Developing London’s Major Trauma System

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Paramedic Advisor Major Trauma
London

- 7.8-9.5 million people,
- 4,700 people sq/km
- 33 Emergency Departments
- 1 ambulance service (1 million ambulance response per annum)
What is Major Trauma?

- Catastrophic and serious injuries
- Often multiple injuries affecting multiple body compartments
- ISS >15 (circa 10 percent mortality)

- Does not include isolated limb fractures
What is major trauma?

- Road accident (pedestrian, cyclist)
- Fall from height
- Assault/violent
Major Trauma is a rare event

Sources: LAS management information, Clinical Audit Research Unit, Major Trauma Centres and TARN
July 2006

- 0630 hrs
- West London
- 30 year old male leaving for an early meeting
- As he crosses the road is hit by a car travelling at 35mph
- Impact with windscreen thrown 10m down road
July 2006

- Head injury - agitated
- Abdominal injury
- Pelvic fracture
- Femur fracture
- Chest injury ? collapsed lung

- Air ambulance crew not on duty for 30 minutes
- Nearest doctor (volunteer) in Whitechapel
Emergency Department does not accept trauma
CT Surg
No Orthopaedic Surg
No General Surg
No Neuro Surg

Emergency Department
Orthopaedic Surg
General Surg
CT Surg
No Neuro Surg

Emergency Department
Orthopaedic Surg
General Surg
No CT Surg
Case for Change

NCEPOD (trauma – who cares) 2007

60% of severely injured patients received sub-optimal care.

– Organisational
  • Major Trauma is rare (Local Emergency Department may only see one patient per week

– Clinical
  • Lack of seniority of staff especially at night and weekends
  • Patient seen by junior doctor /trainee in circa 60 percent of cases
Trauma workload by London HEMS & LAS into London Emergency Departments Between 9\textsuperscript{th} – 29\textsuperscript{th} March 2009
The mismatch?

0 100 200

- Emergency dept: 183
- ED, orthopaedic: 168
- ED, T&O, general surgery: 159
- ED, T&O, GS vascular: 90
- ED, T&O, GS, Vs, cardiothoracic: 33
- ED, T&O, GS, Vs, neurosurgery: 23
- ED, T&O, GS, Vs, NS, CT: 17
Variance in UK Hospital Trauma Outcomes
Case for Change

Victoria, Australia: established Trauma System – 8 years of data

- Unadjusted in-hospital death rate fell from 15% 2001-2002 to 11% 2005-2006
What is a Major Trauma Centre?

- Organisational commitment to excellent trauma care
  - Access to neurosurgery
  - Access to general surgery
  - Access to orthopaedic surgery
  - Access to Cardio-thoracic surgery
- 24/7 Consultant Lead Trauma Team

A specialist hospital not just a hospital of specialties
Ambulance journey time from incident 01/05/2010 – 30/11/2010 n = 2001
Evolution
# Senior Leadership

## MOST SENIOR DOCTOR IN THE EMERGENCY DEPARTMENT

<table>
<thead>
<tr>
<th>Consultant</th>
<th>STR</th>
<th>Foundation Year/Other</th>
<th>Not recorded</th>
</tr>
</thead>
<tbody>
<tr>
<td>348</td>
<td>3</td>
<td>0</td>
<td>11</td>
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</table>

## MOST SENIOR DOCTOR IN THE EMERGENCY DEPARTMENT JANUARY – MARCH 2011

<table>
<thead>
<tr>
<th>Consultant</th>
<th>STR</th>
<th>Foundation Year/Other</th>
<th>Not recorded</th>
</tr>
</thead>
<tbody>
<tr>
<td>195</td>
<td>50</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>89</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>
Major incidents
October 2011

- 1830
- 32 year old male
- Stabbed to left chest and head injuries
- ? Mugged in basement car park
- Barely conscious
- Crew on scene for 8 minutes
October 2011

