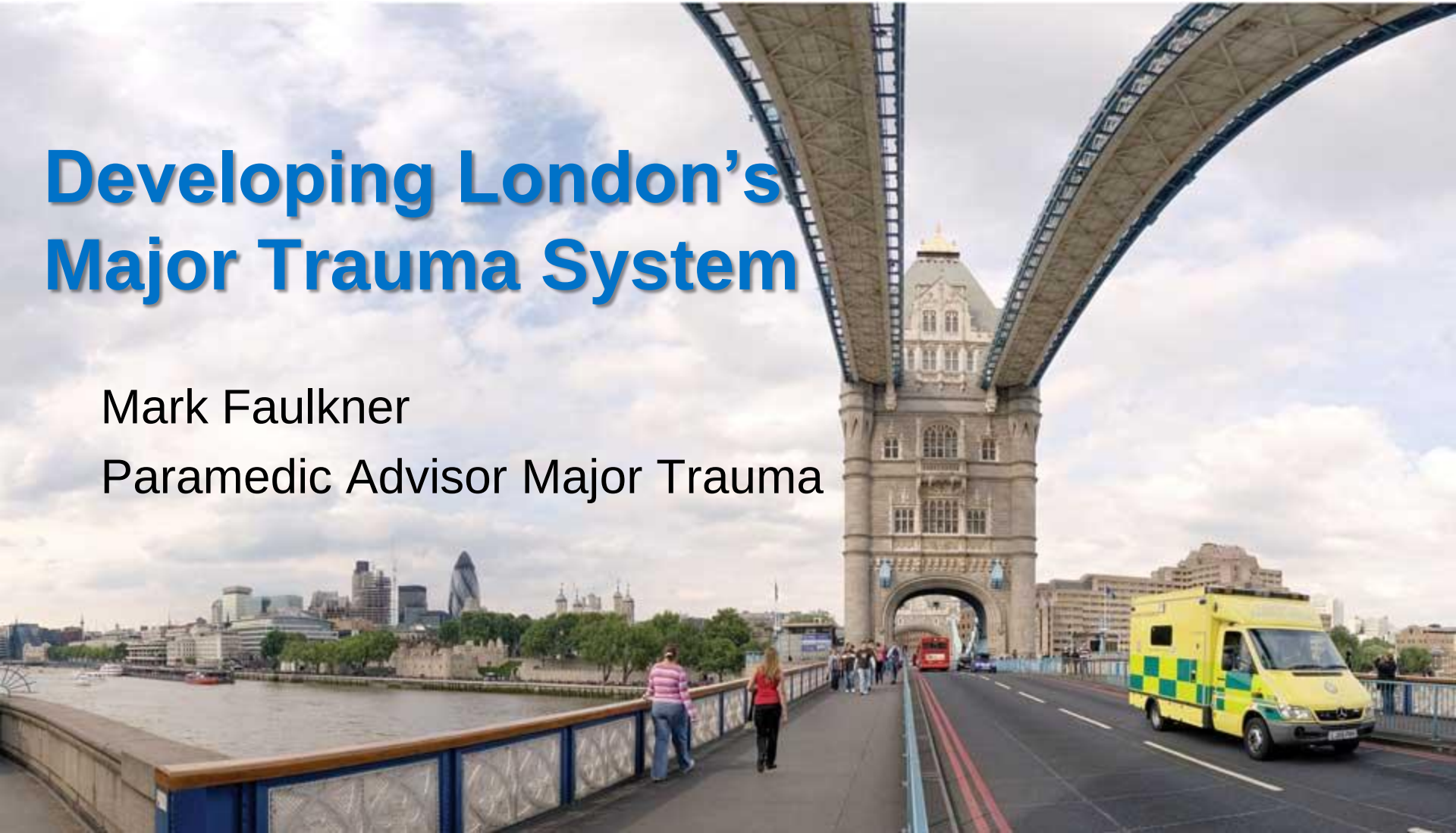
London Ambulance Service
NHS Trust

Developing London's Major Trauma System

Mark Faulkner
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)


London Ambulance Service NHS
NHS Trust
West
East
South
Chase Farm
Chase Farm H1
Ponders End H4
Friern Barnet
Barnet D2
Mill Hill C8
Friern Barnet D4
Edmonton
Edmonton H3
North Middlesex
Bounds Green H2
Tottenham H5
Whipps Cross
Whipps Cross J3
King George's
Walthamstow J4
Ilford K3
Romford
Romford K4
Queen's
Hornchurch K5
Pinner
Harefield
Ruislip B7
Pinner B6
Northwick Park
Kenton C1
Wembley C6
Central Middlesex
Brent
Brent C3
Camden
Whittington
Royal Free
Camden E3
Islington G1
City & Hackney (Homerton)
Homerton
Homerton G3
Cody Road
HART
Newham
West Ham J2
Newham K1
Becontree K2
Hillingdon
Hillingdon B5
Greenford B1
Hayes B2
Hanwell
Hanwell B3
Ealing
Hammersmith
Chiswick C2
North Kensington C4
St John's Wood E2
St Mary's
The Heart
Bloomsbury
University College
Smithfield G5
Shoreditch G4
The London Chest Hospital
Bow J1
Royal London
Poplar J1
Tower Hamlets (Silvertown)
Silvertown J5
Fulham
Chelsea & Westminster
Westminster F1
Waterloo N3
Rotherhithe N2
Char X
Fulham F2
Oval Q3
Deptford
King's College
Deptford N1
Woolwich L5
Queen Elizabeth Military
Greenwich L2
Barnehurst
Barnehurst L1
Lee N4
Lewisham
Mottingham L3
Heathrow Airport A4
West Middlesex
Clock Tower Road
HART
Feltham A1
Isleworth A2
Isleworth
Richmond S2
Twickenham A3
Putney Q4
Battersea Q1
Brixton Q2
Streatham P3
Forest Hill N6
St George's
Wimbledon
Wimbledon R3
Kingston
New Malden S1
New Malden
Tolworth S3
St Helier R1
St Helier
Sutton R2
Mayday
Croydon M2
South Croydon P2
Coulsdon P1
New Addington M3
Croydon
Beckenham M4
Bromley M1
Princess Royal
Bromley
St Pauls Cray L4
London-wide complex map
Key
Main station
Station
Workshop
Hospital
Major trauma centre
Cardiac centre
Stroke centre
Complex area
Area

What is Major Trauma?

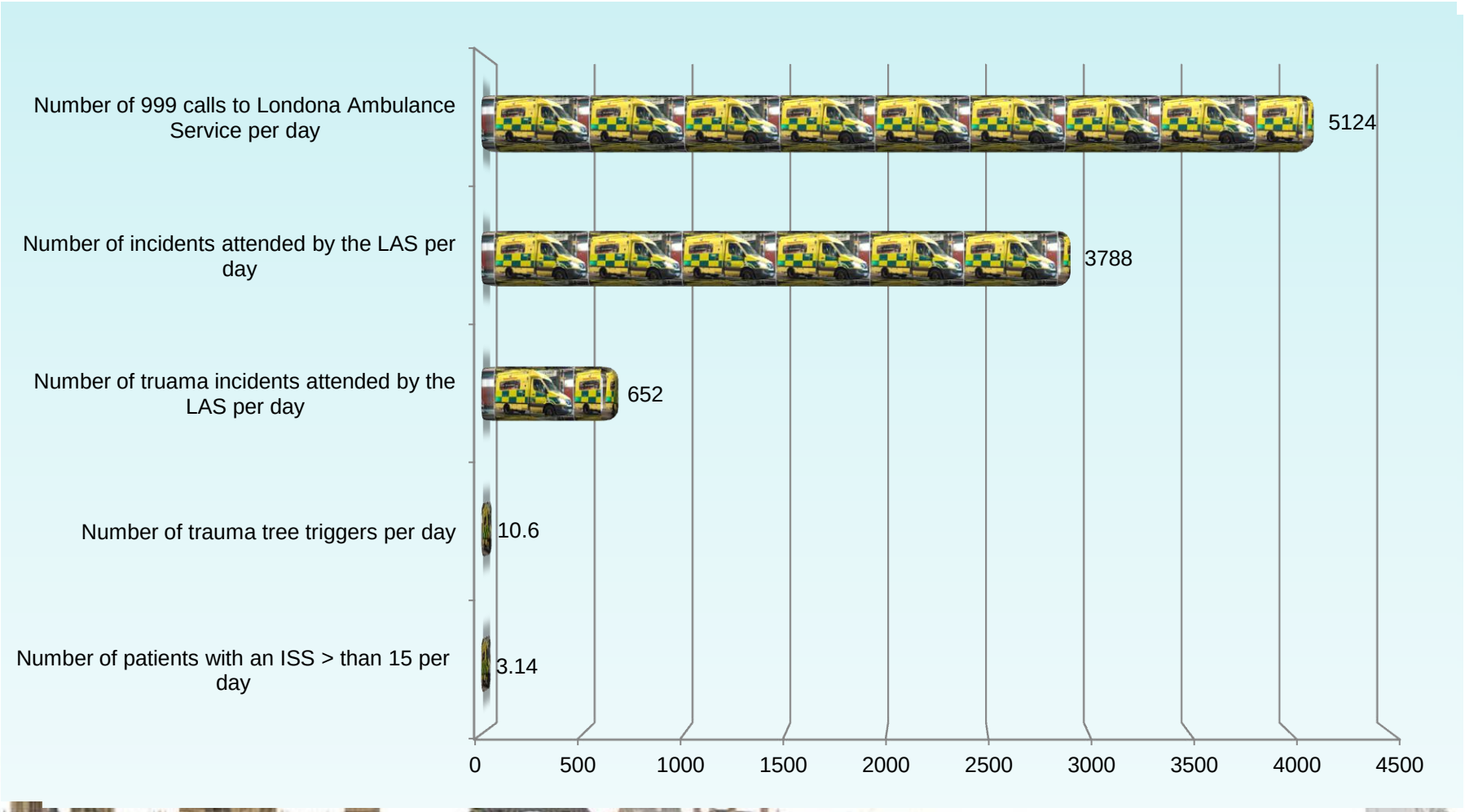
- Catastrophic and serious injuries
- Often multiple injuries affecting multiple body compartments
- ISS >15 (circa 10 percent mortality)

