




New NHS Prehospital Major Incident Triage Tool: from MIMMS to MITT

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ABSTRACT

Triage is a key principle in the effective management of major incidents and is the process by which patients are prioritised on the basis of their clinical acuity. However, work published over the last decade has demonstrated that existing methods of triage perform poorly when trying to identify patients in need of life-saving interventions. As a result, a review of major incident triage was initiated by NHS England with the remit to determine the optimum way in which to triage patients of all ages in a major incident for the UK. This article describes the output from this review, the changes being undertaken to UK major incident triage and the introduction of the new NHS Major Incident Triage Tool from the Spring of 2023.

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Triage is a key principle in the effective management of major incidents and is the process by which patients are prioritised on the basis of their clinical acuity. It is the first clinical priority to be undertaken at a major incident, ahead of any patient treatment, and is typically performed with a rapid physiological assessment.

In countries using the Major Incident Medical Management and Support principles (eg, the UK, Australia and South Africa), a two-staged approach to triage is undertaken.¹ Primary triage is performed using the Triage Sieve, which provides an initial rapid assessment of physiology at the scene. Since 2013, the modified National Ambulance Service Medical Directors (NASMeD) Sieve has been used in the UK.² The NASMeD Sieve is then followed by a more detailed assessment, using the Triage Sort, in a more permissive environment usually removed from the immediate incident scene (eg, in a casualty clearing station) (online supplemental figure 1).

The rationale for this two-stage approach is to allow assessment of a large number of patients

rapidly using the more simplified tool, the Sieve, which requires neither clinical expertise nor additional medical equipment (eg for the measurement of Blood Pressure). Following this, the triage decision can be refined using the more detailed assessment with the Triage Sort (including Blood Pressure measurement and the Glasgow Coma Scale) and incorporating senior clinician decision-making. For the assessment of children under 12 years, an age-specific adaptation of the Triage Sieve (the Paediatric Triage Tape) is advocated as the primary triage method of choice.¹

Additional triage methods are used elsewhere in the world, including the Amberg-Schwandorf Algorithm (ASAV) in Germany, the Careflight tool in some parts of Australia, and in the USA, both the Simple Triage and Rapid Treatment (START) and Sort Assess Life-Saving Intervention and Treatment (SALT) triage tools are used.³ While both START and Careflight are purely objective physiological triage tools, the ASAV and SALT differ in that they include a subjective triage assessment.

Work published over the last decade has demonstrated that existing triage tools perform poorly when identifying patients in need of life-saving intervention and may also be associated with increased mortality.^{4,5} Based on emerging evidence, a review of major incident triage (including an appraisal of all existing methods) was initiated by the National Strategic Incident Director for NHS England Emergency Preparedness, Resilience and Response. A Task and Finish (T&F) group was created, including stakeholders and representation from NHS England, the National Ambulance Resilience Unit, Defence Medical Services and the Advanced Life Support Group. This was a comparable process to that undertaken in the USA by Lerner *et al* which led to the development and introduction of the SALT triage method.⁶ The remit of the group was to determine the optimum way to triage patients of all ages in a major incident in the UK.

This review has resulted in the development of the NHS MITT (Figure 1), which having been announced in October 2022, will be introduced into UK practice from April 2023. In this article we discuss the changes made to the process of triage and the rationale behind these changes.

FORMAT

The layout and format of the MITT was developed in consultation with the Behavioural Science and Insights Unit from the UK Health Security Agency with several options field-tested in August 2021 during two simulated major incidents (one a rail



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NHS Major Incident Triage Tool (MITT)

