London Ambulance Service NHS Trust

Major Trauma Annual Report 2016/17

October 2017

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London Ambulance Service NHS Trust

Major Trauma Care

2016/17

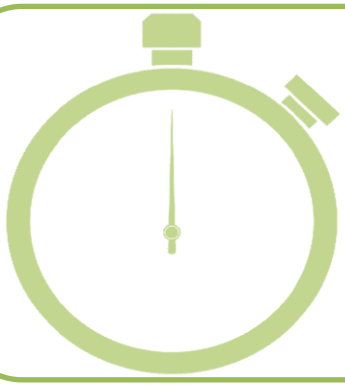
In 2016, the LAS cared for **6,068** potential major trauma patients

An average of 17 potential major trauma patients per day

71% blunt trauma vs 26% penetrating trauma

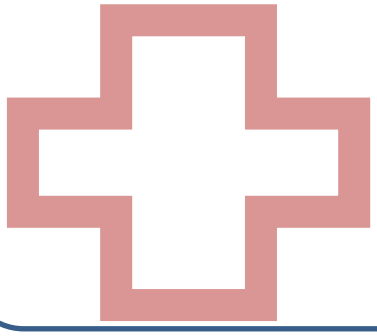
Average response time for Red calls was **7** mins

Average response time for Category C calls was **12** mins



The median on-scene time was **39** minutes for blunt injuries

The median on-scene time was **17** minutes for penetrating injuries



99% of patients were conveyed appropriately

Median journey time to a MTC was **17** minutes

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Introduction

This report presents an overview of the care of patients attended by the London Ambulance Service NHS Trust (LAS) who suffered major trauma. Major trauma patients are defined in this report as patients whose injuries met one or more of the criteria of the London Major Trauma Decision Tool (see Appendix 1) and, as such, may benefit from care at one of four specialist Major Trauma Centres (MTCs). Patients who were taken to a MTC but did not meet one or more of the criteria of the London Major Trauma Decision Tool are considered to have been over-triaged and not classed as major trauma patients (see page 10). Of note, patients involved in major incidents who suffered injuries that met the tool criteria are included.

Findings

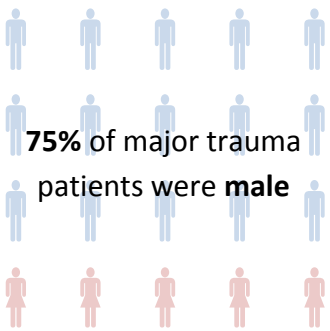
From 1st April 2016 to 31st March 2017, **6,068** major trauma patients were treated by the LAS, which was an average of **17 patients a day** (compared to 14 per day previously). The increased patient numbers reflected the overall growth in demand experienced by the LAS during 2016/17, with major trauma incidents remaining 0.5% of the total workload.

For a detailed breakdown of figures by area of London, please refer to Appendix 2.

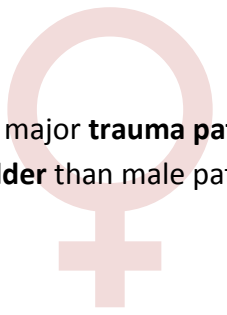
Patient characteristics

The major trauma decision tool distinguishes two groups: adult patients which include children 12 years and over (referred to as adults in this report), and children under 12 years old (referred to as paediatrics in this report). Adult patients formed 93.6% (n=5,677) of major trauma cases, with the remaining 5.7% (n=348) patients classed as paediatric patients. For 0.7% (n=43) cases age was not documented.

75.2% (n=4,562) of major trauma patients were male with a median age of **31**. Females (24.8%, n=1,505) were older with a median age of 42. The gender of the patient was not documented in one case.



75% of major trauma patients were **male**



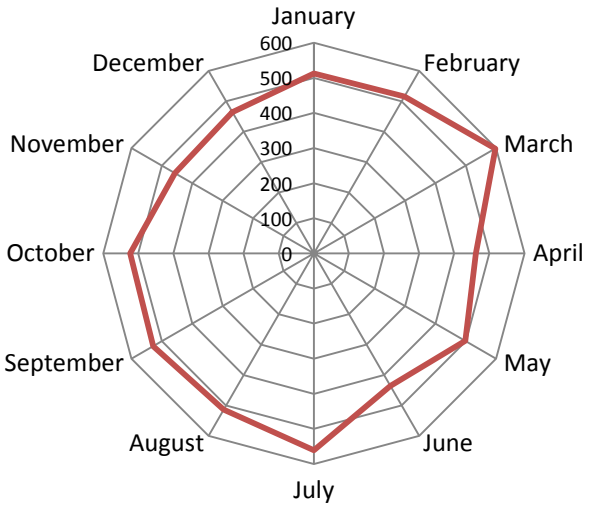
Female major **trauma patients** were **older** than male patients

