MCH TRAUMA RESPONSE SYSTEM
INTEGRATING THE TRAUMA TEAM LEADER PROGRAM

OCTOBER 2014

D. Friedman BSc pht MMgmt
Director, Trauma
Director, Canadian Hospital Injury Reporting & Prevention Program
Assistant Professor, Department of Pediatrics,
Faculty of Medicine, McGill University

R. Baird MDCM, MSc,FRCSC, FACS
Assistant Professor of Surgery McGill University
Medical Director TTL Program
MSc Experimental Surgery(McGill)
MSc Evidence Based Health Care (Oxford)
We have no conflict of interest to declare
Acknowledgements

- Emergency, General Surgery, Critical Care, Anaesthesia
- Surgical Fellows 2006-2014
- 1010/2020 core Trauma Teams & consultants
- ED Medical & Nursing leadership
- ED Clerks
- MUHC Call Centre Supervisors & operators
- Trauma Team Activation Review sub-Committee
- Trauma Coordinators
- Trauma Administrative Team
- MCH ADPS office
- Orientation to Crash Room presenters
- INESSS
- To everyone from all departments, services, and divisions who provides care to our patients & their families
Today’s Talk

- Introduction
- Guiding Principles
- Background
- Objectives
- Highlights of Results
- Trauma Team Leader Program 2014 Why?
INTRODUCTION

Trauma
by its very nature is unpredictable,
a trauma centre’s response can’t be!
MCH Trauma Centre


- Designated Neurotrauma Centre of expertise (2001, 2008)

- Designated Trauma Centre in the provincial Trauma Consortium (2006, 2008)

- Programs: Trauma, Neurotrauma, Burn Trauma, MTBI, Injury Prevention, Trauma Research. Affiliation - CHIRPP
Trauma Response System  guiding principles

- Mandatory requirement (MSSS/INESS)
- A defining feature of being a tertiary level Trauma Centre is a firm commitment of everyone involved to respond to patients in need of emergency trauma care at all times.
- In trauma care timely interventions & expertise can significantly impact outcome.
- Pre-alerts ideal!
Trauma Response System  

- Activation of a trauma team with effective, clearly identified leadership facilitates timely definitive treatment and increases survival rates.

- Health care: efficient & effective use of resources.

- Trauma by its very nature can be unpredictable, the response of a Trauma Centre can’t be!
# Trauma Response System Background

## Trauma Response System 2004-2005

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inconsistent activation</td>
<td>Impact on patient outcomes, under calls</td>
</tr>
<tr>
<td>Inconsistent activation criteria</td>
<td>Performance, resources</td>
</tr>
<tr>
<td>Variable expertise</td>
<td>Diminished professional satisfaction</td>
</tr>
<tr>
<td>Not a systematic approach</td>
<td>Inconsistent leadership</td>
</tr>
<tr>
<td>Challenging paging system</td>
<td>Inconsistent teamwork</td>
</tr>
<tr>
<td>Medical model for quality review</td>
<td>&lt; optimal inter-professional problem solving</td>
</tr>
</tbody>
</table>

## Solution

### 2010/2020 Multi-Level Trauma Response System 2013-2014

<table>
<thead>
<tr>
<th>SOLUTION</th>
<th>IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consistent activation</td>
<td>Improved patient outcomes, fewer under calls</td>
</tr>
<tr>
<td>Clearer activation criteria</td>
<td>Increased professional performance, resources</td>
</tr>
<tr>
<td>Improved and more constant expertise</td>
<td>Increased professional satisfaction</td>
</tr>
<tr>
<td>Systematic and predictable approach</td>
<td>More consistent leadership (still work to be done)</td>
</tr>
<tr>
<td>Functional trauma code paging system</td>
<td>Improved teamwork, communication, response</td>
</tr>
<tr>
<td>Inter-professional model for quality review</td>
<td>Improved inter-professional collaboration</td>
</tr>
</tbody>
</table>
Objectives 2006-2014

