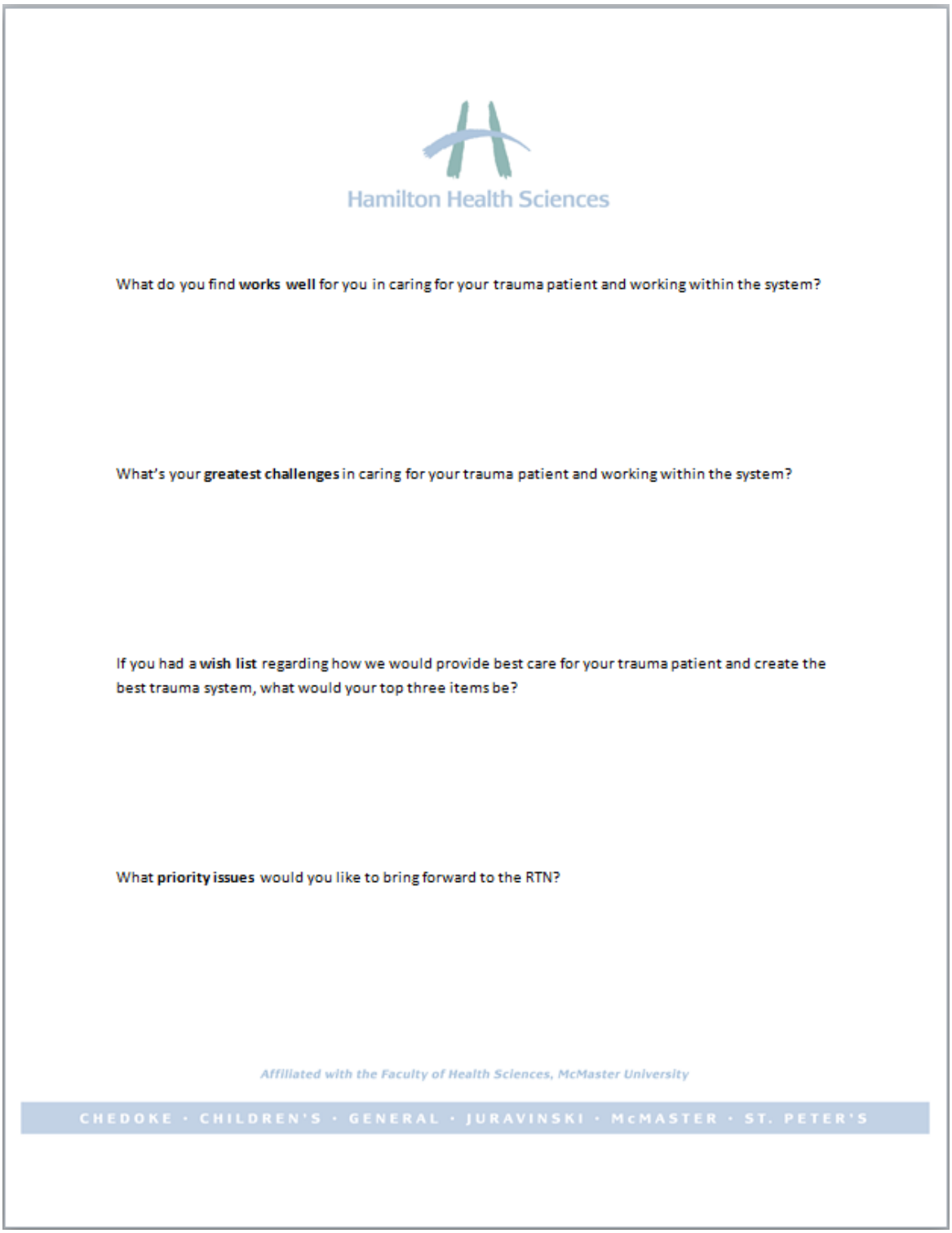
The [Lead Trauma Hospital] and [referring hospital identified as Level 3 trauma centre] are responsible for ensuring that this MOU is upheld and maintained. The centres agree to work collaboratively in this regard. This MOU provides a starting point for classification and evaluation of the role of Level 3 trauma centres within the Regional Trauma Network.