Incident occurrence

Time of day	n*	%
00:00-03:59	798	13%
04:00-07:59	489	8%
08:00-11:59	907	15%
12:00-15:59	1232	20%
16:00-19:59	1330	22%
20:00-23:59	1311	22%

The most common time of day for major trauma to occur was between **4pm** and **midnight**. More trauma incidents took place on **Saturday** (16.2%) than any other day of the week

Major trauma incidence peaked in March 2017



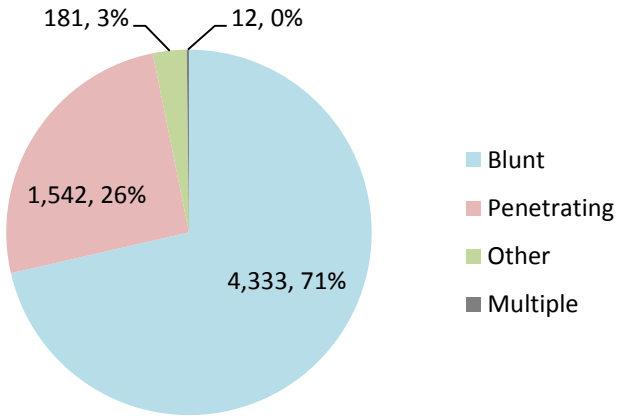
Top 5 locations n (%)	Blunt	Penetrating	Other & Multiple	Total
Street	2,324	773	53	3,150
Home (incl. care homes)	1,302	545	108	1,955
Work	176	27	8	211
Public transport	126	16	5	147
Park/wood/ river	67	24	3	94

Over half of blunt and penetrating major trauma occurred on a **street** or **road**. The most common location for other injury mechanisms such as burns was in a private residence

* One case was not included as times were not available.

Mechanism of injury

The primary mechanism of injury was **blunt** trauma for 71% of patients



Top 5 Blunt trauma mechanisms	n	Median age
Fall from standing on the level	666	67
RTC car[†] vs. pedestrian	589	32
Fall down stairs	534	64
RTC car vs. motorbike[‡]	344	29
Fall 6ft - 20ft	310	38

The age of patients with blunt injuries varied with mechanism, with **older** patients requiring major trauma care after **lower energy incidents**

Overall patients with penetrating injuries were **younger** (median age 24) than those with blunt injuries (median age 39)

Top 5 Penetrating trauma mechanisms	n	Median age
Stab - thorax	422	24
Stab - abdomen	293	28
Stab - lower limb	265	22
Stab - multiple	246	23
Stab - neck	79	30

[†] The 'car' vehicle category includes vans.
[‡] Motorbike includes mopeds and scooters.

Response times

999 calls to the ambulance service are triaged to prioritise the fastest response to the most unwell patients. Immediately life-threatening calls fall within the highest priority Red category and lower priority calls are classed as Category C calls. Major trauma patients can present with a variety of symptoms and will be prioritised into any one of these categories with the response times varying accordingly.

Response times are measured in different ways for each category. Red 1 responses start from the point the 999 call was connected by the operator. For Red 2 and Category C calls a period of time prior to the clock starting is afforded in an attempt to establish the chief complaint. During 2016/17, the LAS was involved in an NHS England initiative to allow up to 240 seconds before the clock was started to help determine the chief complaint.

For major trauma patients, the median response[§] time was just 7 minutes for Red calls and 12 minutes for Category C calls.

Response	n[**]	%
Red 1&2	3537	58%
C1-C4	2530	42%

58% of major trauma calls were assigned a **Red** response, with 10% (n=355) allocated as Red 1 and 90% (n=3,182) classified as Red 2.

A resource arrived within 8 minutes for **51%** of **Red 1** category patients (n=180) and **59%** of **Red 2** patients (n=1,891)

Response	Median time mins (range)
Red 1&2	7 (0-126)
C1-C4	12 (0-208)

[§] Any LAS-dispatched resource including solo vehicles such as (i.e. cars, motorbikes, cycles), volunteer responders and London's Air Ambulance.

[**] One case was excluded as the response category was not available.

On-scene times

LAS clinicians are advised to minimise their time on scene for major trauma patients as it is imperative that definitive care is reached as soon as possible. On-scene times have remained relatively stable since 2015, except for the 'other and multiple injuries' group, which encapsulates a variety of mechanisms where on-scene times may be more challenged due to the patient's presentation and small numbers (see table below). In general, a first responder spent less than 5 minutes on-scene assessing and treating the patient before arrival of the conveying vehicle.