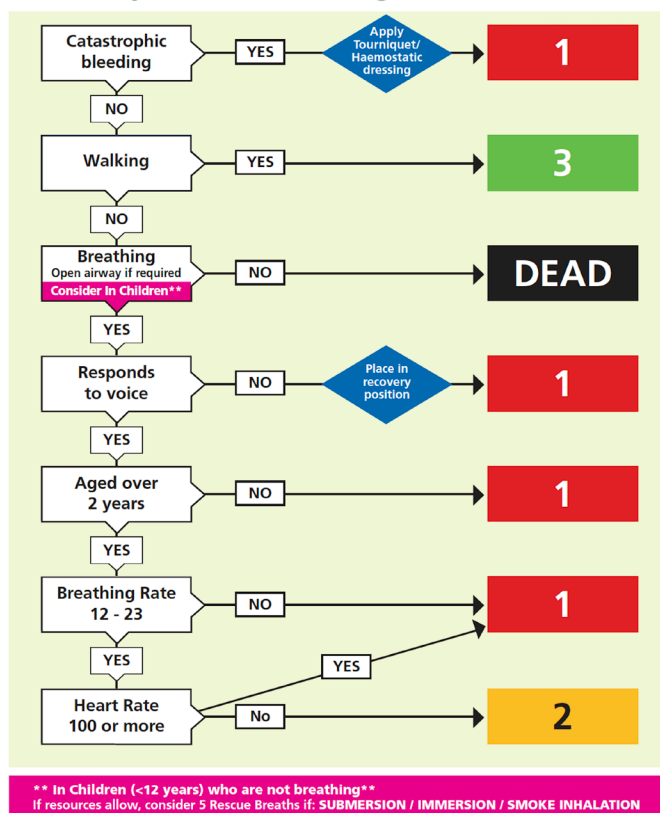


Figure 1 The NHS Major Incident Triage Tool (MITT).

crash scenario and the other a marauding terrorist attack) with 50 casualties and two teams of six front-line ambulance staff with a variety of clinical experience. The style selected has the advantage of simplicity in layout and flow allowing rapid and consistent application of the tool by those who may be unfamiliar with it.

PHYSIOLOGICAL THRESHOLDS

The physiological parameters within the MITT differ to those used in both the Triage Sieve and NASMeD Sieve and incorporate the pulse and respiratory rate thresholds from the Modified Physiological Triage Tool, MPTT-24.⁴ The rationale for changing these thresholds came from a large body of evidence demonstrating that the thresholds within both former tools did not reliably identify patients in need of life-saving intervention and were theoretically associated with both increased mortality and unacceptably high levels of undertriage (incorrectly classifying a patient as not needing a life-saving intervention).

The new thresholds (Heart Rate >100 and Respiratory Rate <12 or ≥ 24) were determined in a study using logistic regression methodology and were found to be the optimum parameters with which to identify adult trauma patients in need of life-saving intervention.⁷ Furthermore, the inclusion of the new physiological thresholds is consistent with the approach taken in the NHS Clinical Guidelines for Major Incidents and the latest iteration of the Defence Medical Services Battlefield Casualty Drills Sieve.⁸

THE SURVIVOR RECEPTION CENTRE

The Survivor Reception Centre (SRC) has historically been used as a term for an area where the uninjured would be taken during

a major incident. Both the SRC and an assessment of whether the patient is injured have been removed from the MITT, as concern was raised that occult injuries may declare themselves within the SRC, where the medical resources are likely to be limited. Furthermore, the MITT is designed as a rapid primary triage assessment, ideally taking less than 30s, so it was felt it was not appropriate to define whether an individual is injured or not at this stage. As a result, all living individuals involved in a major incident should be categorised as minimum Priority Three, allowing for them to be reassessed and discharged from medical care if and when appropriate.

SECONDARY TRIAGE

With evidence demonstrating that the secondary triage tool, the Triage Sort, performs poorly when compared with the MPTT-24 at identifying patients in need of life-saving intervention,⁵ its use has been deprioritised while further research is undertaken to determine an improved method of secondary triage. In the interim, the consensus is to repeat the triage process using the MITT and when resources allow, follow the local major trauma triage tool with decision support from senior clinicians.

WHAT ABOUT THE CHILDREN?

Where previously the Paediatric Triage Tape¹ (online supplemental figure 2) was advocated as the primary triage method for those aged under 12 years, following a review of existing published evidence, the MITT uses the same physiological thresholds in both adult and paediatric patients. This approach is borne out of a recent comparative analysis of paediatric MITTs demonstrating that both the existing Paediatric Triage Tape and JumpSTART performed poorly when identifying paediatric patients in need of life-saving intervention. Within the same comparative analysis, the adult MPTT-24 demonstrated improved performance with reduced rates of undertriage.⁹ The Sheffield Paediatric Triage Tool (online supplemental figure 3), a specific paediatric adaptation of the MPTT-24, demonstrated the best predictive performance, but owing to its complexity, was deemed to be not feasible for use in the field as a primary triage tool.⁹

Additionally, the MITT incorporates two specific paediatric elements; the consideration of rescue breaths and the automatic categorisation of those under 2 years as Priority One. The inclusion of rescue breaths in paediatric life-support algorithms is common and is an attempt to reverse hypoxia which may lead to cardiac arrest. While the Paediatric Triage Tape did not include rescue breaths, the JumpSTART method did. In a large paediatric Delphi study, consensus opinion was that rescue breaths should be included within triage guidance, but only for mechanisms which were likely to result in hypoxia, such as submersion, immersion or smoke inhalation.¹⁰ Paediatric patients who remain apnoeic following five rescue breaths are categorised as dead.

