Injury, Int. J. Care Injured 44 (2013) 23–28

Contents lists available at SciVerse ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury

UK triage – An improved tool for an evolving threat

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ARTICLE INFO

Article history:
Accepted 8 October 2011

Keywords:
Major incident
Mass-casualty
Penetrating trauma
Triage
Sieve
Sensitivity
Military

ABSTRACT

Introduction: A key challenge at a major incident is to quickly identify those casualties most urgently needing treatment in order to survive – triage. The UK Triage Sieve (TS) advocated by the Major Incident Medical Management (MIMMS) Course categorises casualties by ability to walk, respiratory rate (RR) and heart rate (HR) or capillary refill time. The military version (MS) includes assessment of consciousness. We tested whether the MS better predicts need for life-saving intervention in a military trauma population. Ideal HR, RR and Glasgow Coma Score (GCS) thresholds were calculated.

Methods: A gold standard Priority 1 casualty was defined using resource-based criteria. Pre-hospital data from a military trauma database allowed calculation of triage category, which was compared with this standard, and presented as 2 × 2 tables. Sensitivity and specificity of each physiological parameter was calculated over a range of values to identify the ideal cut-offs.

Results: A gold standard could be ascribed in 1657 cases. In 1213 both the MS and TS could ascribe a category. MS was significantly more sensitive than TS (59% vs 53%, $p < 0.001$) with similar specificity (89 vs 88%). Varying the limits for each parameter allowed some improvements in sensitivity (70–80%) but specificity dropped rapidly.

Discussion: Previous studies support the inclusion of GCS assessment for blunt as well as penetrating trauma. Optimising the physiological cut-offs increased sensitivity in this sample to only 71% – a Sieve based purely on physiological parameters may not be capable of an acceptable level of sensitivity.

Conclusions: The MS is more sensitive than the TS. Major incident planners utilising the Sieve should consider adopting the military version as their first line triage tool. If validated, altering the HR and RR thresholds may further improve the tool.

Introduction

One of the main challenges at the scene of major incident is to quickly identify those casualties who most urgently need treatment in order to survive – a process called triage. Most triage systems aim to identify those who need immediate life-saving intervention (Priority 1) and separate them from those who need intervention but who can safely wait a short while (Priority 2), and those likely to survive even if treatment is delayed (Priority 3). The UK system advocated by the Major Incident Medical Management (MIMMS) Course assesses the casualties on the basis of their ability to walk, their respiratory rate and their heart rate or capillary refill time.[1] These parameters feed into an algorithm that then categorises each casualty as Priority 1 (P1), Priority 2 (P2) or Priority 3 (P3) as seen in Fig. 1.

Triage must be a dynamic process as it is well accepted that no tool predicts the clinical course perfectly – patients may deteriorate as time passes, or may improve as a result of interventions. The MIMMS Triage Sieve (TS) is designed as a "first look" which separates P1s from P2s in around 30 s each on the basis of respiratory rate (RR) (if breathing present) and heart rate (HR). In a conventional major incident the TS would normally be performed *in situ*. A more in depth assessment, the Triage SORT, would be undertaken a little further away (if a casualty clearing station has been established) or at receiving hospitals.

The UK military have adapted the TS. Their version of the Triage Sieve (MS) includes an estimate of consciousness as part of the final step of the algorithm.[2] There is good evidence from literature looking at field triage (the process of determining whether single casualties from "normal" civilian trauma need to go to Major Trauma Centres) that the GCS is the physiological parameter most strongly predictive of serious injury.[3,4] One study found it to have an odds ratio (OR) for need for significant intervention (as opposed

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doi:10.1016/j.injury.2011.10.005

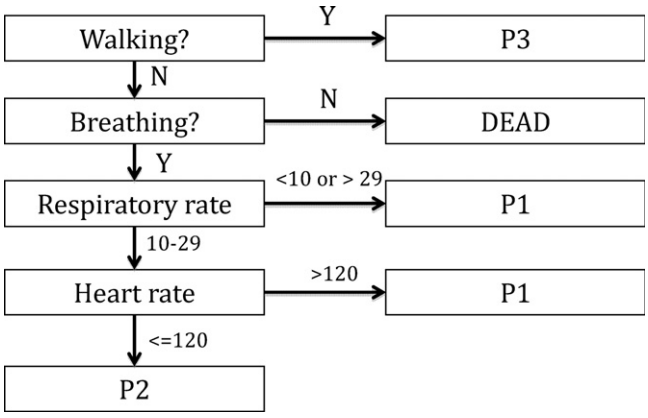

Fig. 1. The Triage Sieve. In the final step, prolonged vs normal Capillary Refill Time may be used instead of heart rate over or below 120.