Median on-scene times (mins)	n	From first resource	From first ambulance
Blunt	4,326	43:37	38:55
Penetrating	1,539	20:34	17:06
Other & Multiple	193	37:32 ⇧ 2mins	34:02 ⇧ 7mins
All patients	6,058	38:13	33:49

Ambulance on-scene times for patients with **blunt** and **penetrating** injuries have **remained stable**.

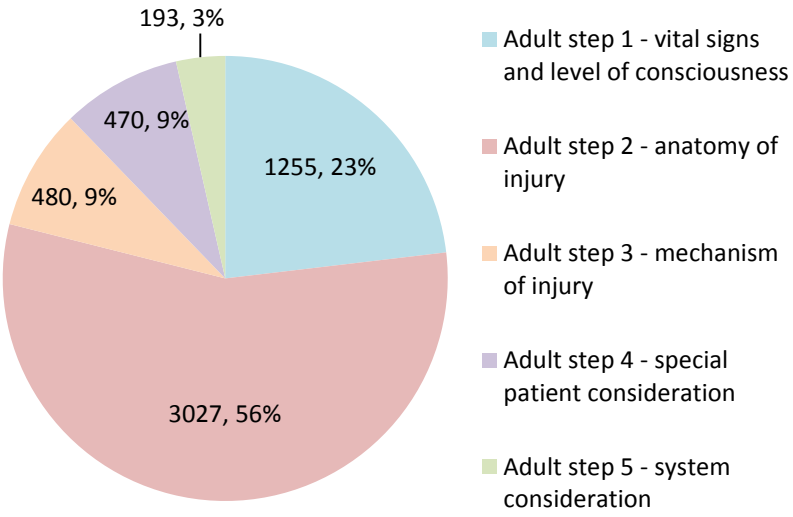
Factors that are not within the ambulance clinicians' control can potentially influence on-scene times, such as patients that are trapped and not immediately accessible to staff, or when a doctor performs advanced pre-hospital interventions at the scene. For all groups shown in the previous table, median on-scene times decreased by less than one minute when instances of entrapments and presence of doctors were removed from the analysis. This suggests that these factors do not necessarily extend overall on-scene times.

Major trauma decision tool usage

The major trauma decision tool distinguishes between adult and paediatric patients (under 12 years old). The tool is divided into five steps covering different areas of assessment. Within these steps are specific triggers, any one of which must be identified during assessment in order for the patient to be triaged directly to a major trauma centre. A patient may have several triggers present but the highest trigger that a patient activates on the tool is referred to as the primary trigger. [††]

Adult trauma tool use (n=5,425)

Adult step activation



Adult trauma tool step distribution remained **consistent** since 2015, with **step 2** (anatomy of injury) accounting for over half of MTC triage decisions

Adult trigger activation

Central penetrating trauma was the most likely reason for triage to an MTC

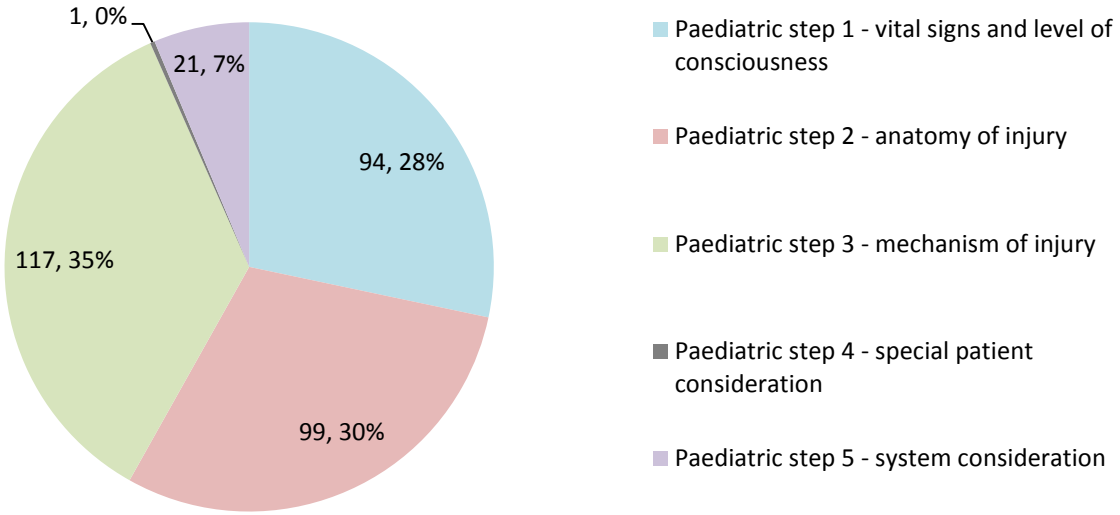
The full list of adult triggers can be found in Appendix 3

Top 5 primary adult tool triggers	Step	n
Penetrating trauma below the head & above the knees (not arms)	2	1,265
Glasgow coma score of 13 or below	1	1,007
Suspected pelvic fracture	2	610
Spinal trauma suggested by abnormal neurology	2	457
Older patients (> 55 years)	4	412

[††] Major trauma patients may be conveyed to a nearer hospital instead of a MTC if their airway is unmanageable, they go into cardiac arrest en route to hospital or if they refuse to attend the MTC.