Develop a multi-level trauma response system to:

• Meet Provincial standards for Trauma Centres
• Consistent comprehensive activation criteria 24/7, 365
• Effective use of available resources
• Develop Trauma Team Leader role
• Expected response of core group and consultants
• Improve communication with the pre-hospital system
• Ensure access to the MCH E.D. and ICU at all times
• Ensure timely consistent expertise
Objectives 2006 - 2014

- Promote inter-professional collaboration
- Ensure an inter-professional quality review process
- Improve reliability of call-centre trauma-code paging system
- Reduce the percentage of under calls and overcalls
- Improve outcome (including time to disposition)
- Ensure effective management of the psychosocial component of trauma
- Develop a system that could be activated by both nurses and physicians
- Ensure equipment priorities to meet trauma standards
# Multi-level ER Trauma Response (call 55555)

<table>
<thead>
<tr>
<th>Category</th>
<th>Team</th>
<th>Response Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Full response 1010</strong></td>
<td><strong>Full 1010 Trauma Team:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• TTL staff on-call</td>
<td>• Transfer from regional centre (intubated)</td>
</tr>
<tr>
<td></td>
<td>• ED resident</td>
<td>• Transfer from regional centre meeting any of 1010 criteria</td>
</tr>
<tr>
<td></td>
<td>• ICU fellow</td>
<td>• Glasgow coma scale &lt; 14</td>
</tr>
<tr>
<td></td>
<td>• Surgery Fellow</td>
<td>• Unstable vital signs</td>
</tr>
<tr>
<td></td>
<td>• Surgery Junior</td>
<td>• Risk of compromised airway, ex: maxillofacial injury, burn in a closed space, etc.</td>
</tr>
<tr>
<td></td>
<td>• Nursing Supervisor</td>
<td>• Burns to head, face and neck region (house fire, explosion)</td>
</tr>
<tr>
<td></td>
<td>• Respiratory Therapist (immediate response)</td>
<td>• Severe burn (20% or more, 2(^{nd}) and 3(^{rd}) degree)</td>
</tr>
<tr>
<td></td>
<td>• Medical Imaging Technologist</td>
<td>• Fall &gt; 20 feet</td>
</tr>
<tr>
<td></td>
<td>• Radiology Resident (communicates via CT Technologist will not be in ED)</td>
<td>• Motor vehicle collision with any of the following:</td>
</tr>
<tr>
<td></td>
<td>• Social Worker</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Pastoral Services</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• OR Charge Nurse</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>1010 Selective Consultants as needed:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Immediate Response</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ex: Anaesthesia, Orthopedic Surgery, Neurosurgery, Plastic Surgery, etc.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> For selective consultants required at any point in the Trauma Code request another 1010 followed by the specific specialty required example: “Code trauma 1010 Neurosurgery.”</td>
<td></td>
</tr>
</tbody>
</table>

| Modified response 2020 | **2020 Trauma Team:** | **Glasgow coma scale 14** |
| (not critical but significant) | • ED attending acts as TTL — Note: ED MD may decide to consult TTL on a case-by-case basis by calling 55555 and requesting “Code Trauma 2020 TTL.” | **Involvement of 2 or more proximal long bone fracture** |
|  | • Nurses (2) | **Suspected pelvic fracture** |
|  | • Nursing Supervisor | **Open fracture** |
|  | • Medical Imaging Technologist | **Significant assault (all ages)** |
|  | • Radiology Resident (communicates via CT Technologist will not be in ED) | **Motor vehicle collision with any of the following:** |
|  | • Respiratory Therapist (immediate response) |  |
|  | • Social Worker |  |
|  | • Pastoral Services |  |
|  | • PCAs |  |
|  | + |  |
|  | **2020 Selective Consultants as needed:** |  |
|  | **Note:** For selective consultants (Plastic Surgery, Orthopedic Surgery, ENT etc.) required at Trauma Code request another 2020 followed by the specific specialty required example: “Code Trauma 2020 General Surgery.” |  |

| Minor | **ED attending** | **LOC (none, brief)** |
|  | **ED nurse** | **GCS 15** |
|  | **Consultants as needed** | **Hemodynamically stable** |
|  |  | **An isolated blunt injury of one extremity** |
|  |  | **Low level fall (sports, height)** |
|  |  | **Low velocity auto vs pedestrian** |

*Exception TTL may call ED staff.*
Activating the Trauma Code

- Upon receipt of pre-hospital information, the Trauma Code should be activated prior to patient arrival (pre-alert).