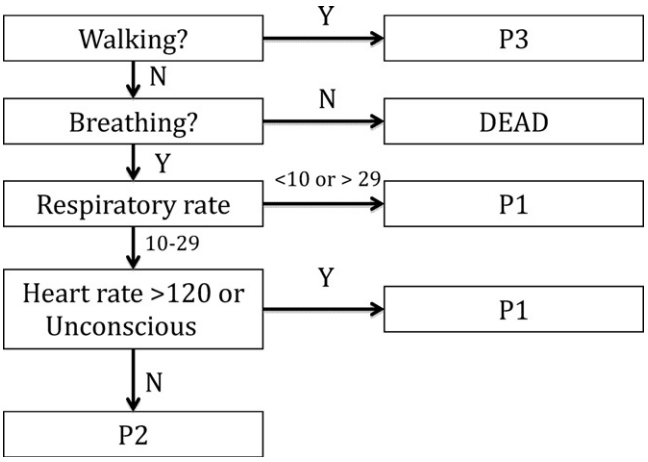

Fig. 2. The Military Sieve, with assessment of consciousness alongside heart rate as the final step.

to no need) of 75.[5] Of particular value is the motor component (Glasgow Motor Score, GMS).

The next most sensitive parameter is the systolic blood pressure (OR 32), with RR and HR being far less predictive (ORs 2.5–3.5).

The current military version does not specify an exact GCS for a P1 – merely whether or not the patient appears "unconscious" (Fig. 2: the military version of the Triage Sieve). There is no clearly defined "best" cut-off for the GCS. A Glasgow Motor Score (GMS) of 6/6 (obeying commands, or the "Hey Bub, touch your nose" test) has been shown to be effective, but does not seem to meet the current description of unconscious in the MS. Whatever assessment is settled upon, it should not add to the time taken to perform the Sieve.

The military triage context may differ somewhat from that encountered by most civilian major incident responders. In particular the model of a casualty clearing station may not be applicable. Casualties may be evacuated direct from scene by helicopter and the transport response times may well be very short. As a result, patients may be transferred to hospital on the basis of a single triage assessment, with no time for secondary triage (SORT). Transport is likely to be in cohorts of patients rather than as a steady stream of ambulances. As the first transport will not be able to take all the casualties at once, the sensitivity of the first tool must be as high as possible. This will reduce under-triage (false negatives) and the risk of the sickest patients being missed from the first transport and having to wait much longer for their "immediate" intervention. Patients are also more likely to suffer penetrating trauma (ballistic or blast injury) in military incidents than in civilian ones, although with the increase in global terrorism, civilian mass casualty events featuring penetrating trauma are becoming more common. There has been very limited research into the behaviour of triage systems in penetrating trauma.[6]

There is only one assessment of the validity of the TS in a clinical context. Garner et al.[5] retrospectively used resource-based criteria to examine a database of consecutive patients arriving at two Major Trauma Centres. The TS was calculated from pre-hospital physiological data, and compared with a gold standard definition of a P1 based on whether the patient needed a life-saving intervention within 6 h. They found that the TS had a sensitivity of 46%, with a specificity of 88%. Other systems tested (START from the US and Careflight from Australia) performed considerably better – sensitivities of 85% and 82%, respectively. A comparison of the various triage systems and the parameters used is shown at Table 1.

Experience after bombings in Israel has shown that experienced clinicians using no particular system at the door to the hospital can have a sensitivity of 50% for casualties with ISS > 15.[7] This serves as a benchmark that any triage tool should exceed.

Aims of this study

1. To compare the ability of the civilian and military versions of the Triage Sieve (TS and MS) to identify patients who needed immediate, life-saving intervention in Afghanistan and Iraq.
2. To identify the HR, RR and GCS thresholds that best predict P1 patients.

Methods

A resource-based definition of a Priority 1 (P1) casualty has been described previously.[5,8] We undertook a modified Delphi process involving all of the consultants involved in trauma management at a British Military Hospital (Camp Bastion, Helmand province, Afghanistan, March 2010) to ensure that it reflected the most current military trauma practice. The starting point was the set of criteria described by Garner et al. Eight people offered changes on the first round, and one on the second. The third round provoked no alterations and the interventions listed in Box 1 became our gold standard. If a patient received one or more of the listed interventions

Table 1
Comparison of criteria used in UK, US and Australian triage systems.

Method	Ist assessment	2nd assessment	3rd assessment	4th assessment
Sieve	Walking?	Breathing? 10 < rate > 30?	Heart rate >120	
Military Sieve	Walking?	Breathing? 10 < rate > 30?	Heart rate >120	"Unconscious?"
START	Walking?	Breathing? Rate > 29?	Palpable pulse?	Obeying commands?
Careflight	Walking?	Obeying commands?	Breathing?	