- Conveyed to nearest Major Trauma Centre on blue lights (journey time 12 minutes nearest hospital 6 minutes away)
- Met by consultant led trauma team
- Emergency surgery within 12 minutes of arriving
- Blood waiting for patient
- Intensive care 3/7
- Day 5 complaining about the sandwiches
- Home day 10
- Statistically expected to die
August 2012

- 34 year old male
- Tree surgeon
- Large branch falls onto head
- Initially alert and chatting to crew
- Crew prepare to convey to nearest
- Starts to become drowsy
August 2012

• Crew divert to nearest Major Trauma Centre
• 18 minute journey
• Patient admitted Neuro intensive care
• Then to neuro rehab
• Home
In the first year since go live, 58 people have survived who were expected to die of their injuries.
Major Trauma is a rare event

Sources: LAS management information, Clinical Audit Research Unit, Major Trauma Centres and TARN
Diagnosing major trauma is difficult

- No access to imaging (X-Ray, CT, USS)
- Patients compensate for injury (often normal blood pressure)
- Initial signs can be subtle (bruising takes time to develop)
- Injuries are common, trauma is rare
- Need for consistent approach
## The risk of getting it wrong

### Under triage
- Patient with major trauma gets conveyed to non major trauma centre
- Centre does not have skill set to offer optimum care
- Delay in transferring the patient
- Poor patient care

### Over triage
- Patient with no major injuries gets taken to Major Trauma Centre
- Centre has limited capacity may effect ability to treat next major trauma patient
- Delays in patient care of non acute patient
- Poor patient care
- *A level of over triage is safe*
American College of Surgeons
# Pre-Hospital Triage Protocol

## Major trauma decision tree

<table>
<thead>
<tr>
<th>Step</th>
<th>Assessment</th>
<th>Status</th>
<th>Action</th>
</tr>
</thead>
</table>
| **Step one** | **Assess vital signs and level of consciousness**  | ? Glasgow coma scale <14  
? Sustained systolic blood pressure <90  
? Respiratory rate <10 >29  | Yes to any one  
Take to nearest major trauma centre: |
| **Step two** | **Assess anatomy of injury**  
[Eight-tick test] | ? Chest injury with altered physiology  
? Traumatic amputation proximal to wrist/ankle  
? Penetrating trauma to neck, chest, abdomen, back or groin  
? Suspected open and/or depressed skull fracture  
? Suspected pelvic fracture  
? Spinal trauma suggested by abnormal neurology  
? Trauma with facial and/or circumferential burns  
? Time-critical (>20% burns)  | Yes to any one  
Take to nearest major trauma centre: |
| **Step three** | **Assess mechanism of injury**  
[Four-tick test] | ? Traumatic death in same passenger compartment  
? Falls >20ft (two stories)  
? Person trapped under vehicle including ‘one unders’  
? Bullseye windscreen and/or damage to ‘A’ post of vehicle  | Yes to any one  
Take to nearest major trauma centre: |
| **Step four** | **Assess special patient or system-consideration**  
[Four-tick test] | Patients who have sustained trauma but do not fit any of the criteria above but are:  
? Older patients (>55 years)  
? Pregnant (>20 weeks)  
? Known to have bleeding disorder  
? Morbidly obese  | Yes to any one  
Patients may benefit from going to a major trauma centre  
Contact the HEMS/Clinical support desk in EOC for further advice  |

Take to nearest trauma centre
Clinical Coordination Desk
Triage Tool positive patients by outcome
06/04/2010 to 30/11/2010
n=2,438

- Discharged: 589 (24%)
- Less severe injuries ISS 1 to 8: 125 (5%)
- Admitted but not TARN eligible: 663 (27%)
- Moderately severe injuries ISS 9 to 15: 305 (13%)
- Major trauma ISS >15: 756 (31%)
Social deprivation in London
Major Trauma incidents and social deprivation
Triage Tool positive patients by mechanism n = 1828