- To activate 1010 full Trauma Team, call 55555 and indicate “code trauma 1010”. The on call TTL will automatically be included as part of the code trauma1010.

- To activate the 2020 Trauma Team, call 55555 and indicate “code trauma 2020”. The TTL will not automatically be included but will need to be called as an additional consultant. In order to do so request: “Code trauma 2020 TTL”.

FOR PRE-ALERTS
For pre-alert of entire trauma code system call 55555 and give the activation level of 1010 or 2020 (already being done and working well).

FOR EXCLUSIVE TTL PRE-ALERT ACTIVATION
Call 55555 and request that the operation put in the following message:

1010 or 2020 pre-alert TTL, please call ED and give the extension
OR
1010 or 2020 pre-alert TTL, patient ETA ___ minutes

Role of on call TTL:

1010: Expected to be on site within a maximum of 15 minutes of trauma activation if outside the Trauma Centre and immediate if in-house. Expected to act as TTL once patient has been handed over by ED MD or as soon as patient arrives if TTL present upon patient’s arrival. Coordinates investigations, treatments, sedations, in-hospital transfers, documentation and orders until final disposition to OR, PICU, Trauma Unit or ED.

2020: Available as consultant or to assume TTL role upon ED MD’s request.

Role of ED MD:

1010: Expected to initiate primary assessment and treatment and to hand over patient to TTL as soon as possible once it has been determined by ED MD that hand-over can occur safely, effectively and without potentially harmful interruption of patient care. Expected to remain part of the treating team unless other clinical duties warrant immediate attention.

2020: Acts as TTL with the support of 2020 core team. May consult TTL or other consultants on a case-by-case basis as required.

Highlights of Results

- Inter-professional ER Trauma Response Quality Review Committee reports to Trauma Committee (clerk, MD, N, SW, RT, MI, Pastoral, consultant, call centre)
- Rapid access to trauma expertise 24/7, 365, no call back to ED
- Improved reliability of call centre (group page system, daily test page, alpha numeric pager, quick identifications of errors, orientation of staff, monthly reports)
- Improved time to disposition and outcome
- Improved choreography and crowd control in CT and crash room
- Collaboration between PICU and ED for transfer acceptances 24/7
- Development of the role of psychosocial specialists in codes
- Role of ED clerk during Trauma Codes
- Mock traumas, teaching and training sessions
Highlights of Results

- Upgrading and purchasing new equipment (rib spreader saw, c-arm, prefabricated splints, orthopedic table, sliders, level 1 rapid infuser, abdominal ultrasound, intra-osseous drill...)
- Development of new protocols (c-spine, contrast for abdominal CT, revised mass transfusion, use of transfer board, use of Propofol, FAST, transfer of imaging results online)
- Improved communication and educational opportunities with pre-hospital system, regional partners, and others in the Quebec Trauma Network
- Trauma orientation process for trainees
- Improved teamwork, inter-professional collaboration, and communication
- More inter-professional team reviews and debriefs following challenging trauma codes
Spectrum of Trauma

- Polytrauma
- Neurotrauma
- Musculoskeletal trauma
- Blunt abdominal trauma
- Facial trauma
- Burn
- Penetrating / violent trauma
- High risk mechanism no injury
- Drowning
- (AVM, cardiac arrest, etc.)
- Thoracic trauma
- Respiratory trauma
- Environmental trauma
- Laryngeal trauma

