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Major incident triage: A consensus based definition of the essential life-saving interventions during the definitive care phase of a major incident

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ABSTRACT

Introduction: Triage is a key principle in the effective management of major incidents. The process currently relies on algorithms assigning patients to specific triage categories; there is, however, little guidance as to what these categories represent. Previously, these algorithms were validated against injury severity scores, but it is accepted now that the need for life-saving intervention is a more important outcome. However, the definition of a life-saving intervention is unclear. The aim of this study was to define what constitutes a life-saving intervention, in order to facilitate the definition of an adult priority one patient during the definitive care phase of a major incident.

Methods: We conducted a modified Delphi study, using a panel of subject matter experts drawn from the United Kingdom and Republic of South Africa with a background in Emergency Care or Major Incident Management. The study was conducted using an online survey tool, over three rounds between July and December 2013. A four point Likert scale was used to seek consensus for 50 possible interventions, with a consensus level set at 70%.

Results: 24 participants completed all three rounds of the Delphi, with 32 life-saving interventions reaching consensus.

Conclusions: This study provides a consensus definition of what constitutes a life-saving intervention in the context of an adult, priority one patient during the definitive care phase of a major incident. The definition will contribute to further research into major incident triage, specifically in terms of validation of an adult major incident triage tool.

Introduction

Major incidents occur on a regular basis across the world and range from natural disasters to transport incidents and terrorist activities [1]. However, it was not until the early 1990s that formal training in major incident management became available, giving guidance to participants on the principles of effective management [2] Triage, the process of sorting patients and categorising them on the basis of clinical acuity, is a key principle and the first clinical management priority at a major incident.

By no means a new concept, triage has been in existence since the Napoleonic wars, and is not unique to major incidents [3]; indeed, it is carried out daily in a variety of clinical emergency environments [4–7]. The Major Incident Medical Management and Support (MIMMS) course recommends a two-stage approach to triage. The first, the Triage Sieve (TSi), is conducted by the initial responders finding the casualty at the incident scene. It is a rapid initial assessment only, and enables an overview of all casualties which can guide treatment priorities [2].

The Triage Sort (TSo) is a more detailed second assessment of the casualty and is conducted by more experienced medical personnel as patients arrive at the Casualty Clearing Station (CCS), a safe environment some distance from the scene, where more time and resources are available to medical staff [2]. Both the TSi and TSo allocate a patient to one of three categories, but there is

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limited guidance as to what the categories correspond to clinically [2,8]. Once casualties have been prioritised using the TSo at the Casualty Clearing Station, treatment can be initiated, depending on patient flow from the incident and the medical resources available.

On arrival at hospital, the patient will be re-triaged, again using the TSo, further guiding treatment priorities. Triage is a dynamic process, reflecting the nature of the patient's response to injury and subsequent treatment.

As would be expected, the TSi/TSo are not the only algorithms used in major incidents; both the US and Australia have developed their own [8,9]. However, all share the common principle of assigning patients to one of three categories. The three categories in guidance currently provided are:

- Priority 1, Immediate: Require immediate life-saving intervention (LSI)
- Priority 2, Urgent: Require medical or surgical intervention within 2–4 h
- Priority 3, Delayed: Treatment can be delayed > 4 h

The concept of a 'life-saving intervention' has evolved over time; in 1990, Baxt was the first to offer a resource-based definition to identify the major trauma patient [10]. Subsequently and specifically for the retrospective analysis of major incident triage algorithms, Garner produced a set of LSIs to define the priority one patient and validate existing algorithms [8]. The identification of those most in need of a life-saving intervention is now accepted as the purpose of major incident triage algorithms and they must be validated against this standard (rather than against the injury severity score (ISS) or other injury scores as has previously been done) [11]. The ISS, while it may be used to predict probability of survival, demonstrates a clear lack of correlation with the requirement for life-saving intervention and is itself not a tool for triage [10].

