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Triaging the right patient to the right place in the shortest time

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Editor's key points

- The majority of trauma deaths occur within 4 h of injury.
- Transporting trauma patients directly to trauma centres (trauma bypass) reduces the time to definitive treatment.
- Optimal triage minimizes over triage and the unnecessary activation of trauma teams whilst avoiding under triage.
- Effective development and monitoring of trauma systems requires the collection of data from multiple sources.

Trauma systems have been successful in saving lives and preventing disability. Making sure that the right patient gets the right treatment in the shortest possible time is integral to this success. Most trauma systems have not fully developed trauma triage to optimize outcomes. For trauma triage to be effective, there must be a well-developed pre-hospital system with an efficient dispatch system and adequately resourced ambulance system. Hospitals must have clear designations of the level of service provided and agreed protocols for reception of patients. The response within the hospital must be targeted to ensure the sickest patients get an immediate response. To enable the most appropriate response to trauma patients across the system, a well-developed monitoring programme must be in place to ensure constant refinement of the clinical response. This article gives a brief overview of the current approach to triaging trauma from time of dispatch to definitive treatment.

Keywords: triage; wounds and injuries

It is nearly half a century since it dawned on the Western world that more people were being killed through civilian injury than in wars. The biggest single killers were motor vehicles and it was clear that primary injury prevention, particularly targeted at reducing vehicle collisions, could save lives. The doctors involved in managing the thousands of injury victims realized that early accurate assessment and treatment of victims would also save lives. Importantly, experience from the Vietnam War, and previous wars, suggested that field stabilization and early transfer to an appropriate facility were critical factors in improving survival.[1] The concept that many deaths were preventable through better organization of care was established.[2] The Anglo-American model of trauma care involved trained paramedics, quickly assessing and stabilizing patients, then transferring to a facility capable of receiving a critically ill trauma patient. The facility itself needed to have systems in place to ensure an appropriate response 24/7 (24 h per day, 7 days per week). The model of integrated trauma care, learnt from the context of war, was slow to translate into civilian practice.

The elements of an integrated trauma system include:

(i) A pre-hospital system that has well-trained paramedics, coordinated dispatch, appropriate transport platforms and agreed protocols for hospital designation, trauma bypass (the transfer of seriously injured patients to a trauma centre even if this means that hospitals closer to the scene of injury are bypassed) and inter-hospital transfer.
(ii) Hospitals that have adequate facilities, staffing, and organization to receive and manage trauma patients. This includes a hierarchical designation from Level 1 (with all services available 24/7) to Level 3 or 4 with limited availability of sophisticated services.[3]
(iii) Post-acute hospital discharge rehabilitation and convalescence.
(iv) A system-wide monitoring capability to ensure that the right patients go to the right hospitals and get the right treatment.[4]

There is now growing evidence that providing trauma care within a well-organized system saves many lives[5 6] and prevents long-term disability.[7] The fundamental basis of a well-organized trauma system is an agreed trauma triage process at each step along the patient journey. The correct level of paramedic response is based on specified dispatch criteria. This is then followed by transfer to an appropriate facility based on agreed patient, mechanistic, and geographic data. The hospital response on patient arrival is based on this pre-hospital data with additional information about paramedic treatment and response to early treatment.

The importance of accurate initial triage was recognized many years ago but with increasing sophistication of both the treatments available and our ability to provide real time

monitoring and feedback, there is now a greater ability and necessity to ensure that regional systems provide optimal care for individual patients. There is also the possibility to progress from simple historical trauma scores to more accurate risk predictions based on all available patient characteristics.

Very few trauma systems internationally are actively researching optimal parameters for identifying high-risk patients who will benefit from trauma bypass or inter-hospital transfer because of the necessity of highly complex treatments. Most trauma care is still delivered and assessed at an institutional, rather than regional, level, without careful monitoring and reference to international benchmarks for optimization.

This article aims to describe the principles of best practice for triaging of trauma patients at each point along the patient journey to ensure optimal outcomes. Monitoring of processes and outcomes at a jurisdictional level is intrinsic to the optimization of trauma systems.