0.0% to 35.0%
Volume of Trauma Codes 2006-2014
Trauma codes by age
Disposition in hospital 2012-2014

- PICU
- Surgical Trauma Unit
- ER Home
- Deceased
Total Trauma Activations

1010 + 2020 volume per month 2006-2014
Trauma Activations

1010/2020 Distribution 2006-2014

- May
- June
- July
- August
- September
- October
- November
- December
- January
- February
- March
- April

Legend:
- 1010
- 2020
Trauma Activations

Time of Day 2006-2014
Trauma Activations

Monthly distribution 2006-2014 (Averages)
A few challenges remained

- Increased size of crash room
- Improved crash room choreography
- Clearer identification of arriving trauma consultants
A few challenges remained

- Exclusive use of 1010 and 2020 codes for consultants
- Improve < 45 minute target to disposition for 2020 cases
- Improve quality of pre-hospital information
- Importance of pre-alert notification to Trauma Team
- Mechanisms to improve communication on northern transfers
- ATLS and PALS certification of Trauma Team Leader
- Consistency in leadership role of Trauma Team Leader
MCH TRAUMA CENTRE
TRAUMA TEAM LEADER PROJECT
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Faculty of Medicine, McGill University
Overview

- The context of Trauma
- Team
- The power of a Leader
- How to be a Program
- The MCH TTL
The Challenge of Trauma

- Diagnostic Uncertainty
- Time pressured
- High stakes
- Emotionally charged
The Epidemiology of Pediatric trauma

- The most common cause of death in all individuals 1-45 years old.

- In 2000, violence among young people left an estimated 199,000 youths dead.
- For every young person killed, 20 to 40 receive injuries that require hospital treatment.

- YOLL = 30% of all life years in NA
The Epidemiology of Pediatric trauma

- Let’s be blunt...

*Distribution of global child injury deaths by cause, 0–17 years, World, 2004*

- Other unintentional: 31.1%
- Road traffic injuries: 22.3%
- Drowning: 16.8%
- Fire-related burns: 9.1%
- Homicide: 5.8%
- Poisoning: 3.9%
- Falls: 4.2%
- Self-inflicted injuries: 4.4%
- War: 2.3%

*“Other unintentional” includes categories such as smothering, asphyxiation, choking, animal and venomous bites, hypothermia and hyperthermia as well as natural disasters.*
The Epidemiology of Pediatric trauma

- Hospitalizations Due to Major Injury in Canada, by Province and Age Group, 2010–2011