Paediatric trauma tool use (n=332)

Paediatric step activation



Step 1 activations have reduced from 38% in 2015 to 28%

Step 2 activations have remained unchanged at 30%

Step 3 activations have increased from 28% to 35%

Paediatric trigger activation

Use of the most frequent trigger, **uninterrupted fall,** has almost doubled in number since 2015

The full list of paediatric triggers can be found in Appendix 3

Top 3 primary paediatric tool triggers	Step	n
Uninterrupted fall over twice the patient's height	3	101
Glasgow coma score of 13 or below	1	50
Inappropriate behaviour post injury	1	39

Treatment

Advanced drug treatments

For critical patients, the advanced drug treatments that staff have available are tranexamic acid (TXA) for significant internal/external haemorrhage, ketamine for analgesic effect, and midazolam for sedation and seizure management in major trauma cases.

TXA is administered under patient group directives by LAS Paramedics, with Ketamine and midazolam only available to Advanced Paramedic Practitioners (APP), and Doctors from the LAS Medical Directorate and London's Air Ambulance.

TXA

n=94

Ketamine

n=121

Midazolam

n=104

Pelvic binders and tourniquet use

Pelvic binders were used in 1,015 of cases to stabilise and support the pelvis

An arterial tourniquet was used to attempt to stem the flow of blood in 18 cases

Conveyance and journey times

Conveyance was deemed appropriate if patients were taken to a MTC or Trauma Unit (TU) in line with the Major Trauma Decision Tool. The majority of patients were conveyed appropriately but 1.3% of patients were under-triaged to a TU inappropriately and subsequently transferred to a MTC (compared to 1% in 2015).[‡‡]

Conveyance	n[§§]	%
MTC appropriate	5,975	98.5%
TU appropriate	14	0.2%
TU inappropriate	78	1.3%

98.7% of major trauma patients were conveyed to an appropriate destination

London's major trauma networks are designed so that a patient's journey to a MTC should not exceed 60 minutes. Only 9 cases exceeded the 60 minute journey time target (see Appendix 4 for reasons).

Journey times to a MTC[***] (mins)	n	Median	25th percentile	75th percentile
All MTCs	6,019	17:14	11:00	23:28
King's College	1,129	14:05	7:03	21:07
St George's	971	15:46	10:54	20:38
Royal London	1,874	17:50	11:57	23:43
St Mary's	2,055	18:43	12:19	25:07

Median journey times to a MTC were **less than 20 minutes**

[‡‡] Under-triaged patients are usually only identified if the TU subsequently transfers the patient to a MTC. It is likely that the under-triage rate is higher as there will be instances where the patient is not transferred or where we are unaware of subsequent transfers (e.g. if another provider is used).

[§§] One patient refused conveyance to hospital.

[***] Includes total journey time of tool-triggering patients initially transported incorrectly to a TU by the LAS before being transferred to a MTC by a LAS vehicle following time spent in the TU.

Over-triage of trauma patients

In addition to major trauma patients conveyed appropriately to a MTC, there were 496 additional trauma patients who were conveyed to a MTC despite not meeting the criteria of the decision tool. This was an increase of 141 patients from 2015; which equates to a 40% rise in over-triage rates. These additional patients can have a substantial impact on the MTC's workload and detract care from those that are more seriously injured.

8% of the patients triaged directly to an MTC by the LAS were **over-triaged**

Over-triaged patients by MTC	Over-triaged	Over-triaged as % of MTC total
St Mary's	175	8%
Royal London	135	7%
St George's	94	9%
King's College	91	7%
Overall	496	8%

Quality improvement initiatives

During 2016/17, the LAS undertook a range of initiatives aimed at improving major trauma care, which included:

- We launched our 5-year Clinical Strategy 2016-2021 and committed to a number of actions, including the importance of recognising major trauma especially in older adults and reducing on-scene times.
- The LAS has continued to provide educational updates to staff via Core Skills Refreshers, internal bulletins and publications in the Clinical Update and the learning from experience Insight magazine.
- An 'Improving Patient Care' poster emphasising the key assessments, interventions and triage was released to all staff to help support decision making in an effort to reduce time on-scene.
- Quarterly care packs, under-and over-triage reports and cases of extended on-scene times have been disseminated across the Trust to improve clinical care at a local level.
- We continued to work with the trauma networks in London to monitor activity and enhance the major trauma pathway, including supporting local peer review activity.