Consensus exists on what constitutes a LSI in a paediatric population [11] but comparatively little work has been done for an adult population. Building on a previously published list, Horne conducted an adapted Delphi that identified 34 LSIs for use in an adult military trauma population (Appendix A in Supplementary material) [8,12]. Although currently the only work of its kind, there is limited detail as to the Delphi methodology used, instead focusing on the derivation of a novel triage tool. Additionally, its intention was to reflect military and not civilian trauma care – with all participants currently deployed "to ensure that it reflected the most current military trauma practice." [12].

With marked differences in the injury mechanism between military and civilian populations as well as differences in available healthcare resources in the military setting, these life-saving interventions may not be wholly transferable to the civilian population [13]. In order to review and optimise current triage methods utilised at major incidents, there is a need to define the output of the triage process.

The aim of this study was to obtain consensus as to what constitutes a life-saving intervention during the definitive care phase of a civilian major incident. This in turn will allow us to define a triage priority one patient in the civilian setting. For the purposes of this study, a patient in the definitive care phase was one at an appropriate medical facility capable of providing advanced life-saving interventions with no limitation on available resources.

Methods

Using the framework set out by Boulkedid et al., a modified three round online Delphi study was conducted between July-December 2013. [14] This study received approval through the Human Research Ethics Committee of the University of Cape Town (reference 285/2013).

To maximise heterogeneity of the Delphi panel, participants were specialists in Emergency Care or Major Incident Management and drawn from the work locations of the authors: the United Kingdom and Republic of South Africa. The following initial screening criteria were used: held positions of authority within the sphere of emergency planning, involvement in Major Incident academic work, specialists in the management of major incidents, major trauma or the emergency care of patients, current MIMMS course faculty, Consultant Advisors, Defence Consultant Advisors or Defence Professors in specialities involved in deployed trauma care within the UK Defence Medical Services. Only those responding to the initial invitation were subsequently invited to take part in the Delphi study. Participation was fully anonymised throughout the study period, with no additional participants included after the first round commenced. Following the final round, consent was sought from participants to publish their names.

In keeping with prior studies within the literature, consensus was set *a priori* at 70% [15], with a four point Likert scale used to deter neutrality, ranging from strongly agree to strongly disagree. All rounds were distributed online using SurveyMonkey ®(SurveyMonkey Inc. Palo Alto, California, USA). Round one consisted of 51 interventions that included the 41 life-saving interventions described by Horne (Appendix A, Table 1; Horne, in Supplementary material). The other ten were related to timing (Appendix B, Table 3 in Supplementary material). During the first round, participants were given the opportunity to suggest additional interventions they considered to be life-saving of which all were included in the second round (Appendix C, Table 4 in Supplementary material). Email feedback was provided to all participants individually following each round. This included participant's individual responses from the preceding round and also group results. Interventions reaching positive or negative consensus (70%) were removed from subsequent rounds. Interventions reaching positive consensus after three rounds were considered to be LSIs, to be used to define Priority One patients.

Data were collected using SurveyMonkey ®(SurveyMonkey Inc. Palo Alto, California, USA) software and analysed using a Microsoft Excel ® spreadsheet.

Results

Of 74 potential experts identified, 30 responded and consented to take part in the first round; 24 completed all three rounds (UK 13 and SA 11) with the majority (20) from Emergency Medicine (Fig. 1).

Following three rounds 32 (64%) interventions reached positive consensus and were considered life-saving interventions (Table 1). Of the rest, 6 (12%) reached negative consensus and 12 (24%) failed to reach consensus. Fig. 2 demonstrates the flow of life-saving interventions throughout the Delphi. Detailed analysis of each round and subsequent flow is provided at Appendix D and E in Supplementary material.

Over three rounds only 6 of 10 time statements reached consensus status. The 2 positive statements were "following an injury, a LSI is one that is required immediately" and "following an injury, a LSI is one that is required within one hour". Four statements reached negative consensus (life-saving intervention required within 6,8.12 or 24 h).

Discussion

This study has determined a consensus opinion of life-saving interventions to be performed during the definitive care phase of a