Automatically categorising paediatric patients aged under 2 years as Priority One originates from a review of the Trauma Audit and Research Network (TARN) database, which demonstrated an increased mortality and need for life-saving intervention in this age group (online supplemental figure 4).¹¹ The nature of the TARN database and its inclusion criteria have been previously described elsewhere and are included within online supplemental figure 5.⁹ While cases of non-accidental injury will certainly influence these data, it was felt that this was a clinically important and pragmatic step.

This age group will be at variable developmental milestones (mobility and verbal), thereby making accurate assessment difficult; furthermore, assessing young children is likely to be emotive, especially for those with limited paediatric experience. These factors are likely to be exaggerated in the context of a major incident. This automatic categorisation as Priority One was felt necessary to reduce cognitive burden of those involved in triage at the incident scene. While the introduction of this step may result in a theoretical increase in overtriage, the likelihood of significant numbers of paediatric patients under the age of 2 years being involved in a major incident is deemed to be low and therefore was felt by the T&F group to be a tolerable risk.

SUMMARY

The new NHS MITT will be introduced into UK practice as a unified replacement to the NASMeD Sieve and Triage Sort in the Spring of 2023. It differs from the previous NASMeD Triage Sieve in a number of ways, notably by having modified physiological parameters and by being designed for use across the entire age range, including both adults and children. Major incident triage should be rapid, reliable and reproducible, irrespective of the provider performing it. The introduction of the MITT into practice fulfils these principles, and provides not only an evidence-based approach to major incident triage, but also a more simplified approach by adopting a single approach across all ages.

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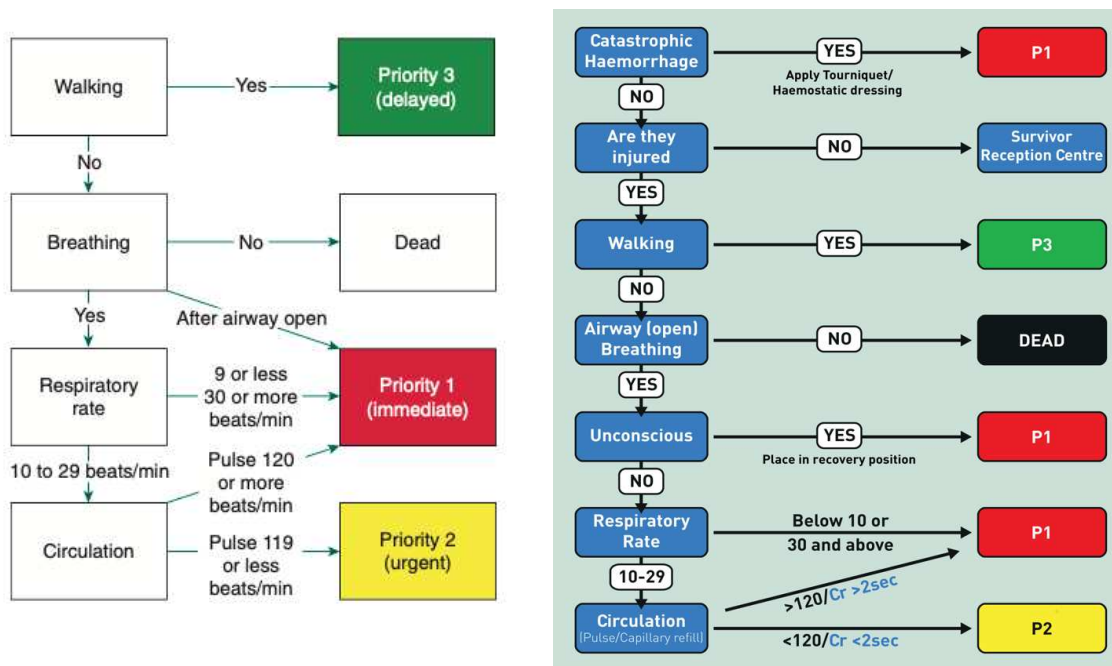
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a. Triage Sieve

b NASMeD Sieve

Step 1: calculate the Glasgow Coma Score (GCS)