Conclusion

The key findings of this report show that the LAS has continued to provide a good level of care to major trauma patients. We provided a prompt response to patients despite an increased number of major trauma patients. The presentation of patients in terms of characteristics, mechanisms and triage triggers has remained similar to the previous annual report findings from 2015.

There has been little improvement in decreasing the length of time spent on-scene despite an active focus on the importance of keeping on-scene time to a minimum. During 2016-17, CARU have highlighted all extended on-scene times to Quality Governance and Assurance Managers for feedback to staff and there has been a series of messages to reduce on-scene times as part of the Trust's overall review of penetrating trauma care.

Staff have continued to convey major trauma patients appropriately, although there has been a slight increase in under-triage to TU's of 0.3%. However, there has also been an increase in the number of trauma patients who, on the basis of documentation, have been conveyed unnecessarily to a MTC and thus overtriaged. CARU have flagged cases of under- and over-triage for feedback to staff to enhance the understanding of the MTC pathway.

Areas for improvement

1. On-scene times – the findings suggest further work is required to decrease on-scene times for this critical patient group despite the efforts of the LAS in the last year.

2. Under-triage rates – although these are relatively low at 1.3%, this is an area that the LAS should continue to focus on to ensure that patients are correctly triaged directly to a MTC for definitive care.

3. Over-triage rates – inappropriate triage of trauma patients to a MTC is an area that the LAS will need to reduce going forward as this will have a significant impact on the capacity of the major trauma system to cope effectively.

Acknowledgments

CARU wishes to thank colleagues in the Medical Directorate for their ongoing support, particularly, Mark Faulkner, Neil Thomson and Fenella Wrigley.

Glossary

'A' post – The front pillars of a vehicle that hold the windscreen in place.

Abnormal neurology – Changes to the nerves and nervous system, e.g. pins and needles or loss of sensation.

Advanced interventions – Specialist treatments that are provided by more skilled clinicians, e.g. Rapid Sequence Intubation and thoracotomies.

Advanced Paramedic Practitioner (APP) – a Paramedic with a greater range of assessment and interventional skills.

Altered physiology – Changes in organs and their functions, e.g. an increase in heart rate, respiratory rate.

Anti-coagulation therapy – A type of drug therapy that reduces the body's ability to form clots in the blood.

Blunt trauma – Injuries where a patient is struck by an object that does not penetrate the body, e.g. falls from height, road traffic collisions and crushing injuries.

Bullseye windscreen – A distinctive pattern of concentric cracks to the front windscreen of a vehicle caused by impact.

Central penetrating wound – Penetrating trauma between the neck and knees, excluding the arms.

Depressed skull fracture – A break in the skull resulting in dents or indentations.

Glasgow Coma Score (GCS) – A measurement that assesses the level of consciousness a person has through observing and scoring eye, verbal and motor responses.

Injury Severity Score (ISS) – An anatomical scoring system that is used to assess trauma severity in hospitals. A score above 15 is considered major trauma.

Journey time – The time taken from the ambulance leaving the incident scene to arriving at hospital.

London's Air Ambulance – The charity that provides the HEMS service in London to deliver an advanced trauma team to trauma patients in London via helicopter or response car.

London Major Trauma Decision Tool – Tool developed by London Ambulance Service to determine if a patient needs a Major Trauma Centre or not. It assesses vital signs and consciousness, anatomy of injury, mechanism of injury and special patient considerations.

Major Trauma Centre (MTC) – A hospital that can provide specialist services and expertise to the most severely injured patients. In London the major trauma centres are: King's College Hospital, Royal London Hospital, St. George's Hospital and St. Mary's Hospital.

Mechanism of Injury – The method of injury.

Median – The mid-point in a range of values.

Morbidity – The frequency which a disease appears in the population.

Mortality – The frequency of death within the population.

On-scene times – The time ambulance clinicians spend at the incident location assessing and caring for the patient prior to transportation.

Open fracture – A fracture where the bone has penetrated the skin.

Other Trauma – Injuries that are not blunt or penetrating but are still major trauma injuries, e.g. burns and massive lacerations (non-penetrating).

Over-triage – When a patient is transported to a major trauma centre when they have not triggered the Major Trauma Decision tool.

Paediatric – In terms of major trauma in London, children under 12 years old.

Penetrating trauma – Injuries where an object pierces the skin, e.g. stabbings, gunshot wounds and impalements.

Proximal – A term to refer to the distance of a limb from the body. The closer to the centre the more proximal the limb is.

Respiratory rate – The number of breaths per minute.

Response Categories – Nationally-agreed categories on the type of response patients should get depending on the severity and priority of the incident.