- 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

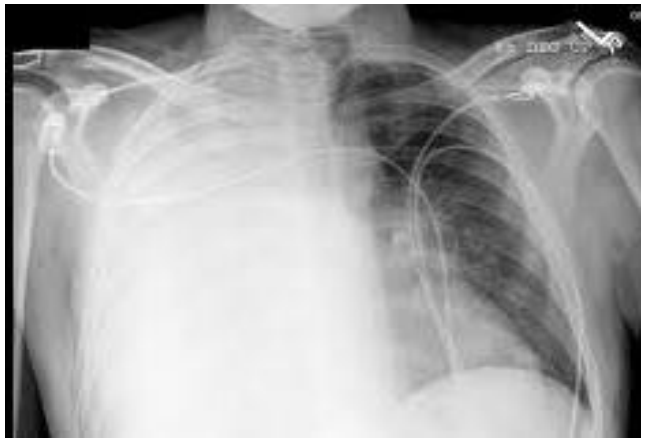
July 2006

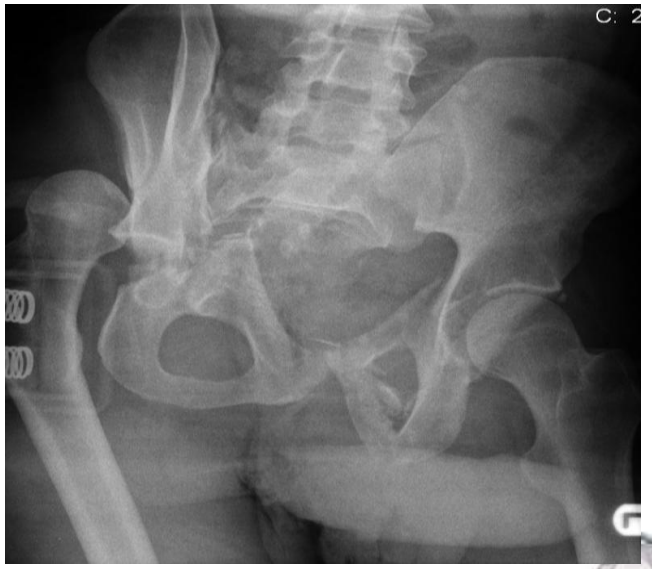
- 0630 hrs
- West London
- 30 year old male leaving for an early meeting
- As he crosses the road is hit by a car travelling at 35mph
- Impact with windscreen thrown 10m down road

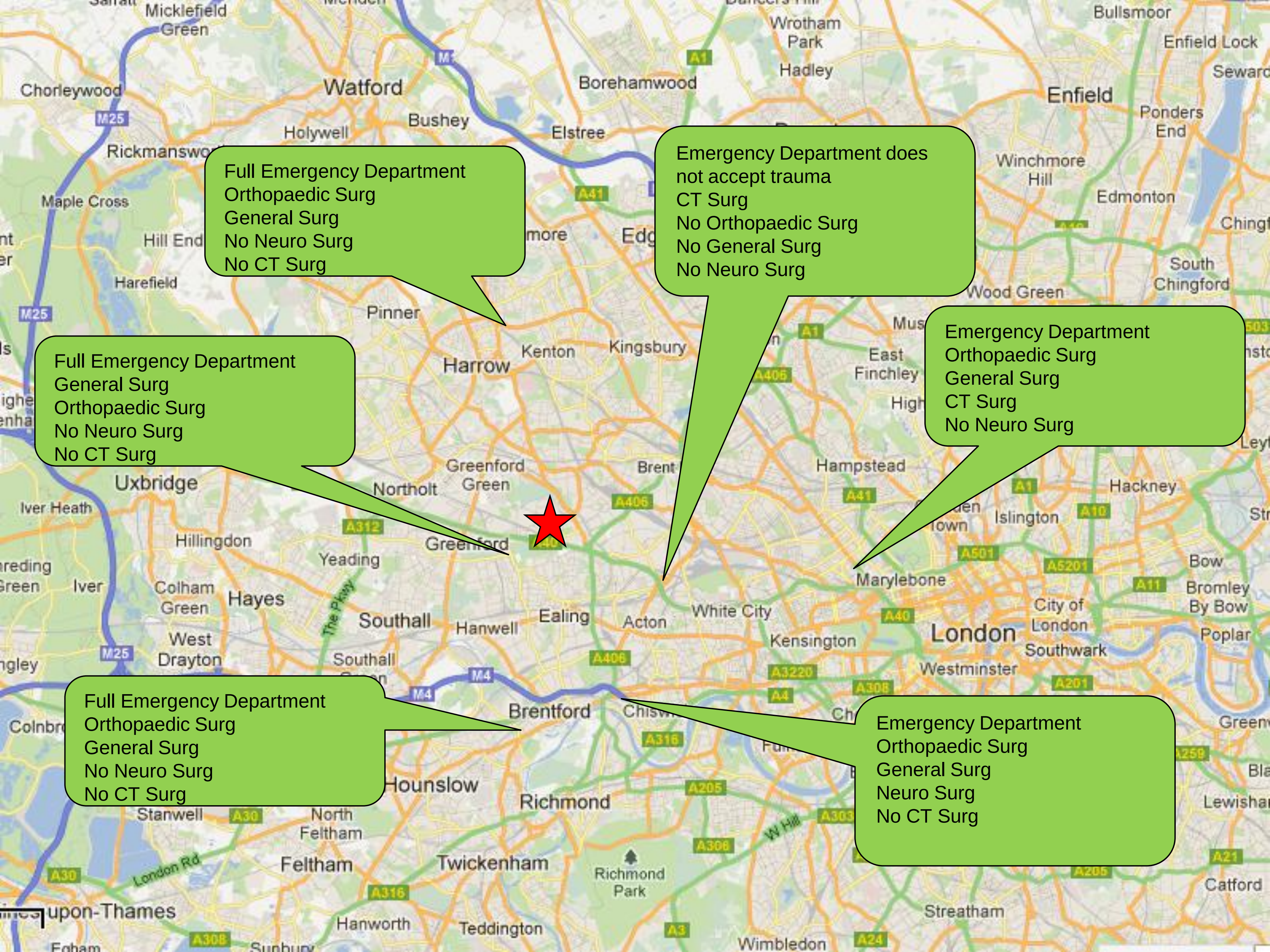
July 2006

- 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






Full Emergency Department
Orthopaedic Surg
General Surg
No Neuro Surg
No CT Surg
Emergency Department does not accept trauma
CT Surg
No Orthopaedic Surg
No General Surg
No Neuro Surg
Full Emergency Department
General Surg
Orthopaedic Surg
No Neuro Surg
No CT Surg
Emergency Department
Orthopaedic Surg
General Surg
CT Surg
No Neuro Surg
Full Emergency Department
Orthopaedic Surg
General Surg
No Neuro Surg
No CT Surg
Emergency Department
Orthopaedic Surg
General Surg
Neuro Surg
No CT Surg
Micklefield Green
Wrotham Park
Hadley
Bullsmoor
Enfield Lock
Chorleywood
Watford
Borehamwood
Enfield
Bushey
Holywell
Elstree
Ponders End
Winchmore Hill
Edmonton
Maple Cross
Hill End
Harefield
South Chingford
Wood Green
Pinner
Kenton
Kingsbury
East Finchley
Harrow
Uxbridge
Northolt
Greenford Green
Brent
Hampstead
Hackney
Iver Heath
Islington
Hillingdon
Yeading
Greenford
Bow
Marylebone
Iver
Colham Green
Hayes
Bromley By Bow
Southall
Hanwell
Ealing
Acton
White City
City of London
West Drayton
Kensington
London
Poplar
Southwark
Westminster
Brentford
Hounslow
Richmond
Stanwell
North Feltham
Feltham
Twickenham
Richmond Park
Lewisham
Catford
upon-Thames
Hanworth
Teddington
Streatham
Wimbledon