<p>E = Eye opening:</p> spontaneous 4 to voice 3 to pain 2 none 1	<p>V = Verbal response:</p> orientated 5 confused 4 inappropriate 3 incomprehensible 2 no response 1	<p>M = Motor response:</p> obeys commands 6 localises 5 pain withdraws 4 pain flexes 3 pain extends 2 no response 1
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GCS = E + V + M

Step 2: calculate the Triage Sort score

<p>X = GCS</p> 13-15 4 9-12 3 6-8 2 4-5 1 3 0	<p>Y = Respiratory rate</p> 10-29 4 30 or more 3 6-9 2 1-5 1 0 0	<p>Z = Systolic BP</p> 90 or more 4 76-89 3 50-75 2 1-49 1 0 0
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Triage Sort Score = X + Y + Z

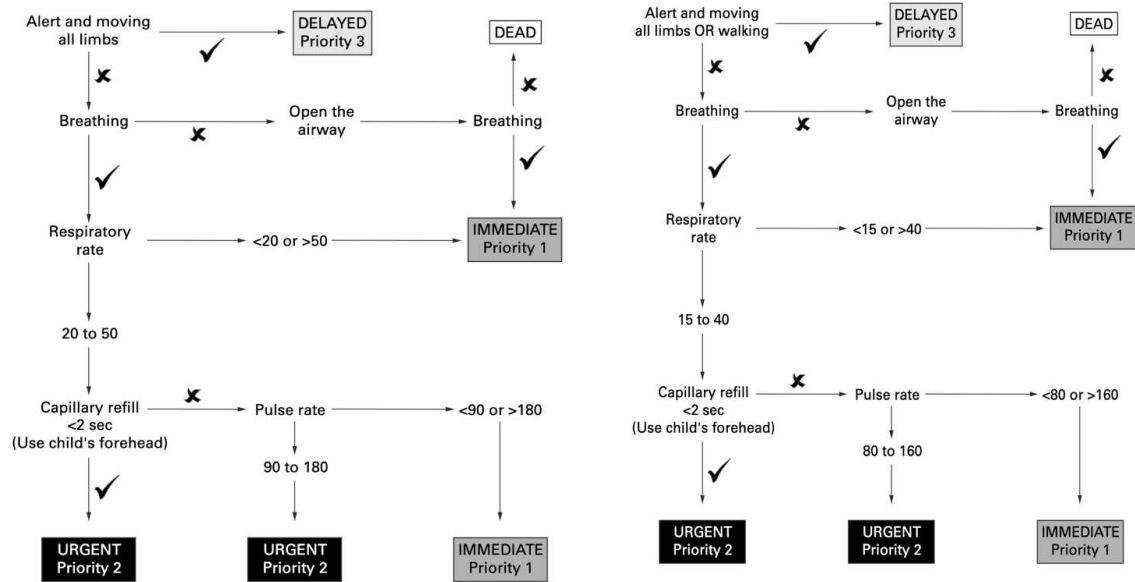
Step 3: assign a triage priority

12 =	T3
11 =	T2
10 or less =	T1

Step 4: upgrade priority at discretion of senior clinician, dependent on the anatomical injury/working diagnosis

c. Triage Sort

Supplementary Figure 1: Triage Sieve, NASMeD Sieve, Triage Sort

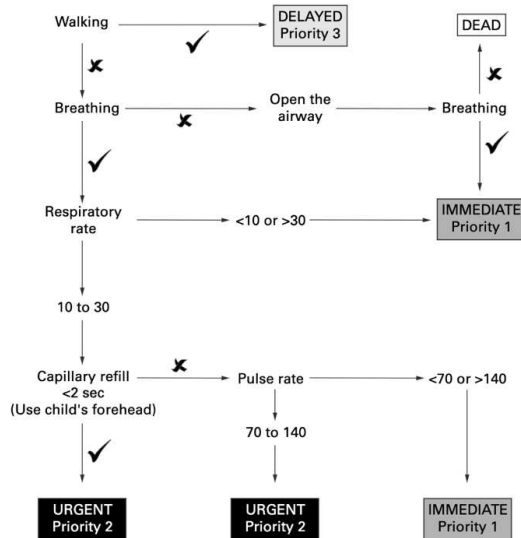


Green Red Yellow

Green Red Yellow

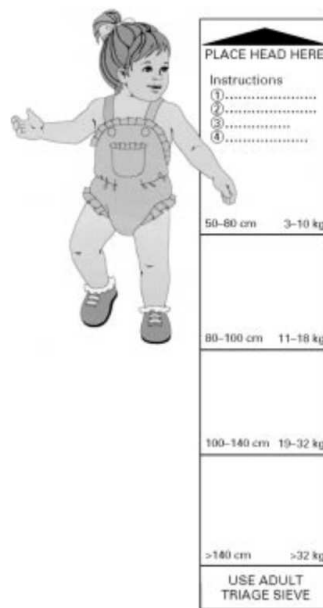
a) 50-80cm (3-10kg)

b) 80-100cm (11-18kg)