- RTC (627) 34%
- FALL (454) 25%
- STABBED (440) 24%
- ASSAULT (112) 6%
- OTHER (73) 4%
- UNKNOWN (66) 4%
- SHOT (56) 3%
# London Major Trauma Decision Tool (adults and children 12–18)

## Step 1: Assess vital signs and level of consciousness

- **1A** Glasgow coma score less than 14
- **1B** Sustained systolic blood pressure less than 90mmHg
- **1C** Respiratory rate less than 10 or greater than 25bpm

Convey to nearest Major Trauma Centre. Ensure pre alert call is passed on PD09.

## Step 2: Assess anatomy of injury

- **2A** Chest injury with altered physiology
- **2B** Traumatic amputation/mangled extremity proximal to wrist/ankle
- **2C** Penetrating trauma below the head above the knees (not arms)
- **2D** Suspected open and/or depressed skull fracture
- **2E** Suspected pelvic fracture
- **2F** Spinal trauma suggested by abnormal neurology
- **2G** Open fracture of the lower limb proximal to the ankle
- **2H** Burns/scaald greater than 30 percent
- **2I** Facial burns with complete skin loss to lower half of face
- **2J** Circumferential burns from a flame injury

Convey to nearest Major Trauma Centre. Ensure pre alert call is passed on PD09.

## Step 3: Assess mechanism of injury

- **3A** Traumatic death in same passenger compartment
- **3B** Falls >20 ft. (two storeys)
- **3C** Person trapped under vehicle or large object (including ‘one unders’)
- **3D** Bullseye to the windscreen and/or damage to the ‘A’ post of the vehicle caused by impact of individual outside of the vehicle

Convey to nearest Major Trauma Centre. Ensure pre alert call is passed on PD09.

## Step 4: Assess special patient consideration

Patients who have sustained trauma but do not fit any of the above criteria but are:

- **4A** Older patients (>55 years)
- **4B** Pregnant (>20 weeks)
- **4C** Known to have bleeding disorder or receiving current anti-coagulation therapy e.g. warfarin or novel oral anticoagulant agent
- **4D** Morbidly obese

Convey to nearest Major Trauma Centre. Contact The Clinical Hub on PD09.

## Step 5: Assess system consideration

Patients who have sustained trauma but do not fit any of the above criteria but there is:

- **5A** Significant crew concern only when discussed with a Trauma Paramedic within EOC

Convey to nearest Major Trauma Centre. Contact The Clinical Hub on PD09.
# London Major Trauma Decision Tool (children under 12)

## Step 1: Assess vital signs and level of consciousness
- **6A** Glasgow coma score less than 14
- **6B** Inappropriate behaviour post injury (too quiet or inconsolable)
- **6C** Abnormal vital signs not explained by other cause for example crying, pain responses

Yes to any one → Convey to nearest Major Trauma Centre. Ensure pre alert call is passed on PD09.

## Step 2: Assess anatomy of injury
- **7A** Significant bruising to chest or abdomen
- **7B** Traumatic amputation/mangled extremity proximal to wrist/ankle
- **7C** Penetrating trauma below the head above the knees (not arms)
- **7D** Suspected open and/or depressed skull fracture
- **7E** Suspected pelvic fracture
- **7F** Significant degloving (soft tissue) injury
- **7G** Spinal trauma suggested by abnormal neurology
- **7H** Open long bone fracture (with significant soft tissue injury)
- **7I** Multiple fractures (long bone)
- **7J** Burns/scald greater than 20 percent
- **7K** Facial burns with complete skin loss to lower half of face
- **7L** Circumferential burns from a flame injury

Yes to any one → Convey to nearest Major Trauma Centre. Ensure pre alert call is passed on PD09.