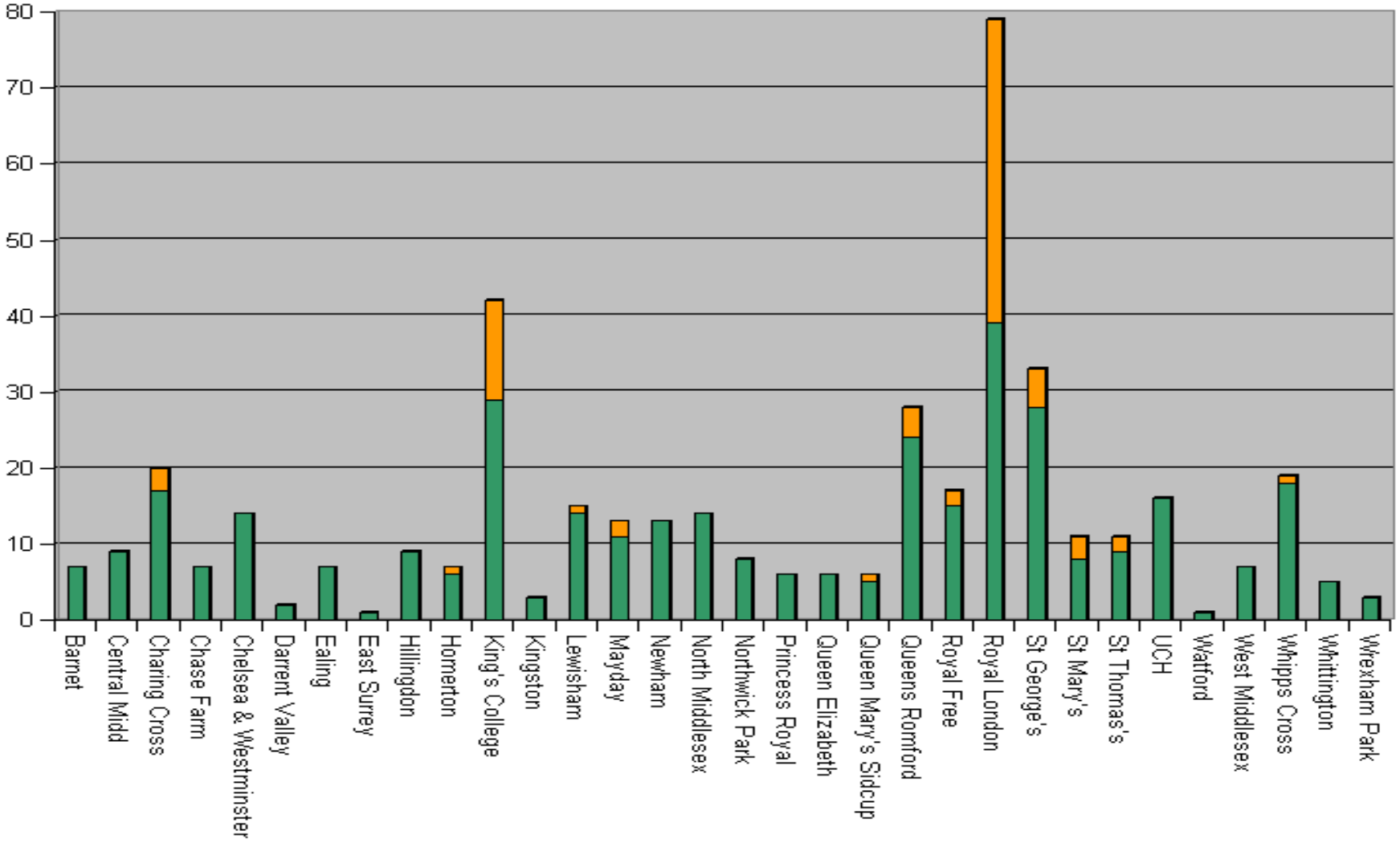
Case for Change

NCEPOD (trauma – who cares) 2007

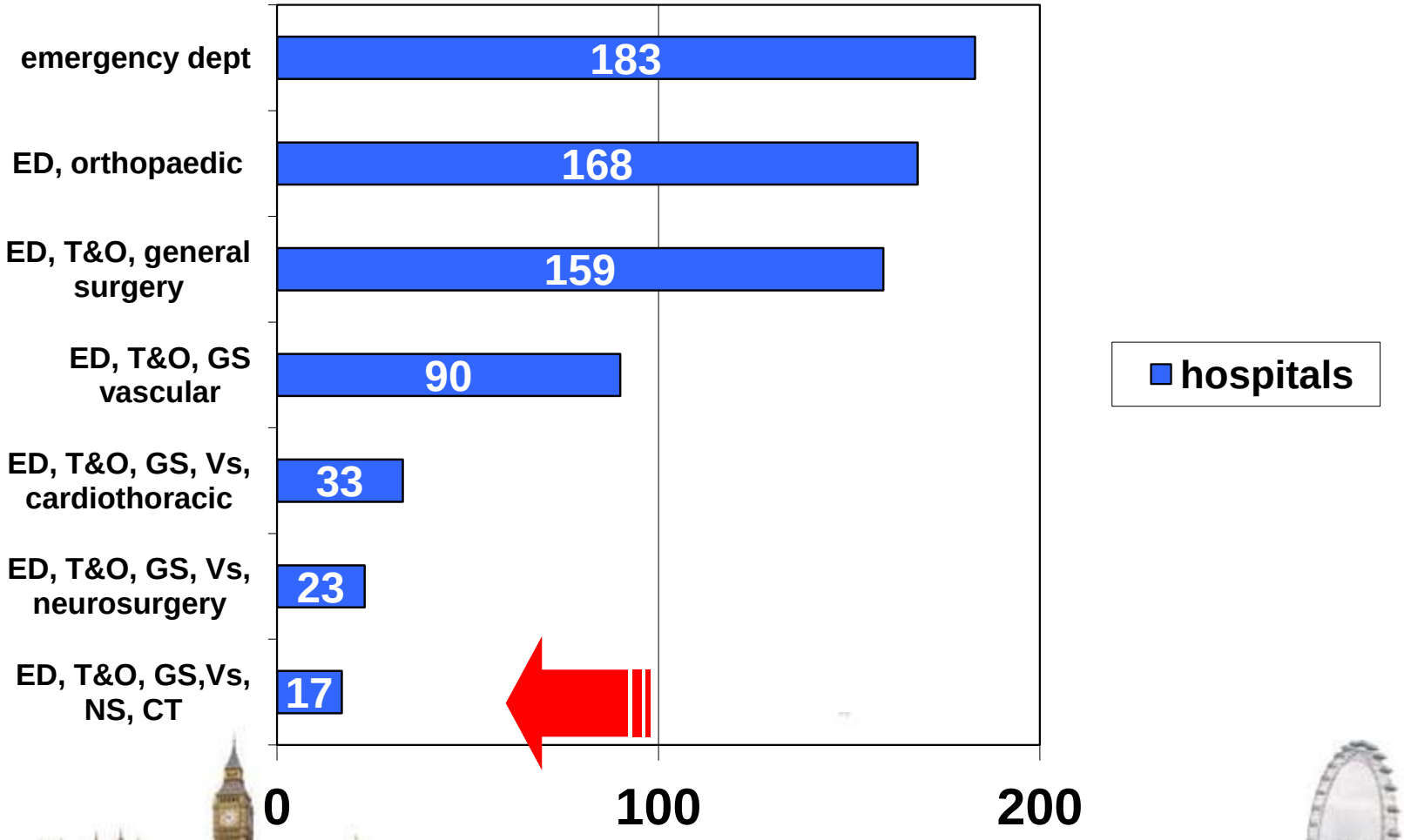
60% of severely injured patients received sub-optimal care.