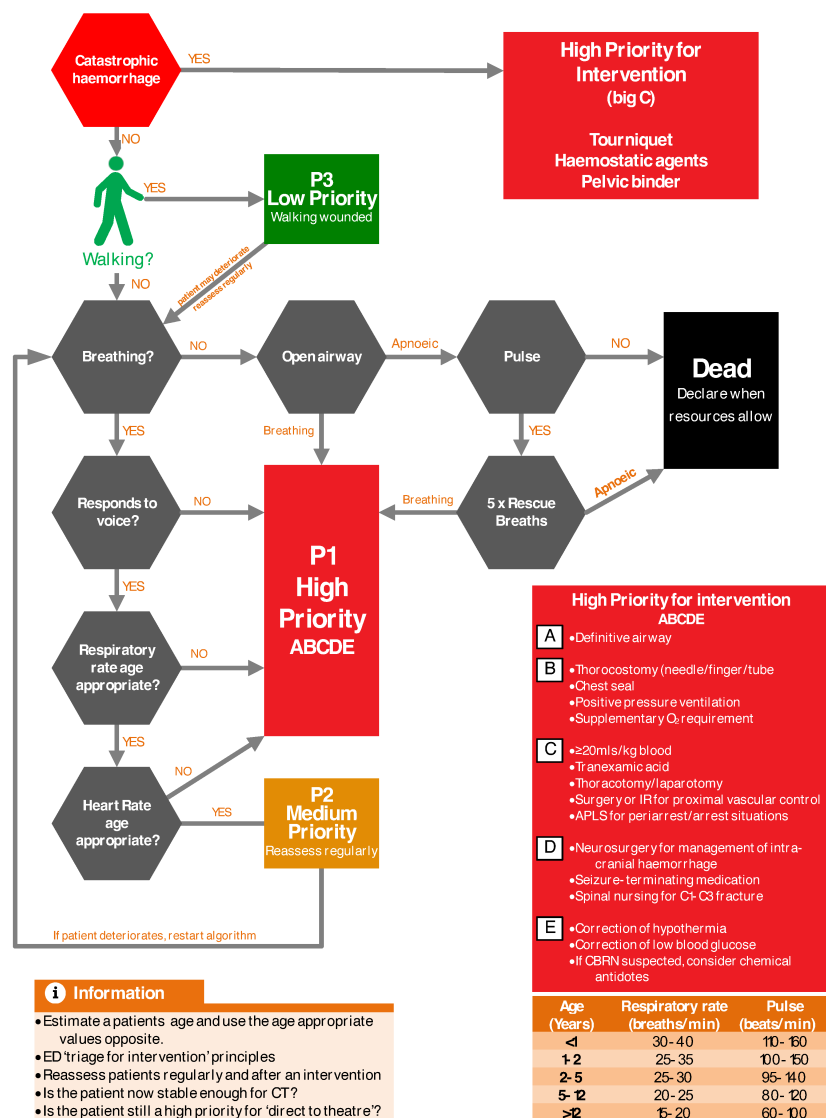
Green Red Yellow

c) 100-140cm (19-32kg)