<table>
<thead>
<tr>
<th>Province</th>
<th>&lt;1</th>
<th>1–4</th>
<th>5–9</th>
<th>10–14</th>
<th>15–19</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.C.</td>
<td>15</td>
<td>25</td>
<td>25</td>
<td>45</td>
<td>139</td>
</tr>
<tr>
<td>Percentage</td>
<td>0.7</td>
<td>1.2</td>
<td>1.2</td>
<td>2.1</td>
<td>6.6</td>
</tr>
<tr>
<td>Alta.</td>
<td>23</td>
<td>38</td>
<td>30</td>
<td>71</td>
<td>183</td>
</tr>
<tr>
<td>Percentage</td>
<td>0.9</td>
<td>1.5</td>
<td>1.2</td>
<td>2.8</td>
<td>7.3</td>
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<tr>
<td>Sask.</td>
<td>N/R</td>
<td>N/R</td>
<td>N/R</td>
<td>N/R**</td>
<td>22</td>
</tr>
<tr>
<td>Percentage</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>9.9</td>
</tr>
<tr>
<td>Man.†</td>
<td>8</td>
<td>9</td>
<td>7</td>
<td>21</td>
<td>59</td>
</tr>
<tr>
<td>Percentage</td>
<td>1.4</td>
<td>1.6</td>
<td>1.2</td>
<td>3.7</td>
<td>10.3</td>
</tr>
<tr>
<td>Ont.</td>
<td>66</td>
<td>90</td>
<td>61</td>
<td>88</td>
<td>314</td>
</tr>
<tr>
<td>Percentage</td>
<td>1.5</td>
<td>2.0</td>
<td>1.4</td>
<td>2.0</td>
<td>7.0</td>
</tr>
<tr>
<td>Que.</td>
<td>25</td>
<td>37</td>
<td>50</td>
<td>78</td>
<td>271</td>
</tr>
<tr>
<td>Percentage</td>
<td>0.6</td>
<td>0.8</td>
<td>1.1</td>
<td>1.8</td>
<td>6.1</td>
</tr>
<tr>
<td>N.B.†</td>
<td>0</td>
<td>N/R</td>
<td>0</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Percentage</td>
<td>0.0</td>
<td>—</td>
<td>0.0</td>
<td>0.0</td>
<td>9.6</td>
</tr>
<tr>
<td>N.S.</td>
<td>N/R**</td>
<td>N/R</td>
<td>6</td>
<td>12</td>
<td>48</td>
</tr>
<tr>
<td>Percentage</td>
<td>—</td>
<td>—</td>
<td>1.0</td>
<td>2.0</td>
<td>8.1</td>
</tr>
<tr>
<td>N.L.</td>
<td>0</td>
<td>N/R</td>
<td>N/R</td>
<td>N/R</td>
<td>10</td>
</tr>
<tr>
<td>Percentage</td>
<td>0.0</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>9.4</td>
</tr>
<tr>
<td>Total</td>
<td>146</td>
<td>207</td>
<td>182</td>
<td>324</td>
<td>1,059</td>
</tr>
<tr>
<td>Percentage</td>
<td>1.0</td>
<td>1.4</td>
<td>1.2</td>
<td>2.1</td>
<td>7.0</td>
</tr>
</tbody>
</table>
The Ontario experience

Table 2: Comparison of the Preventable Death Rates Between the Study Cohorts

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of deaths</td>
<td>378</td>
<td>211</td>
</tr>
<tr>
<td>Number of cases with sufficient data for determination</td>
<td>317</td>
<td>164</td>
</tr>
<tr>
<td>Preventable deaths</td>
<td>67</td>
<td>11</td>
</tr>
<tr>
<td>Number of prehospital/in-hospital preventable deaths</td>
<td>34/33</td>
<td>7/4</td>
</tr>
<tr>
<td>Number of prehospital/in-hospital unpreventable deaths</td>
<td>140/110</td>
<td>113/40</td>
</tr>
<tr>
<td>Preventable death rate</td>
<td>67/317 (21%)</td>
<td>11/164 (7%)</td>
</tr>
</tbody>
</table>
The Power of Team

- A group of individuals working towards a common goal

“Teamwork is essential – it allows you to blame somebody else”  
Anon
A 15% reduction in mortality

Table 4 Meta-analysis

<table>
<thead>
<tr>
<th>Study</th>
<th>Postdesignation</th>
<th>Predesignation</th>
<th>Odds</th>
<th>95%</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kane</td>
<td>207/766</td>
<td>191/658</td>
<td>0.905</td>
<td>0.718</td>
<td>1.142</td>
</tr>
<tr>
<td>Mullins</td>
<td>284/7236</td>
<td>182/4230</td>
<td>0.909</td>
<td>0.751</td>
<td>1.099</td>
</tr>
<tr>
<td>Sampalis</td>
<td>30/288</td>
<td>31/158</td>
<td>0.476</td>
<td>0.276</td>
<td>0.822</td>
</tr>
<tr>
<td>Mullins</td>
<td>611/10803</td>
<td>568/9893</td>
<td>0.984</td>
<td>0.875</td>
<td>1.107</td>
</tr>
<tr>
<td>Mullins</td>
<td>666/11879</td>
<td>766/13129</td>
<td>0.959</td>
<td>0.861</td>
<td>1.067</td>
</tr>
<tr>
<td>Abernathy</td>
<td>65/1718</td>
<td>77/1306</td>
<td>0.628</td>
<td>0.447</td>
<td>0.880</td>
</tr>
<tr>
<td>Total (fixed effects)</td>
<td>1863/32690</td>
<td>1815/29374</td>
<td>0.930</td>
<td>0.869</td>
<td>0.995</td>
</tr>
<tr>
<td>Total (random effects)</td>
<td>1863/32690</td>
<td>1815/29374</td>
<td>0.881</td>
<td>0.778</td>
<td>0.998</td>
</tr>
</tbody>
</table>