Response times – The time it takes an emergency service vehicle to arrive on-scene after the call have been received in the Emergency Operations Centre.

Road Traffic Collision (RTC) – An incident that occurs when a vehicle collides with another vehicle, person or object.

Solo responder – A fast-response vehicle that does not have transporting capabilities, often with only one ambulance crew member.

Thorax – The area between the neck and the abdomen, the chest.

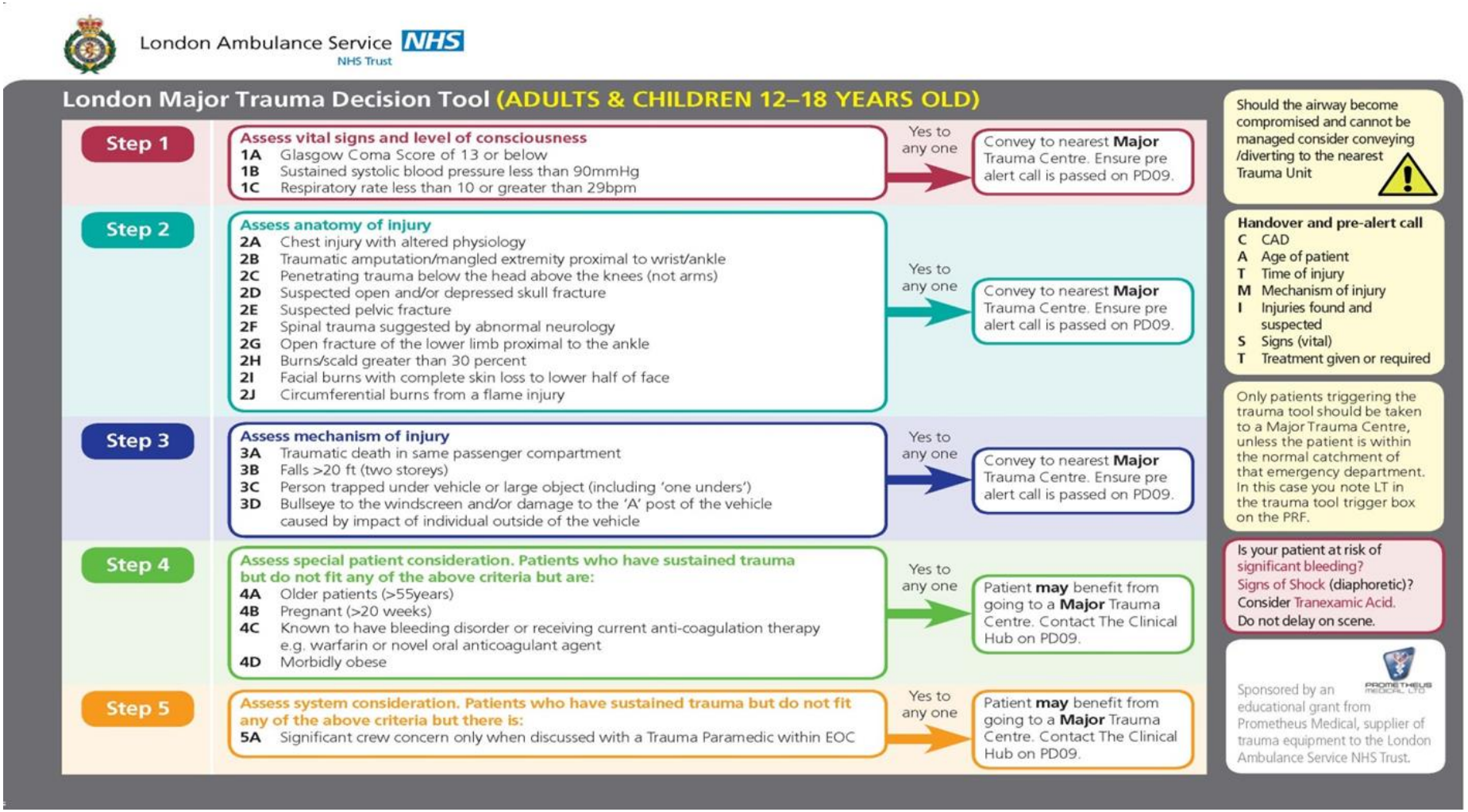
Trauma Unit (TU) – An emergency department that is connected to the Trauma Network but does not hold the same specialist skills as a major trauma centre.