Signatures:

Authority	Signature	Date
CEO, [Lead Trauma Hospital]		
Chief of Staff/ Head Trauma Services, [Lead Trauma Hospital]		
CEO, [Referring hospital]		
Chief of Staff/ Head Trauma Services, [Referring hospital]		

Appendix F: Sample questionnaire to identify regional areas of concern

The Central South pilot RTN developed and distributed the following questionnaire to identify areas of focus within its region.



Hamilton Health Sciences

What do you find **works well** for you in caring for your trauma patient and working within the system?

What's your **greatest challenges** in caring for your trauma patient and working within the system?

If you had a **wish list** regarding how we would provide best care for your trauma patient and create the best trauma system, what would your top three items be?

What **priority issues** would you like to bring forward to the RTN?

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Appendix G: Work Planning Resources

To create a work plan that will function as a useful tool, clearly identify activities, target dates, deliverables, and the person responsible for leading each activity. That person should be prepared to report on the progress of his/her assigned activity/activities at progress meetings.

Below is a sample format.

Toolkit: Implementation of Clinical Practice Guidelines
Action Plan Template:

Instructions: Use this template to develop your implementation action plan. You will need to complete the columns and identify specific activities under each of the major activities identified in the template.

	activity	target date	most responsible person	outcome/ deliverables	progress
1.	Create a proposal describing the project background, goals and rationale. Include any information you have on costs and benefits, implementation strategies, action planning, timetables and evaluation. Don't forget the executive summary.				
2.	Identification of project lead, champions and/or the group who will lead the identification and implementation of a CPG a) Identify skill and role requirements. b) Communicate/recruit interested individual or group. c) Secure participation of project lead. d) Ensure project lead has clear mandate and resources required to start the planning process.				
3.	Identification, analysis and engagement of stakeholders a) Define scope of implementation-- extent of implementation. b) Identify stakeholders-- use team approach to identify. c) Using team, collect data about the stakeholders-- use template provided. d) Organize the data and analyze--again use a team approach--strive for consensus. e) Determine strategies that will be used to influence, support and engage stakeholders				

Appendix H: Trauma Centre Consultation Guidelines

TRAUMA CENTRE CONSULTATION GUIDELINES

These guidelines are meant to facilitate consultations and/or transfer with a trauma centre and should be applied using clinical judgement. Final decision to transfer remains at the discretion of the referring and receiving physicians.

The decision to transfer should be made within 1 hour.

All consultations with a TTL should be coordinated through CritiCall: 1-800-668-4357

ALL TRAUMA PATIENTS

For ALL paediatric and adult injuries, contact CritiCall for the appropriate Trauma Centre.

Systems Criteria
Any patient (with a major traumatic injury (severe multisystem; life-or-limb threatening single system)) requiring trauma consultation or who requires more care than can be provided at the referring centre based on the assessment of the ED physician. Not all patients with single system injuries will need to be transferred to a Lead Trauma Hospital and may be able to receive care where local expertise exists.

Anatomical Criteria (one or more of the following):
- Suspected spinal cord injury with paraplegia or quadriplegia
- Moderate-to-severe head trauma
- Severe (or suspected severe) penetrating injury to the head, neck, torso or groin (stab wound or GSW)
- A requirement for blood products to maintain vital signs
- Amputation above the wrist or ankle
- Pelvic fractures with hemodynamic instability or significant hematoma
- Major crush or vascular injury
- Trauma with burn or inhalation injury

Physiological Criteria
- GCS <10 due to traumatic injury
- Significant alteration of consciousness due to trauma
- Hypotension (due to trauma) that is unresponsive or only transiently responsive to fluids
- Hypothermia (Body Temp) < 32°C (with traumatic injuries)

SPECIAL CONSIDERATIONS

High risk considerations which may warrant transfer to Lead Trauma Center at a lower threshold. These considerations include:

- Age > 55;
- Anticoagulation;
- Immunosuppression;
- Pregnancy; or
- Other significant medical problems.
- A CT Scan may not always be required for the decision to transfer if it will delay definitive management.

For any considerations, consult with on-call trauma team leader through CritiCall.

CCSO Critical Care Services Ontario

CRITICALL ONTARIO

Refer to ABA (American Burn Association) Burn Centre Referral Criteria.
Please refer to the Neurosurgery Cranial and Spinal Consultation Criteria for isolated Cranial and Spinal Neurosurgical cases found on site.

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