Test for heterogeneity: Q = 12.2856, DF = 5, p = 0.0311.
Trauma teams - pediatric

A 10 fold reduction in DDIs
Effect of a Pediatric Trauma Response Team on Emergency Department Treatment Time and Mortality of Pediatric Trauma Victims

Donald D. Vernon, MD, FAAP*; Ronald A. Furnival, MD, FAAP*; Kristine W. Hansen, BSN||; Edma M. Diller, MPH/HSAS; Robert G. Bolte, MD, FAAP*; Dale G. Johnson, MD, FAAP*‡; and J. Michael Dean, MD, FAAP*

<table>
<thead>
<tr>
<th></th>
<th>Control Patients</th>
<th>Trauma-one Patients</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury Severity Score</td>
<td>24 ± 3</td>
<td>25 ± 3</td>
<td>NS</td>
</tr>
<tr>
<td>Revised Trauma Score</td>
<td>5.66 ± 0.33</td>
<td>5.89 ± 0.31</td>
<td>NS</td>
</tr>
<tr>
<td>P(s)</td>
<td>0.743 ± 0.052</td>
<td>0.777 ± 0.045</td>
<td>NS</td>
</tr>
<tr>
<td>Deaths</td>
<td>14</td>
<td>7</td>
<td>NS</td>
</tr>
<tr>
<td>Unexpected deaths (P[s] &gt; 0.5)</td>
<td>2</td>
<td>0</td>
<td>NS</td>
</tr>
<tr>
<td>Unexpected survivors (P[s] &lt; 0.5)</td>
<td>0</td>
<td>2</td>
<td>NS</td>
</tr>
</tbody>
</table>

**Tests**

- For the **z score**:
  - Z score: 0.8068
  - N: 8.004
- For the **W score**:
  - W score: N/A

* z score ≤1.96 indicates survival significantly decreased from Major Trauma Outcome Study (MTOS) reference patients; z score > +1.96 indicates survival significantly increased from MTOS reference patients.
The meaning of **team**

- So how do we build a team?

*Tuckman Model (1995) – Developmental sequence in small groups*
How to be a leader

**Do’s**
- See the 360° view
- Call on all available resources
- Identify what has to happen next

**Don’ts**
- Adhere to rules too closely
- Interrupt when things are going right
- Be a hero

“The ability to hide your panic from others”

*Anon*
The MCH Trauma Team Leadership program:

- Traumatologists from 4 disciplines
  - PICU, ED, GSx and Anaesth
- Expertise in advanced care of acutely unwell children
  - ATLS, PALS, ...TRIK....
- In depth understanding of institution-specific resources and protocols
The MCH Trauma Team Leadership program:

- Consistency
- Accountability
- Provide exceptional, family-centered patient care
Acknowledgements

- Emerg, General Surgery, Critical Care, Anaesthesia
- Surgical Fellows 2006-2014
- 1010 / 2020 core Trauma Teams & consultants
- ED Nursing & ED Clerks
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- Trauma Team Activation Review sub-Committee
- Trauma Coordinators
- Trauma Administrative Team: Amanda Fitzgerald & Mike Chuipka
- ADPS office: Cathy Martell, Dr. M. Ste-Marie
- Orientation to Crash Room: Violaine Vastiel & RT Team
- And everyone that helps us care for injured children
Judge your hospital by how it treats its patients.

Dostoevsky