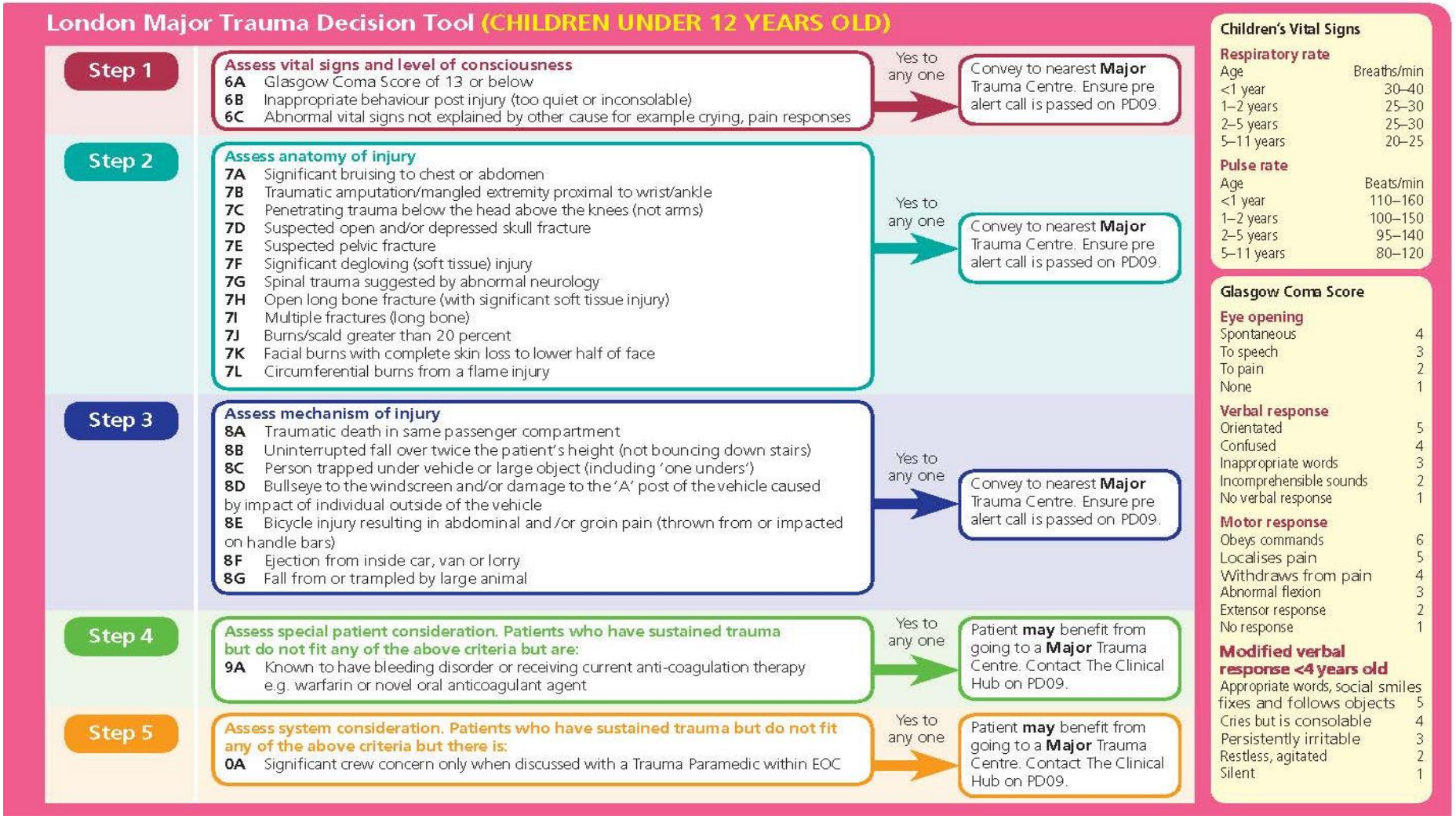
Triage – The process of determining when, how and where a patient should be treated.

Under-triage – When a patient is transported to a Trauma Unit or Emergency Department instead of a major trauma centre despite triggering the Major Trauma Decision Tool.

Vital signs – Measurements that assess the state of a patient's body functions, e.g. pulse rate, respiratory rate, blood pressure.

Appendix 1: London Major Trauma Decision Tool




London Major Trauma Decision Tool (CHILDREN UNDER 12 YEARS OLD)
Step 1
Assess vital signs and level of consciousness
6A Glasgow Coma Score of 13 or below
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')
8D Bullseye to the windscreen and/or damage to the 'A' post of the vehicle caused 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
Localises pain 5
Withdraws from 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
Persistently irritable 3
Restless, agitated 2
Silent 1

Appendix 2: Incident information by area (as determined by the CCG of the incident)