- 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

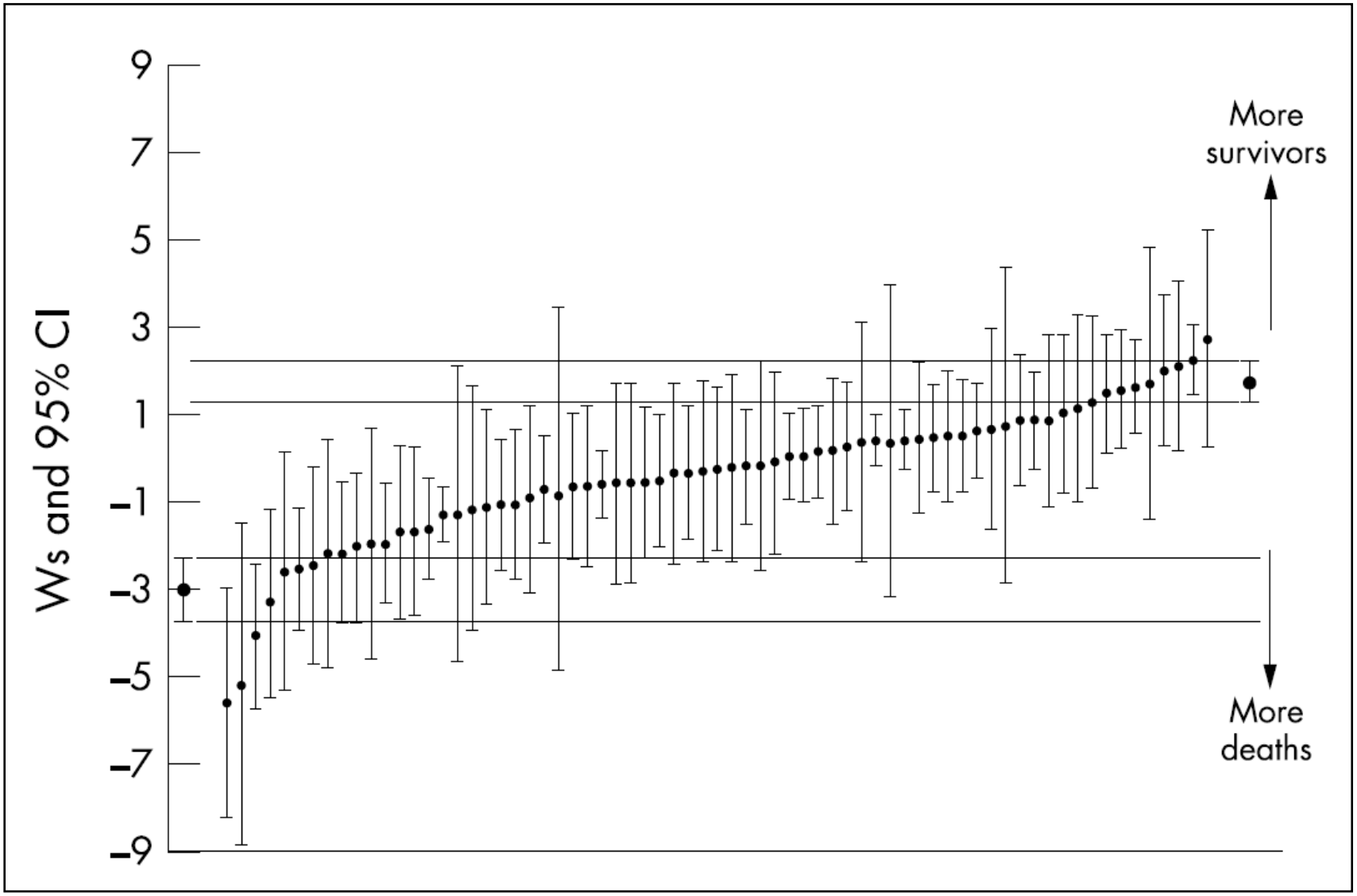
Trauma workload by London HEMS & LAS into London Emergency Departments Between 9th – 29th March 2009



The mismatch?



Variance in UK Hospital Trauma Outcomes

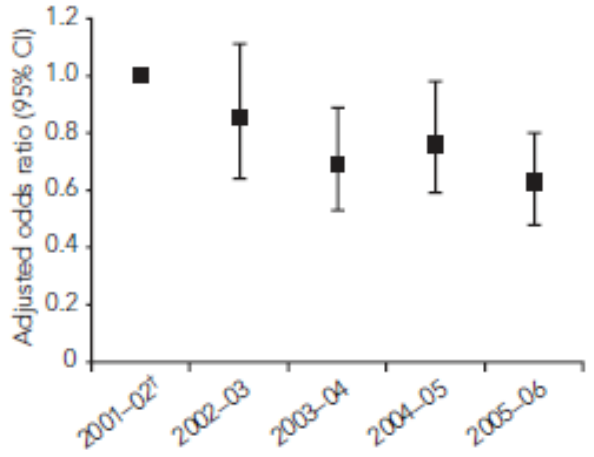


Case for Change

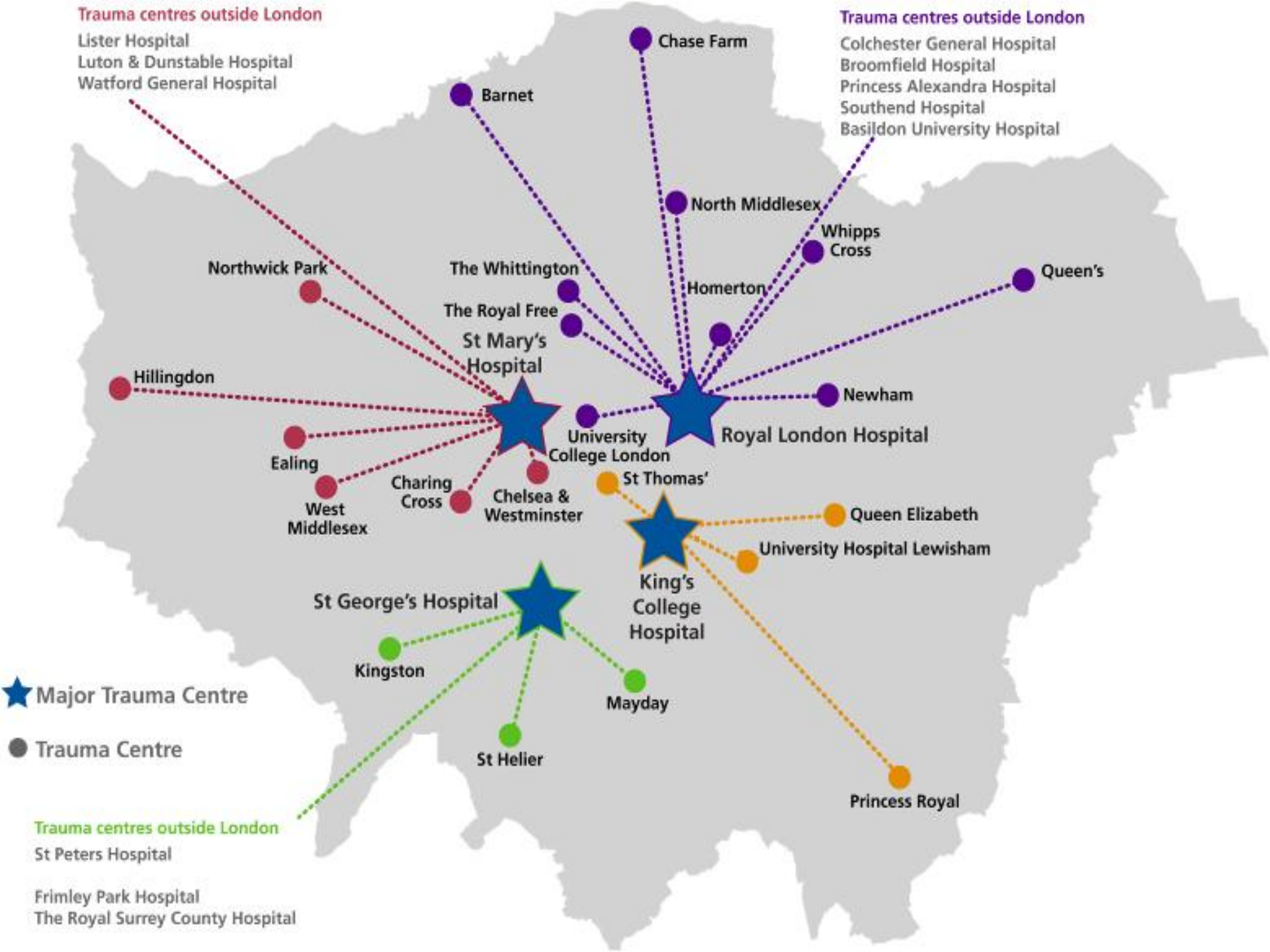
Victoria, Australia: established Trauma System – 8 years of data