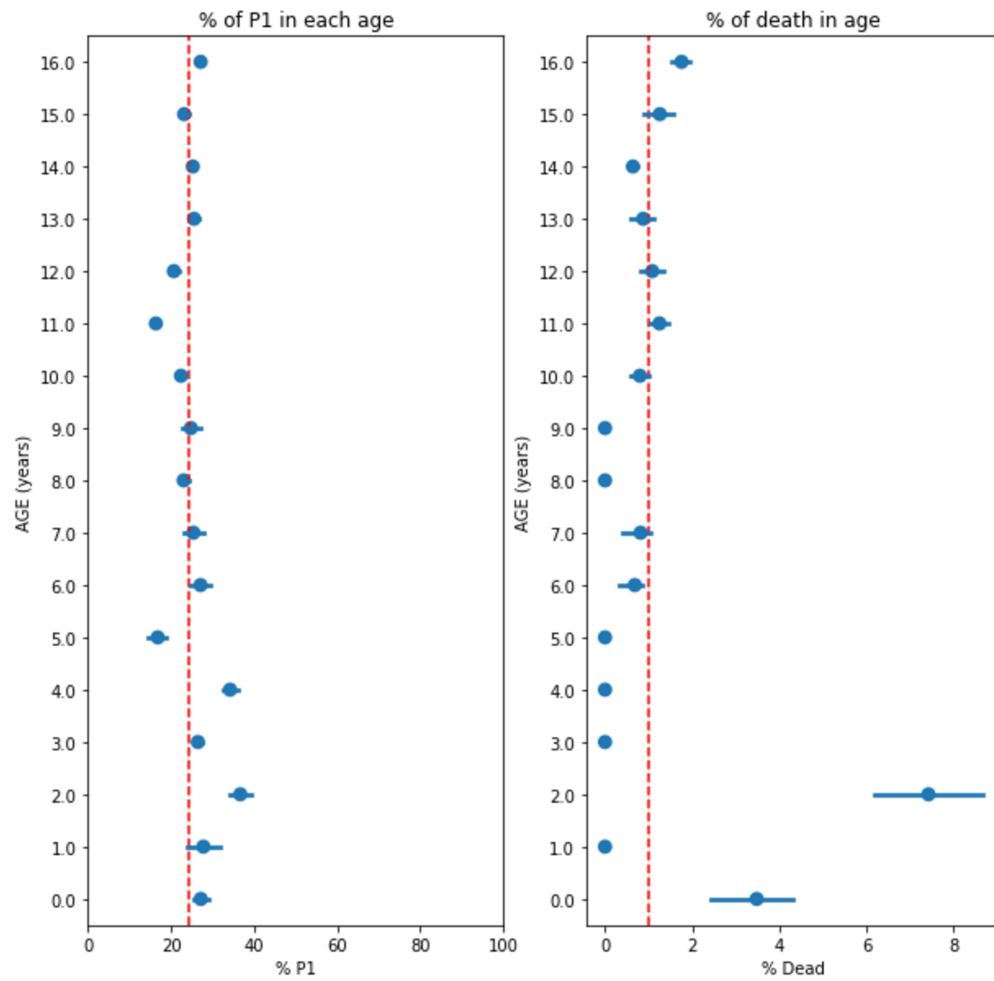


d) Using the Paediatric Triage Tape

Supplementary Figure 2: Paediatric Triage Tape



Supplementary Figure 3: Sheffield Paediatric Triage Tool (SPTT)



Supplementary Figure 4: Priority One (need for life-saving intervention) and mortality distribution by age.

2. Standards of practice

2.1 INCLUSION CRITERIA

The decision to include a patient should be based on the following points:

- A. ALL TRAUMA PATIENTS IRRESPECTIVE OF AGE
- B. WHO FULFILL THE FOLLOWING LENGTH OF STAY CRITERIA

DIRECT ADMISSIONS	PATIENTS TRANSFERRED IN
Trauma admissions whose length of stay is 72 hours or more OR Trauma patients admitted to a High Dependency Area regardless of length of stay OR Deaths of trauma patients occurring in the hospital including the Emergency Department (even if the cause of death is medical) OR Trauma patients transferred to other hospital for specialist care or for an ICU/HDU bed.	Trauma patients transferred into your hospital for specialist care whose combined hospital stay at both sites is 72 hours or more OR Trauma admissions to a ICU/HDU area regardless of length of stay OR Trauma patients who die from their injuries (even if the cause of death is medical) OR Patients transferred in for rehabilitation only do not need to be submitted to TARN.

- C. AND WHOSE INJURIES MEET THE FOLLOWING CRITERIA

INJURY	INCLUDED	EXCLUDED
BURN	Any full thickness burn. Partial or superficial burn $\geq 10\%$ body surface area.	Partial or superficial burn $< 10\%$ body surface area.
FACIAL FRACTURE	Documented as displaced, open, compound or comminuted.	Simple, stable fracture.
FEMORAL FRACTURE	Shaft, condyle, supracondylar or head. Neck of femur < 65 years old.	Neck of femur ≥ 65 years.
FOOT OR TOE: JOINT OR BONE	Massive destruction or crush injury.	Any combination of the following: Foot fracture, any number of fractured toes, metatarsals &/or tarsals, dislocated phalanges or inter-phalangeal joints, subtalar, transtarsal or transmetatarsal joints.

Supplementary Figure 5: TARN Inclusion Criteria.