## Step 3: Assess mechanism of injury
- **8A** Traumatic death in same passenger compartment
- **8B** Uninterrupted fall over twice the patient's height (not bouncing down stairs)
- **8C** Person trapped under vehicle or large object (including 'one unders') crying, pain responses
- **8D** Bullseye to the windscreen and/or damage to the 'A' post of the vehicle by impact of individual outside of the vehicle
- **8E** Bicycle injury resulting in abdominal and/or groin pain (thrown from or impacted on handle bars)
- **8F** Ejection from inside car, van or lorry
- **8G** Fall from or trampled by large animal

Yes to any one → Convey to nearest Major Trauma Centre. Ensure pre alert call is passed on PD09.

## Step 4: Assess special patient consideration. Patients who have sustained trauma but do not fit any of the above criteria but are:
- **9A** Known to have bleeding disorder or receiving current anti-coagulation therapy e.g. warfarin or novel oral anticoagulant agent

Yes to any one → Patient may benefit from going to a Major Trauma Centre. Contact The Clinical Hub on PD09.

## Step 5: Assess system consideration. Patients who have sustained trauma but do not fit any of the above criteria but there is:
- **0A** Significant crew concern only when discussed with a Trauma Paramedic within EDC

Yes to any one → Patient may benefit from going to a Major Trauma Centre. Contact The Clinical Hub on PD09.

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### Children's Vital Signs

<table>
<thead>
<tr>
<th>Respiratory rate</th>
<th>Age</th>
<th>Rate/min</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>&lt;1 year</td>
<td>30–40</td>
</tr>
<tr>
<td></td>
<td>1–2 years</td>
<td>25–30</td>
</tr>
<tr>
<td></td>
<td>2–5 years</td>
<td>25–30</td>
</tr>
<tr>
<td></td>
<td>5–11 years</td>
<td>20–25</td>
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<table>
<thead>
<tr>
<th>Pulse rate</th>
<th>Age</th>
<th>Rate/min</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;1 year</td>
<td>110–150</td>
</tr>
<tr>
<td></td>
<td>1–2 years</td>
<td>100–150</td>
</tr>
<tr>
<td></td>
<td>2–5 years</td>
<td>95–140</td>
</tr>
<tr>
<td></td>
<td>5–11 years</td>
<td>80–120</td>
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### Glasgow Coma Score

<table>
<thead>
<tr>
<th>Eye opening</th>
<th>Score</th>
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<tbody>
<tr>
<td>Spontaneous</td>
<td>4</td>
</tr>
<tr>
<td>To speech</td>
<td>3</td>
</tr>
<tr>
<td>To pain</td>
<td>2</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
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</table>

<table>
<thead>
<tr>
<th>Verbal response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientated</td>
<td>5</td>
</tr>
<tr>
<td>Confused</td>
<td>4</td>
</tr>
<tr>
<td>Inappropriate words</td>
<td>3</td>
</tr>
<tr>
<td>Incomprehensible sounds</td>
<td>2</td>
</tr>
<tr>
<td>No verbal response</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Motor response</th>
<th>Score</th>
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</thead>
<tbody>
<tr>
<td>Obeys commands</td>
<td>6</td>
</tr>
<tr>
<td>Localised pain</td>
<td>5</td>
</tr>
<tr>
<td>Vomits pain</td>
<td>4</td>
</tr>
<tr>
<td>Abnormal flexion</td>
<td>3</td>
</tr>
<tr>
<td>Extensor response</td>
<td>2</td>
</tr>
<tr>
<td>No response</td>
<td>1</td>
</tr>
</tbody>
</table>

### Modified verbal response <4 years old

<table>
<thead>
<tr>
<th>Appropriate words, social smiles, likes and follows objects</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Cries but is consolable</td>
<td>4</td>
</tr>
<tr>
<td>Persistent irritable</td>
<td>3</td>
</tr>
<tr>
<td>Restless, agitated</td>
<td>2</td>
</tr>
<tr>
<td>Silent</td>
<td>1</td>
</tr>
</tbody>
</table>