- Unadjusted in-hospital death rate fell from 15% 2001-2002 to 11% 2005 - 2006

4 Adjusted odds ratios for death in hospitalised patients admitted with major trauma* in Victoria, 2001–2006, by year



* Injury Severity Score > 15. † Reference category. ◆

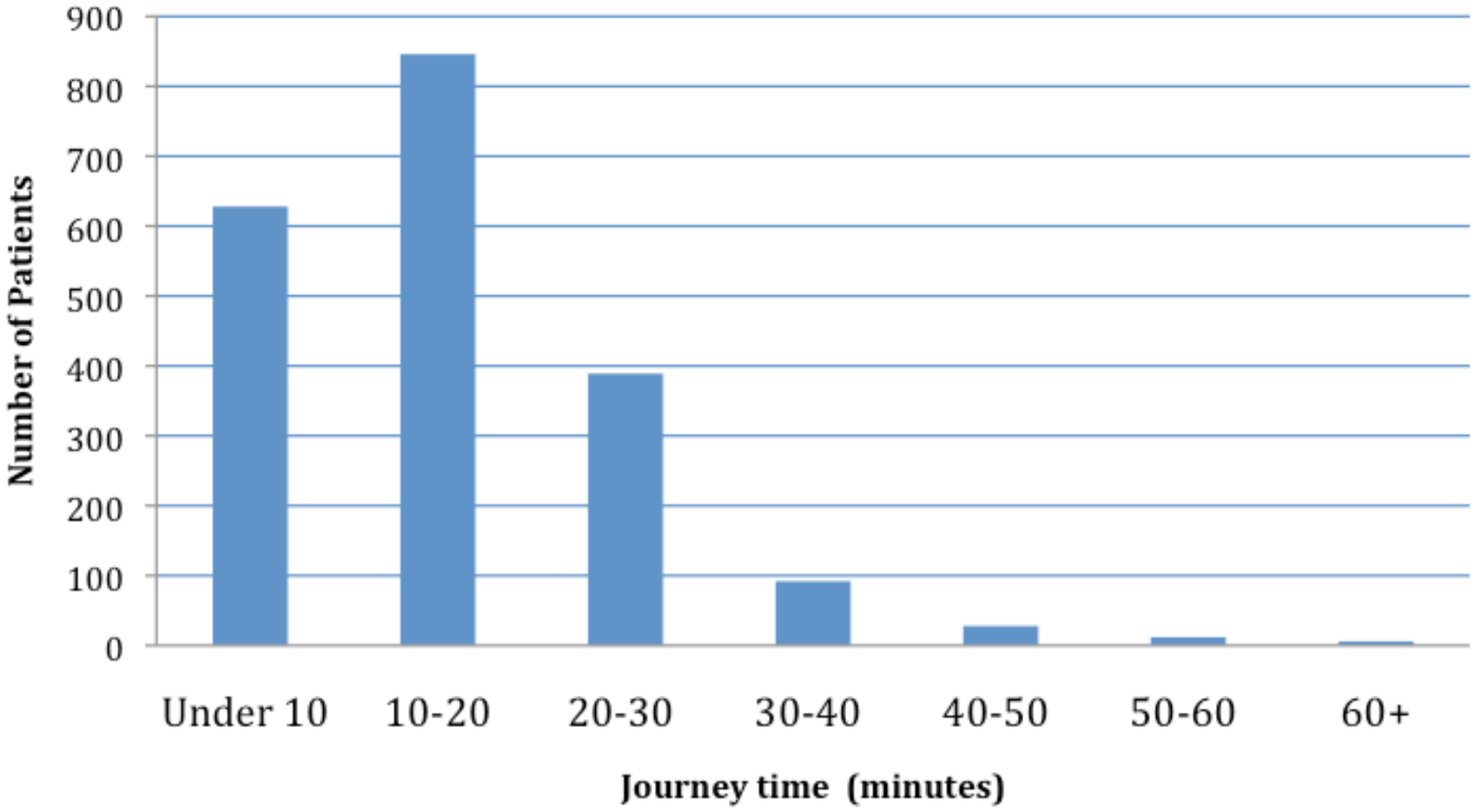

Trauma centres outside London
Lister Hospital
Luton & Dunstable Hospital
Watford General Hospital
Trauma centres outside London
Colchester General Hospital
Broomfield Hospital
Princess Alexandra Hospital
Southend Hospital
Basildon University Hospital
Chase Farm
Barnet
North Middlesex
Whipps Cross
Queen's
Homerton
Northwick Park
The Whittington
The Royal Free
St Mary's Hospital
Hillingdon
Newham
University College London
Royal London Hospital
Ealing
West Middlesex
Charing Cross
Chelsea & Westminster
St Thomas'
Queen Elizabeth
University Hospital Lewisham
King's College Hospital
St George's Hospital
Kingston
Mayday
St Helier
Princess Royal
Major Trauma Centre
Trauma Centre
Trauma centres outside London
St Peters Hospital
Frimley Park Hospital
The Royal Surrey County Hospital

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

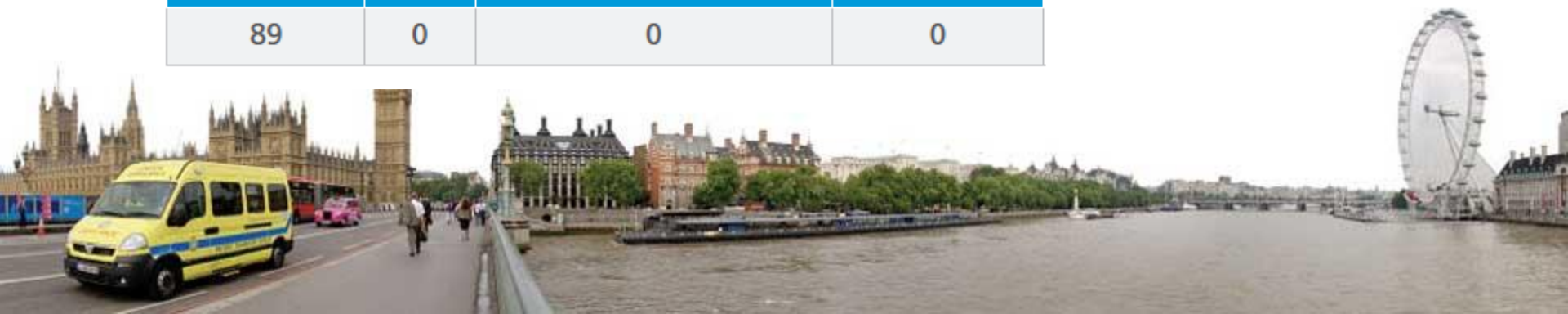
Consultant	STR	Foundation Year/Other	Not recorded
348	3	0	11

MOST SENIOR DOCTOR IN THE EMERGENCY DEPARTMENT

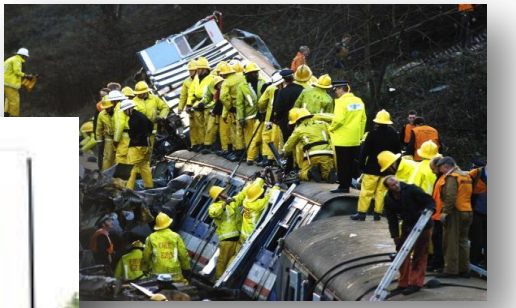
Consultant	STR	Foundation Year/Other	Not recorded
195	50	3	14

MOST SENIOR DOCTOR IN THE EMERGENCY DEPARTMENT JANUARY –MARCH 2011

Consultant	STR	Foundation Year/Other	Not recorded
89	0	0	0



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

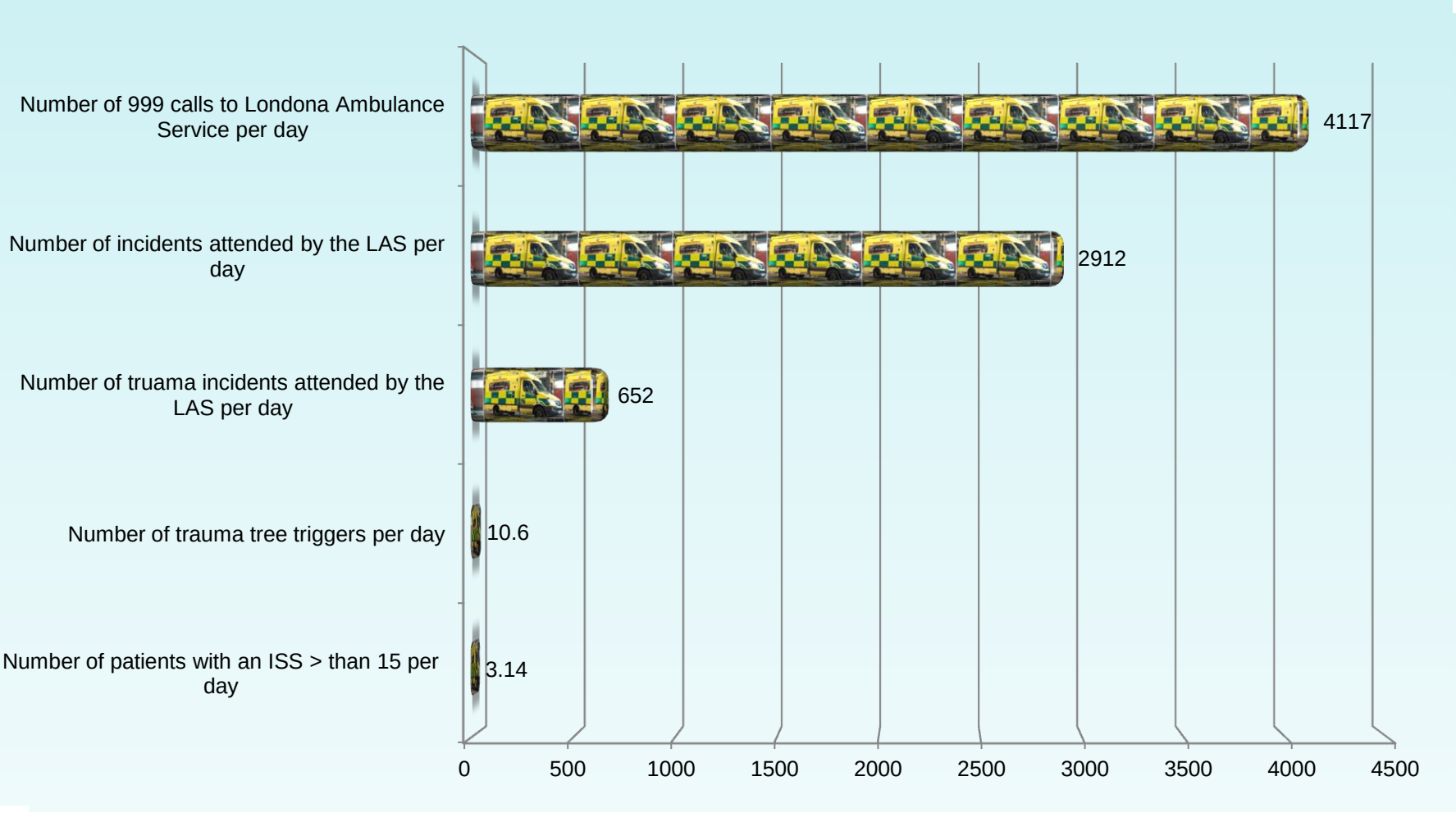
- 34 year old male
- Tree surgeon
- Large branch falls onto head
- Initially alert and chatting to crew
- Crew prepare to convey to nearest
- Starts to become drowsy