CCG	n	Blunt	Penetrating	Response time (mins)	Journey time to MTC (mins)	999 call connection to MTC (hour: mins)
		n	n			
Barking and Dagenham	113	68	42	11	20	0:46
Barnet	208	161	40	13	24	1:13
Bexley	208	104	20	13	28	1:40
Brent	257	173	76	12	17	1:11
Bromley	169	147	16	12	24	1:23
Camden	224	152	60	10	13	1:02
Central London	225	182	36	9	11	1:00
City and Hackney	234	157	71	10	10	0:55
Croydon	311	225	81	11	18	1:11
Ealing	271	201	62	11	20	1:15
Enfield	248	154	85	12	28	1:31
Greenwich	198	135	56	10	21	1:13
Hammersmith and Fulham	171	131	35	10	14	1:07
Haringey	221	140	75	11	21	1:12
Harrow	106	79	25	10	27	1:17
Havering	110	90	17	12	30	1:32
Hillingdon	215	184	25	11	28	1:29
Hounslow	194	145	40	10	27	1:31
Islington	177	126	45	10	15	1:07
Kingston	93	73	15	10	18	1:14
Lambeth	299	192	98	9	9	0:53
Lewisham	184	107	70	10	14	1:01
Merton	110	92	17	10	9	0:58
Newham	225	148	71	10	16	1:00
Redbridge	153	114	33	11	20	1:19
Richmond	122	87	31	11	24	1:17
Southwark	222	142	70	9	8	0:50
Sutton	119	102	16	11	15	1:11
Tower Hamlets	171	117	54	9	7	0:50
Waltham Forest	171	116	51	12	19	1:13
Wandsworth	212	154	45	10	10	0:59
West London	187	129	51	10	10	1:02

Notes:

- All figures above relate to patients transported in accordance with the major trauma decision tool.
- All times are median averages.
- Response time shown is from the time the 999 call is connected to the first LAS vehicle arriving on-scene.
- For 13 cases no incident CCG data was available and there were 4 patients attended by the LAS at locations in non-London CCG areas. These have been excluded from the table.

Appendix 3: Trauma tool trigger breakdowns

Adult decision tool triggers	Step	n
Penetrating trauma below the head above the knees (not arms)	2	1,265
Glasgow coma score of 13 or below	1	1,007
Suspected pelvic fracture	2	610
Spinal trauma suggested by abnormal neurology	2	457
Older patients (>55years)	4	412
Bullseye to the windscreen and/or damage to the 'A' post of the vehicle caused by impact of individual outside of the vehicle	3	351
Suspected open and/or depressed skull fracture	2	242
Open fracture of the lower limb proximal to the ankle	2	232
Significant crew concern only when discussed with a senior clinician	5	193
Respiratory rate less than 10 or greater than 29bpm	1	191
Chest injury with altered physiology	2	179
Falls >20 ft (two storeys)	3	108
Sustained systolic blood pressure less than 90mmHg	1	57
Known to have bleeding disorder or receiving current anti-coagulation therapy e.g. Warfarin or novel oral anticoagulant agent	4	49
Person trapped under vehicle or large object (including 'one unders')	3	21
Burns/scald greater than 30 per cent	2	17
Traumatic amputation/mangled extremity proximal to wrist/ankle	2	13
Pregnant (>20 weeks)	4	7
Circumferential burns from a flame injury	2	6
Facial burns with complete skin loss to lower half of face	2	6
Morbidly obese	4	2
Traumatic death in same passenger compartment	3	2

Paediatric decision tool triggers	Step	n
Uninterrupted fall over twice the patient's height (not bouncing down stairs)	3	101
Glasgow coma score of 13 or below	1	50
Inappropriate behaviour post injury (too quiet or inconsolable)	1	39
Spinal trauma suggested by abnormal neurology	2	22
Significant crew concern only when discussed with a senior clinician	5	21
Burns/scald greater than 20 per cent	2	15
Penetrating trauma below the head above the knees (not arms)	2	15
Suspected pelvic fracture	2	13
Open long bone fracture (with significant soft tissue injury)	2	12
Bullseye to the windscreen and/or damage to the 'A' post of the vehicle by impact of individual outside of the vehicle	3	8
Suspected open and/or depressed skull fracture	2	8
Significant bruising to chest or abdomen	2	6
Abnormal vital signs not explained by other cause for example crying, pain responses	1	5
Significant degloving (soft tissue) injury	2	4
Bicycle injury resulting in abdominal and /or groin pain (thrown from or impacted on handle bars)	3	4
Person trapped under vehicle or large object (including 'one unders') crying, pain responses	3	3
Multiple fractures (long bone)	2	2
Facial burns with complete skin loss to lower half of face	2	2
Fall from or trampled by large animal	3	1
Known to have bleeding disorder or receiving current anti-coagulation therapy e.g. Warfarin or novel oral anticoagulant agent	4	1

Appendix 4: Journeys to MTCs of 60 minutes or more

Journey delay reasons	n
Delayed by stopping to meet with HEMS en route to hospital	5
Delayed by traffic conditions	3
Delayed due to vehicle failure	1