Triage Sieves, which application is best for the Military Medic?

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TRIAGE

Introduction

In the event of multiple causalities the military medic requires a tool to provide a guide for the sorting and disposition of causalities.

The influence of contemporary operations has altered the priorities for assessment and early intervention. For this review, over twenty military and civilian triage tools were identified. The majority provide an algorithm to determine the priority attributed to each patient by the use of a pragmatic flow-chart which provides little opportunity for variation in the decision making process, while others include physiological criteria to support the process.

There is little evidence base for the traditional tools which raises questions over their validity. Often the systems are non-reproducible, not scalable , have no scientific basis [10, 17].

The most critical element within triage is the allocation of the Priority One (P1) to the patients who require lifesaving interventions (LSI)[3,17]. Therefore it is the sensitivity and specificity of the tools used to allocate P1 to the correct patients that informs the basis of the selection of the most useful triage tool. Triage may be the most important medical task performed at any disaster site [8].

The Requirements

The high proportion of critically injured patients within military MCI means it is essential to have rapid and accurate allocation of triage categories. While military triage has stood alone in the past, the emergence of terrorist events with similar patient presentation of civilian cohorts to that of military cohorts identifies the need to modify civilian triage for such events [16].

Mortality in a number of retrospective studies was identified as 15% within military population compared to 3.4% in the civilian cohort studies

While evolution of triage including an anatomy criteria addresses triage form a different perspective, such triage has poor reproducibility and a low sensitivity. It is impractical as the patient needs to be undressed and is unlikely to detect cavity related haemorrhage in >40% of cases [5, 14].

Evidence

Validation of MMS showed it performed better at predicting the need for life saving intervention than any of the commonly used triage tools TS, START, CF[17]. Both versions of the Military Sieves, MS and MMS, have higher sensitivities than any of the other common sieves for military cohort patients requiring LSI [17].

Performance

Triage sieves alone are significantly poor predictors of severe injury[2]. Triage sieves which include a physiological parameter such as heart rate (HR), respiratory rate (RR) or an assessment of level of consciousness (LOC), in particularly the motor score (MS) of Glasgow Coma Scale (GCS) have greatly improved triage accuracies and outcomes[17].

Physiological

Various cardiovascular assessments have been recommended as hypotension has always been associated with increased mortality. While systolic blood pressure remains the gold standard for assessing cardiovascular status, the impracticality of collecting this is identified[4].

While HR has been shown to be a reliable indicator of severity in hospital, it has been shown to be less reliable in out-of-hospital triage. Anticipated tachycardia as a response to hypovolemia is also an unreliable parameter [3]. The utilisation of a HR of <40-60 can be safely used with a modest increase in sensitivity [3].

The inclusion of the shock Index (SI), HR divided by Systolic Blood Pressure (SBP) may be the key to securing a hemodynamic state as a triage parameter[1,11]. Heart rate and blood pressure alone are often poor predictors of a patient's perfusion status.

The Inclusion of GCS is supported in a number of studies and appears to be the single parameter which most strongly predicts serious injury (OR=75). While SBP is identified as the next significant predictor (OR = 32), RR and HR proved to be far less predictive (OR's 2.5-3.5) [2,4].

Inclusion of a GCS score of <13 representing "unconscious" is selected for two reasons. It is the level that a non-trained person cannot confuse unconsciousness, and as the sensitively of the MMS increased with a GCS score of between 9-12 the inclusion of a GCS score of <13 is supported [17].

Although a GCS of <8 is also highlighted as a strong predictor, the time required to accurately assess GCS is a limiting factor in its use[3]. Adding a consciousness assessment to the triage tools gave an absolute increase in sensitivity in all cases of approximately 5.2%. In MS, sensitivity improved from 58.4% to 62.1%, TS sensitivity was increased from 49.4% to 56.8%, and inclusion GSC of <13 in MMS projected a sensitivity and specificity of 71.2 % and 79.3% respectively [17].

A retrospective study of 482 military patients presented at an ED at Camp Bastion, Afghanistan in 2011, identified 59.0% as P1 (n=199) with MMS producing sensitivity of 68.3%, and specificity of 79.4%. There was an absolute increase in sensitivity over existing tools such as MS and CF of 5.0% and 23.6% respectively. There was a statistically significant difference between MMS and MS (P=0.0005) supporting MMS as the superior tool.

TS [2,3].	**46.0%**	**88.0%**	**7**
TS [17].	50.3%	89.0%	
MS [17].	63.3%	82.4%	
MMS [17].	68.3%	79.4%	
START [2,3,9].	85.0%	86.0%	35
START [7].	90.0%	90.0%	
CareFlight [3, 9].	82.0%	96.0%	99
CareFlight [17].	44.7%	91.9%	
START [2].	85.0%	89.7%	

Table 1: Summary of Sensitivity and Specificity

HISTORY

Triage, with its roots firmly embedded in military history, derives from the French verb, trier "to sort". It was conceived by Napoleon's surgeon Baron Dominique Jean Larrey, with his 'ambulances volantes' (flying ambulances) during the Napoleonic wars 1803-1815. [1, 6, 8, 10, 12, 13, 14, 15, 17]. The specific allocation of a triage category is attributed to Royal Navy surgeon Wilson in 1846 [5].

GLOSSARY

MCI	Multiple/mass casualty incident
LSI	Life-saving intervention
TS	Triage Sieve
MS	Military Sieve
MMS	Modified Military Sieve
START	Simple Triage and Treatment
CF	Care flight

Sensitivity: The proportion of people who are correctly identified within a criteria [3].

Specificity: The proportion of people who are correctly identified as not meeting the Criteria [3].
Shock Index (SI) : Heart Rate divided by Systolic Blood Pressure (HR/SBP)[3].

Odds ratio (OR): The ratio of the odds of having the target disorder in the experimental group relative to the odds in favour of having the target disorder in the comparison or control group [3].

METHODOLOGY

Methodology
Electronic databases Medline, Scopus, OVID and EBSCO were searched via the AUT library with key terms "triage" AND "sieve" AND/OR "multiple casualty" AND/OR " mass casualty" with limits of date: 2000-2017, English and full articles. Exclusion included specific reports on single events. Twenty-six articles were identified for inclusion.

OVER-TRIAGE

Over-triage has a directly relationship to mortality [17]. It is estimated as much as over 50% of P1 allocation is over-triage. Both MS & MMS have much lower specificities corresponding to over-triage rates of 17.6% and 20.6% respectively. The Centre for Disease Control (CDC) states that under triage is unacceptable and the only acceptable sensitivity is between 95-100%, while over-triage is acceptable in 50-60% of cases [3]. Is this an achievable level [7]?

WALKING

Triage systems such as START which separate ambulatory and expectant patients attempt to "do the greatest good for the greatest number" [10]. However walking wounded may not present for care due to their low priority allocation [17]. The walking criteria also fails to identify those with developing TBI who may still be able to walk and provides an allocation of a higher priority to those who cannot walk due to a minor injury to a lower limb [1,16].

CONCLUSION

The inclusion of physiological parameters within a triage sieve appeared to provide better overall results. Of all the systems reviewed MMS is superior to all others. While the roots of triage are buried deep in military medical history, ongoing review and validation of the triage sieves and their application, can only result in better patient outcomes.

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