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

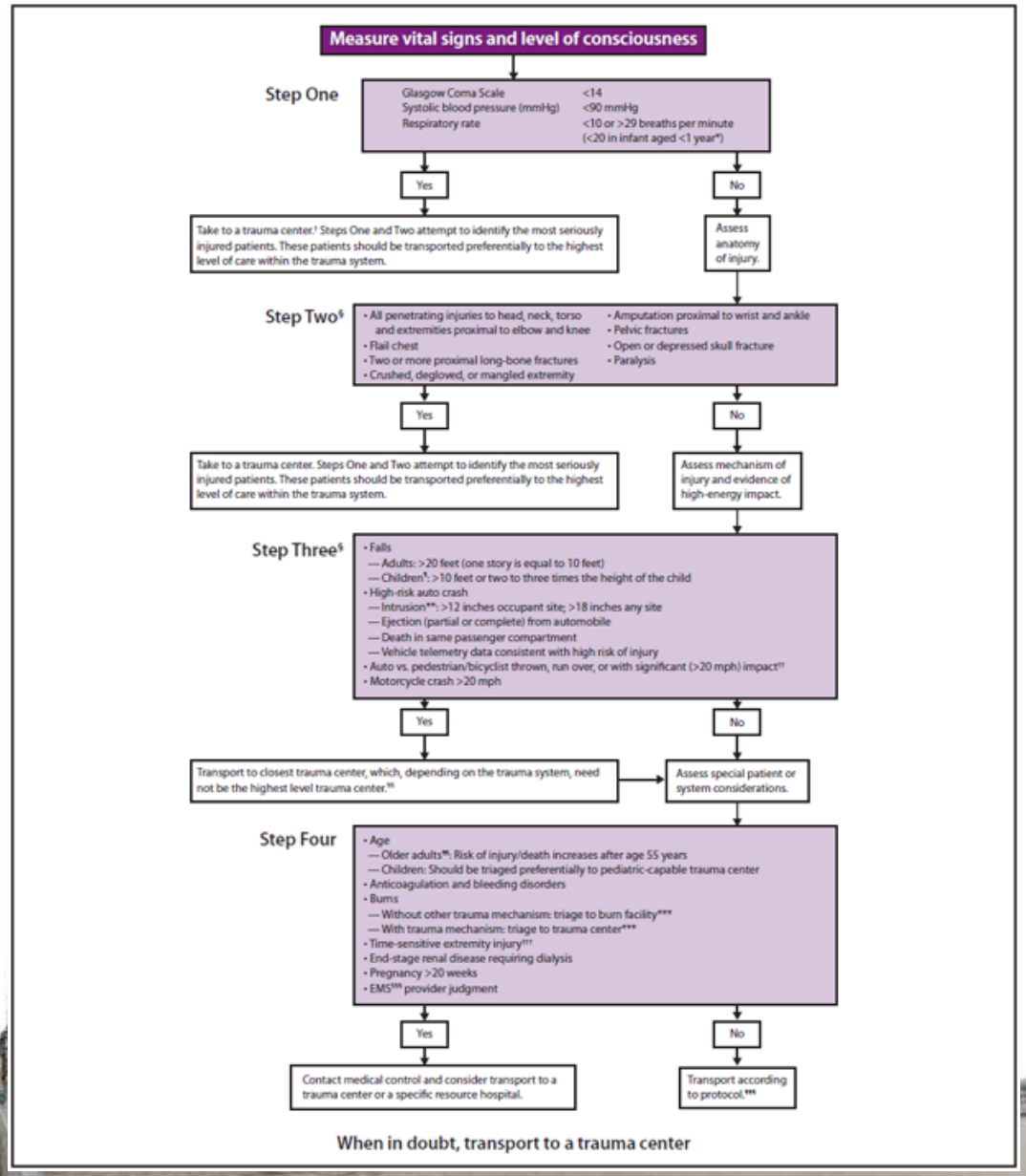
Under triage

- 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

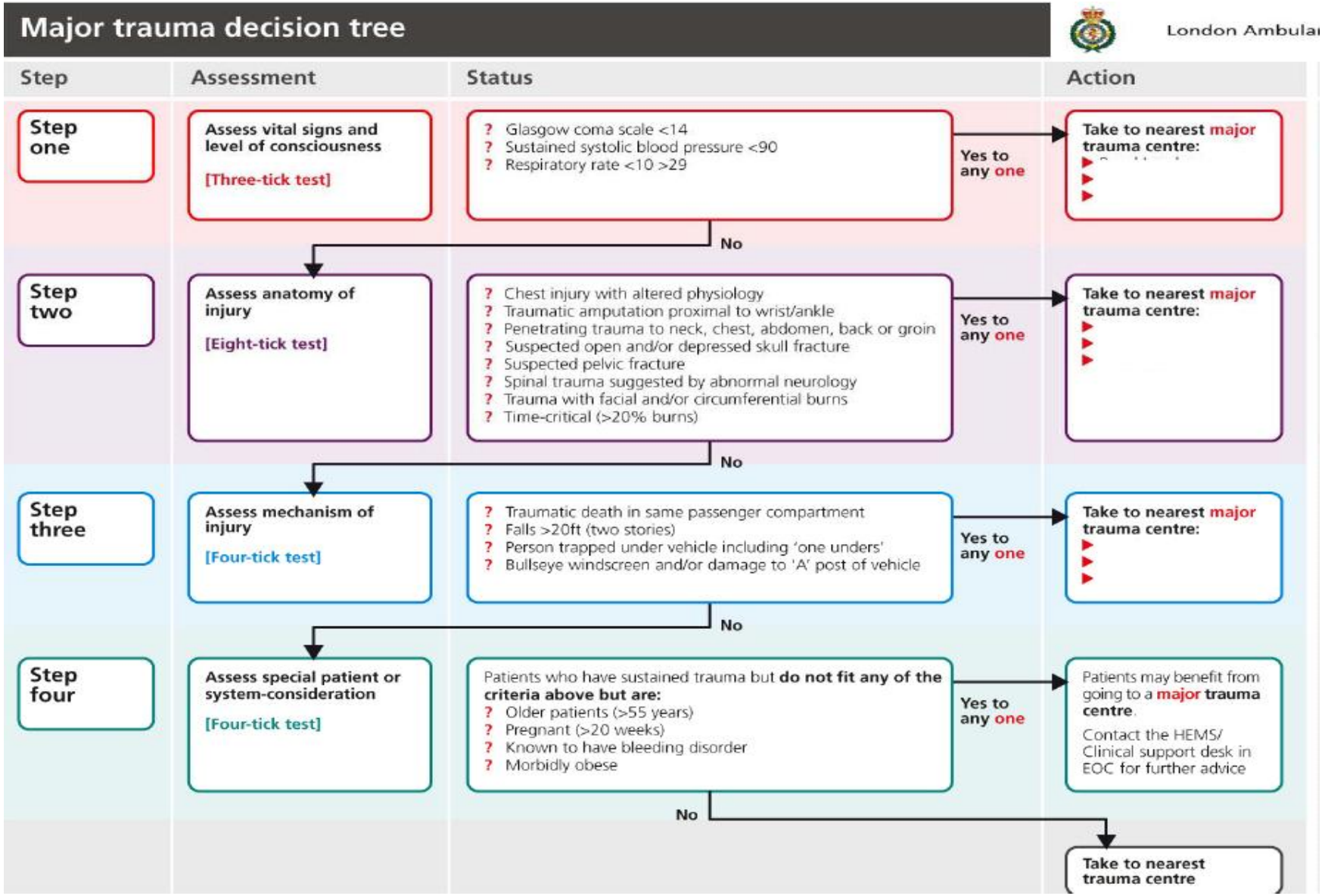
Over triage

- 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

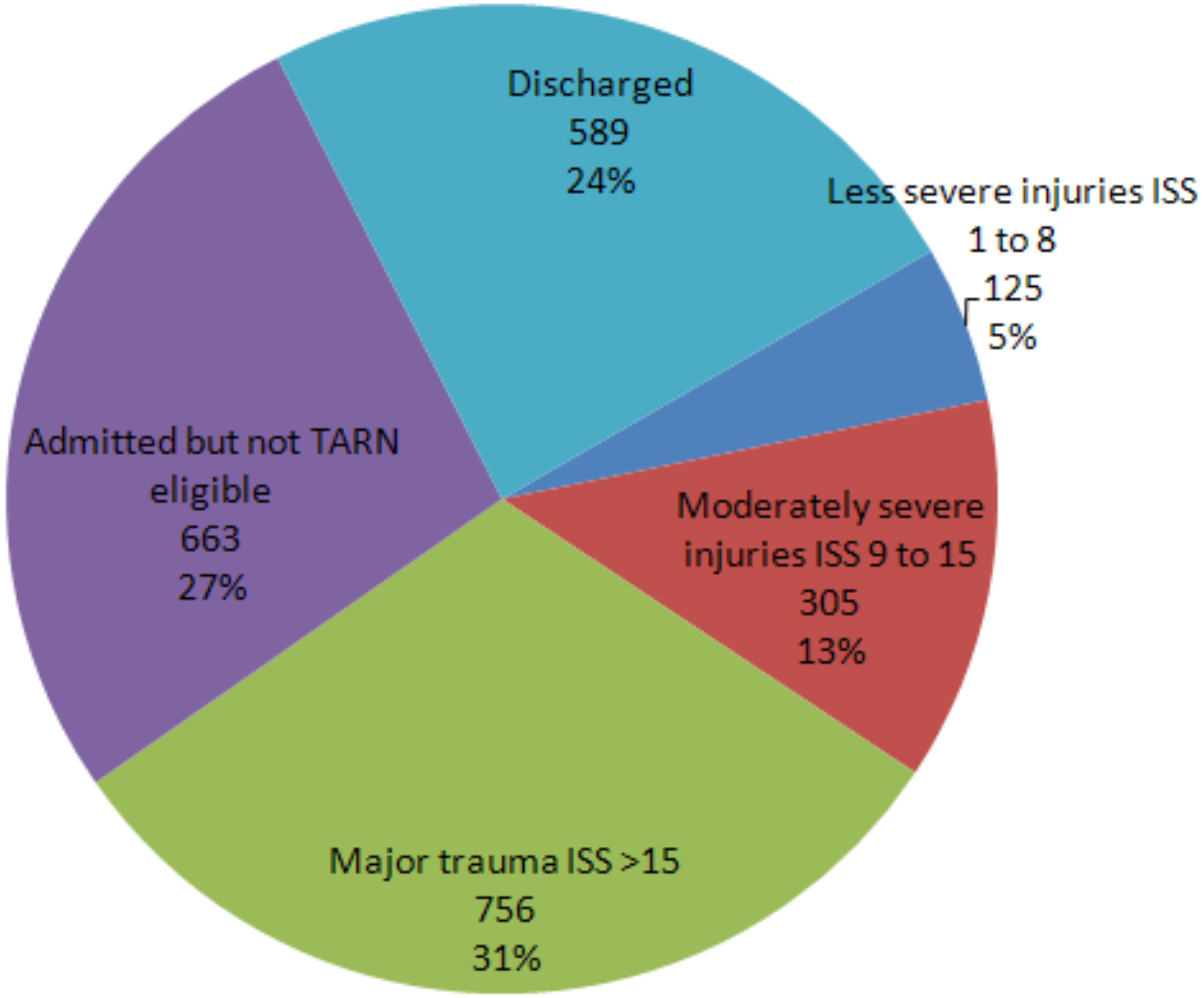


Pre-Hospital Triage Protocol

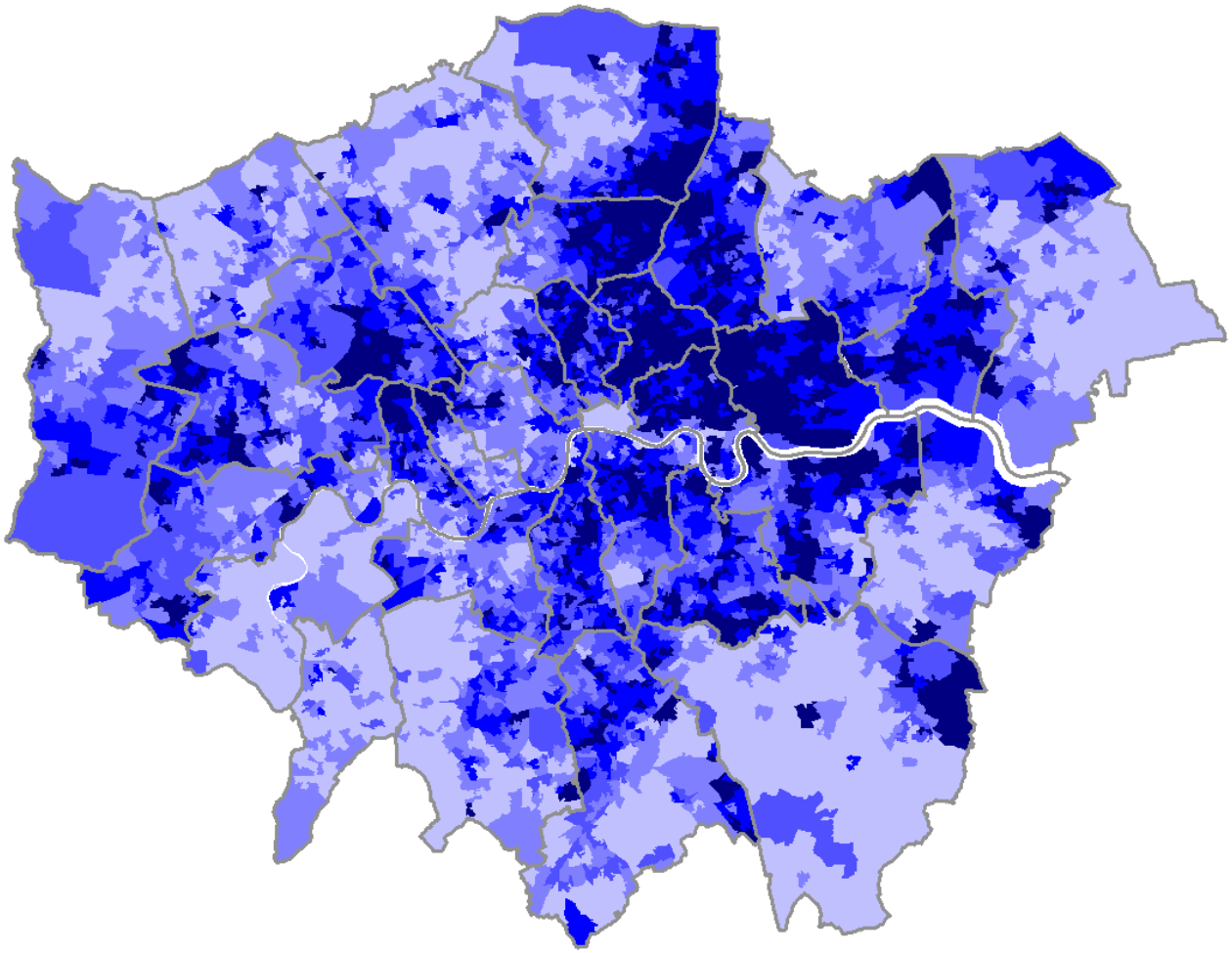


Clinical Coordination Desk

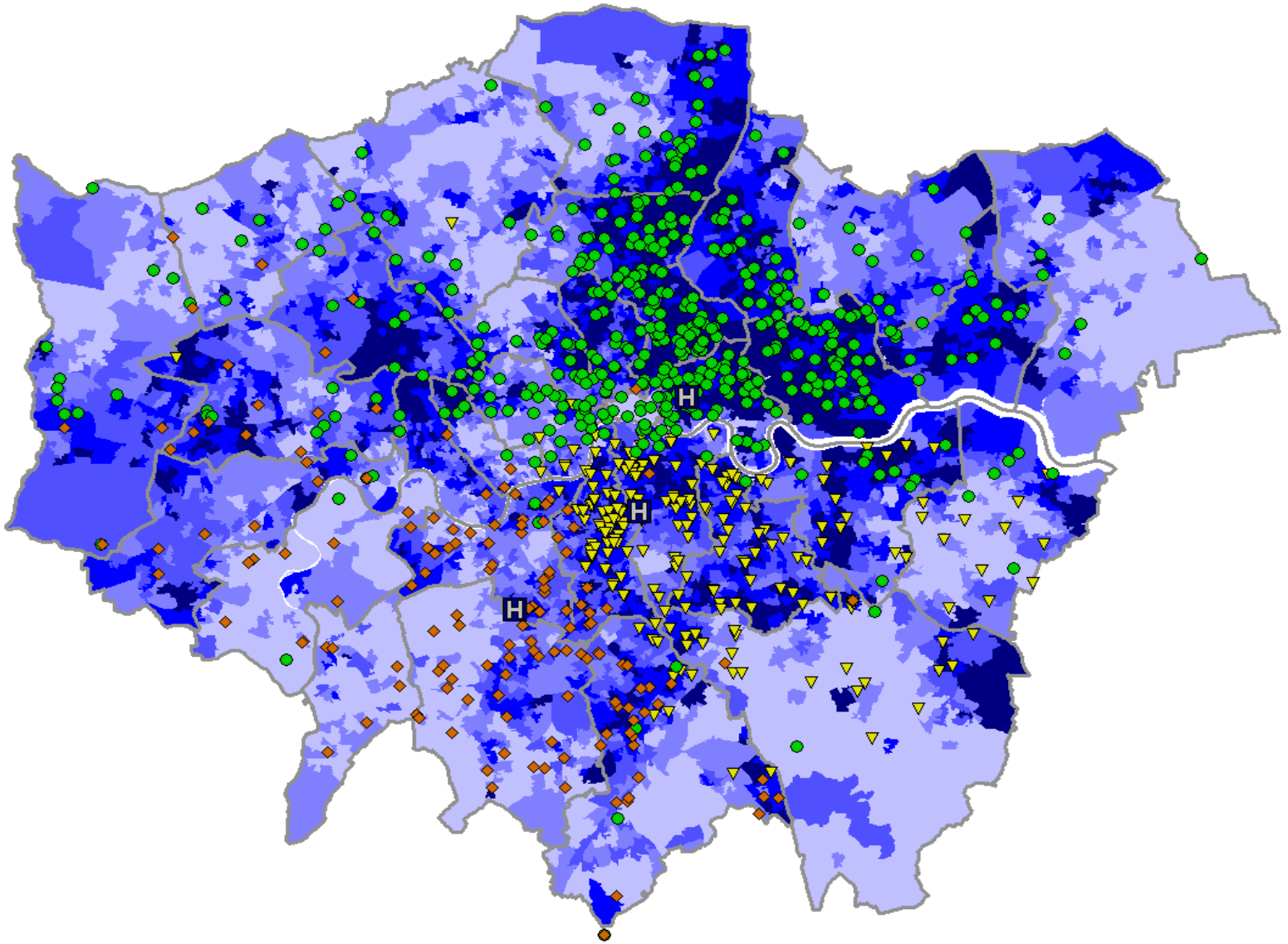
Triage Tool positive patients by outcome
06/04/2010 to 30/11/2010
n=2,438



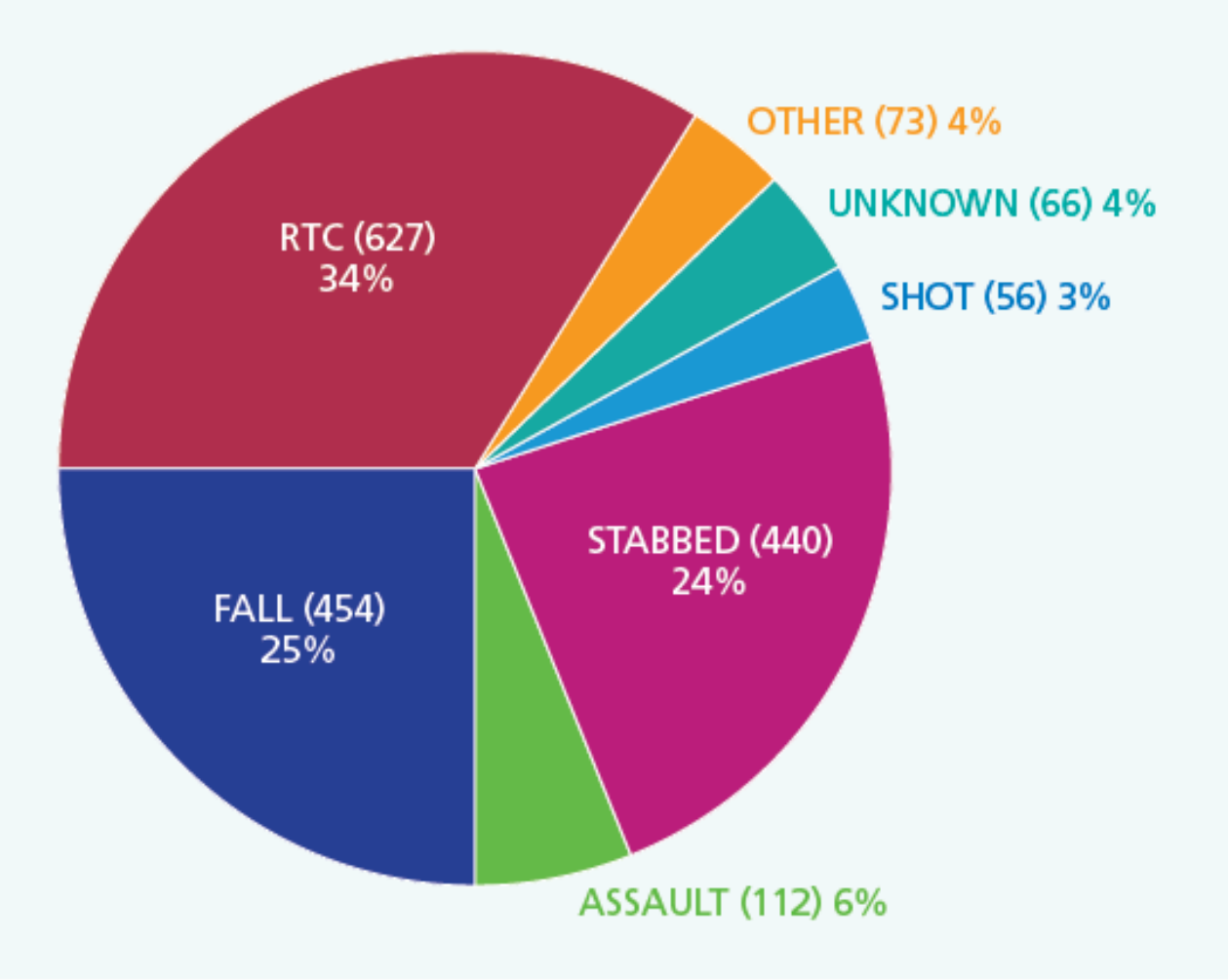
Social deprivation in London



Major Trauma incidents and social deprivation



Triage Tool positive patients by mechanism n = 1828



London Ambulance Service NHS
NHS Trust

London Trauma Office NHS

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 29bpm

Yes to any one → 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/scald greater than 30 percent
- **2I** Facial burns with complete skin loss to lower half of face