Pre-hospital

The majority of trauma deaths occur in the pre-hospital environment or within 4 h of the trauma event.[8] Mortality and morbidity can be reduced by effective identification, field triage, and transport of severely injured patients to specialized trauma centres. This starts with recognition of the severity of injuries at the time of the call to Emergency Medical Services (EMS). In Australia and many other countries, the majority of EMS systems use a commercial medical call-taking system, such as the Medical Priority Dispatch System (MPDS) to categorize EMS calls by problem type and urgency.[9]

The dispatch rules determined by individual EMS specify the designated level of ambulance response to send to each category (determinant code). An ideal system will mobilize EMS resources in a manner that is timely and appropriate to patient acuity and has the ability to positively influence the patient outcome. This needs to be balanced by rational use of resources and limiting potentially dangerous aeromedical and 'lights and sirens' responses.[10]

In most developed countries, Helicopter Emergency Medical Services (HEMS) complement ground ambulances in providing pre-hospital care for severely injured patients. Although debate continues, this combination is believed to improve the patient outcome.[11 12] Benefits include the possibility of increased level of care (superior interventions and training of HEMS paramedics or physicians) and the enhanced speed of the response.[13] In many parts of the world helicopters are staffed by physicians or anaesthetists. In Victoria, Australia, HEMS are staffed by highly trained Intensive Care flight paramedics who are authorized to perform interventions such as rapid sequence intubation of comatose patients, administration of ketamine for traumatic pain, and red cell concentrate in indicated patients.

HEMS dispatch should be efficient as overtriage represents a significant cost and is not without safety risks. HEMS dispatch criteria validity has been questioned. A recent systematic review on HEMS dispatch criteria for trauma patients demonstrated low accuracy in discrimination of appropriate patients across criteria based on mechanism of injury, anatomy of injury, age and comorbidities.[14] The most promising single criterion appears to be loss of consciousness.[14 15] When activating an HEMS response, consideration is also given to a patient's given situation, regional and logistical factors.

Accurate pre-hospital trauma triage criteria are critical for ensuring that patients with severe injuries are transported to trauma centres within appropriate timeframes. The 'golden hour' is often referred to in the trauma literature, as the optimal timeframe for pre-hospital care and delivery to definitive treatment.[16] This dogma does not take into account advanced life support interventions by paramedics to reduce preventable deaths and the fact that a longer transport time may reduce overall time to definitive treatment by avoiding delays at secondary hospitals before transfer. In the trauma system implemented in the state of Victoria, Australia, this delay to definitive treatment caused by transport to a non-major trauma centre averaged greater than 6 h.[17] The criteria and coordination for onward transfer of time critical major trauma patients to Level 1 centres must be clear and requires standard operating procedures agreed in advance.

Pre-hospital trauma triage criteria typically adopt a combination of physiological, anatomic, and mechanism of injury components tailored to meet individual trauma system needs, generally adapted from early criteria developed in the USA.[18] These have generally replaced scoring systems such as the Revised Trauma Score[19] and the 'CRAMS' (Circulation, Respiration, Abdomen, Motor and Speech) scale,[20 21] which were cumbersome to calculate and had inadequate sensitivity to detect serious injury. Other scoring systems, such as the Injury Severity Score (ISS), require knowledge of all injuries,[22] some of which are not identified or confirmed in the pre-hospital setting.

Paramedic judgement is an important adjunct to field triage guidelines but has not been demonstrated to be an accurate or reliable alternative triage method.[23] In an Australian study comparing experienced HEMS paramedic rating of the severity of injury with hospital patient outcomes, the sensitivity of paramedic predictions for severe injury ranged from 57.6% (95% CI: 45.4, 68.9) for the head to 38.5% (95% CI: 22.1, 57.9) for the abdomen.[24]

Epidemiological surveillance where field triage guidelines are assessed for over- and undertriage of severely injured patients is critical to driving improvements in triage criteria and identifying local issues including paramedic compliance.[25] This has been facilitated by the advent of electronic patient care records in the pre-hospital setting.[26] Access to electronic devices by EMS also raises the possibility of tailored decision support tools including validated scoring systems.[27] However, the feasibility of data entry by paramedics at the point of care is yet to be demonstrated.

Hospital designations

Trauma designation is essential in a trauma system and basically describes the minimum resources necessary for the care of patients with serious injury. A systems approach to trauma