- **2J** 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

- **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

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:

- **4A** Older patients (>55years)
- **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

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:

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

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

Should the airway become compromised and cannot be managed consider conveying /diverting to the nearest Trauma Unit

Handover and pre-alert call

- **C** CAD
- **A** Age of patient
- **T** Time of injury
- **M** Mechanism of injury
- **I** Injuries found and suspected
- **S** Signs (vital)
- **T** Treatment given or required

Only patients triggering the trauma tree should be taken to a Major Trauma Centre, unless the patient is within the normal catchment of that emergency department. In this case you note L.T in the trauma tree trigger box on the PRF.

Is your patient at risk of significant bleeding?
Signs of Shock (diaphoretic)?
Consider Tranexamic Acid.
Do not delay on scene.

Sponsored by an educational grant from Prometheus Medical, supplier of trauma equipment to the London Ambulance Service NHS Trust.

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 EOC

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

Children's Vital Signs

Respiratory rate

Age	Breaths/min
<1 year	30–40
1–2 years	25–30
2–5 years	25–30
5–11 years	20–25

Pulse rate

Age	Beats/min
<1 year	110–160
1–2 years	100–150
2–5 years	95–140
5–11 years	80–120

Glasgow Coma Score

Eye opening

Spontaneous	4
To speech	3
To pain	2
None	1

Verbal response

Orientated	5
Confused	4
Inappropriate words	3
Incomprehensible sounds	2
No verbal response	1

Motor response

Obeys commands	6
Localised pain	5
Withdraws pain	4
Abnormal flexion	3
Extensor response	2
No response	1

Modified verbal response >4 years old

Appropriate words, social smiles, fixes and follows objects	5
Cries but is consolable	4
Persistent irritable	3
Restless, agitated	2
Silent	1