Qualitative Analysis of Surveyed Emergency Responders and the Identified Factors That Affect First Stage of Primary Triage Decision-Making of Mass Casualty Incidents

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Abstract

Introduction: After all large-scale disasters multiple papers are published describing the shortcomings of the triage methods utilized. This paper uses medical provider input to help describe attributes and patient characteristics that impact triage decisions.

Methods: A survey distributed electronically to medical providers with and without disaster experience. Questions asked included what disaster experiences they had, and to rank six attributes in order of importance regarding triage.

Results: 403 unique completed surveys were analyzed. 92% practiced a structural triage approach with the rest reporting they used “gestalt”. (gut feeling) Twelve per cent were identified as having placed patients in an expectant category during triage. Respiratory status, ability to speak, perfusion/pulse were all ranked in the top three. Gut feeling regardless of statistical analysis was fourth. Supplies were ranked in the top four when analyzed for those who had placed patients in the expectant category.

Conclusion: Primary triage decisions in a mass casualty scenario are multifactorial and encompass patient mobility, life saving interventions, situational instincts, and logistics.

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INTRODUCTION

A mass casualty incident (MCI) is defined as an event which generates more patients at one time than locally available resources can manage using routine procedures.1 The goal of triage systems, protocols and algorithms, at every level of care, is to ensure the best possible opportunity for survival of all the victims served. Advancements within emergency medical services (EMS) have had considerable impact on the manner in which MCIs are triaged and initially managed.

Primary triage occurs at the first contact with the EMS medical personnel at which point victims are assigned an acuity level based on injury severity. Secondary triage, or a reevaluation of the victim's condition after initial medical care, may also occur at the scene of the MCI following EMS interventions or during transport to an emergency department or secondary collection station.2 The decision-making processes involved in primary triage and patient hospital distribution are influenced by both reactive (ad hoc) and proactive (based on situational awareness) factors.2 An 'ideal' triage protocol system would result in minimal under-triage or patients classified less acute than what they really are, and over-triage, which has been shown to increase mortality as more people are labeled as a higher acuity than they really are.

To date, no single triage tool algorithm can demonstrate sufficient scientific evidence to justify national adoption. In 2006 the National Association of EMS Physicians (NAEMSP) and the Centers for Disease Control and Prevention (CDC) funded the SALT workgroup. The goal was to exam published triage systems and make recommendations based on available science for the adoption of one standard mass casualty triage system. The initial result of the workgroup effort showed that there was no published triage system that could be adopted. Secondary outcomes were two fold; the first was the development a new triage system, the Sort-Assess-Lifesaving Interventions-Treatment/Triage (SALT). This a non-proprietary free system developed from available research, with widely accepted best practices of existing mass triage systems, and consensus opinion from the workgroup. The second outcome, because of resistance from local, state and federal agencies to change current triage
practices which, would allow interoperability among existing triage tool algorithms, the SALT workgroup, developed the Model Uniform Core Criteria (MUCC) for Mass Casualty Triage. The MUCC consists of 24 criteria of recommended elements of a MCI triage system (Table 1).

<table>
<thead>
<tr>
<th>Table 1: Model Uniform Core Criteria for Mass Casualty (MUCC) triage</th>
</tr>
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<tbody>
<tr>
<td>Triage systems and all of their components must apply to all ages and populations of patients.</td>
</tr>
<tr>
<td>Triage systems must be applicable across the broad range of mass-casualty incidents in which there is a single location with multiple patients.</td>
</tr>
<tr>
<td>Triage systems must be simple, easy to remember and amenable to quick memory aids.</td>
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<tr>
<td>Triage systems must be rapid to apply and practical for use in an austere environment.</td>
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<tr>
<td>Triage systems are resource dependent, and the system must allow for dynamic triage decision based on changes in available resource and patient conditions.</td>
</tr>
<tr>
<td>The triage system must require that the assigned triage category for each patient be visibly identifiable (i.e., flags, tags, markers, bags).</td>
</tr>
<tr>
<td>Triage is dynamic and reflects patient condition and available resources at the time of assessment. Assessments may be repeated whenever possible and categories adjusted to reflect changes.</td>
</tr>
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</table>

**Sorting of patients:**
- Simple commands must be used to prioritize victims for individual assessment.
- The first priority for individual assessment is to identify those who are likely to need a lifesaving intervention (unable to follow commands, no purposeful movements, obvious threat to life).
- The second priority for individual assessment is to identify those who are unable to follow the command to ambulate to an assigned place but are able to follow other commands or make purposeful movement.
- The last priority for individual assessment is to identify those who follow commands by ambulating to an assigned place (or make purposeful movements) and have no obvious life-threatening conditions.
- All patients must be assessed individually regardless of their initial prioritization during global sorting. This includes the assessment of walking patients as soon as resources are available.

**Lifesaving interventions (LSI):**
- LSI are considered for each patient and provided as necessary, before assigning a triage category. Patients must be assigned a triage category according to their condition after any lifesaving interventions.
- LSI are performed only if the equipment is readily available, the intervention is within the provider’s scope of practice, the intervention can be performed quickly (less than one minute), and the intervention does not require the provider to stay with the patient.
- LSI include the following: controlling life-threatening external hemorrhage, opening the airway using basic maneuvers (for an apneic child, consider 2 rescue breaths), +/- performing chest decompression, and providing autoinjector antidotes.

**Individual Assessment**
- Each victim must be assigned to 1 of 5 triage categories with an associated color and initial (Immediate/red, delayed/yellow, minimal/green, expectant/gray, dead/black).
- Assessment must not require counting or timing of vital signs and instead must use yes/no criteria. No diagnostic equipment may be used (pulse ox., BP cuff, EKG monitor, AED).
- Capillary refill must not be used as a sole indicator of peripheral perfusion.
- Patients who are not breathing after 1 attempt to open their airway (in children 2 rescue breaths) must be classified as dead and visually identified as such.
- Patients are categorized as immediate if they are unable to follow commands or make purposeful movements OR they do not have a peripheral pulse, OR they are in obvious respiratory distress, OR they have a life-threatening external hemorrhage, AND they are unlikely to survive given the available resources. These patients should receive resuscitation or comfort care when sufficient resources are available.
- Patients are categorized as delayed if they are able to follow commands or make purposeful movements, AND they have peripheral pulse, AND they are not in respiratory distress, AND they do not have a life-threatening external hemorrhage, AND their injuries are considered minor.
- Patients are categorized as minimal if they are able to follow commands or make purposeful movements, AND they have peripheral pulse, AND they are not in respiratory distress, AND they do not have a life-threatening external hemorrhage, AND their injuries are considered minor.
- Patients categorized as immediate are the first priority for treatment and/or transport followed by patients categorized as delayed and minimal. Patients categorized as expectant should be provided with treatment and or transport as resources allow. Efficient use of transport assets may include mixing categories of patients and using alternate forms of transport.

The criteria, if adopted into existing triage systems, would allow for uniformity and interoperability between EMS responders from different jurisdictions upon arrival at an MCI site. As of 2011, 15 of the 24 MUCC essential elements are being used by existing triage systems; SALT is totally compliant with all 24 criteria.\(^3\)

In recognition that current classification systems may not be accurate enough or properly mitigate subjectivity, several studies...
including those by ethicists and critical care specialists have suggested that, due to social, medical, and logistical variables, that only an experienced provider or a triage team approach should be utilized during the most difficult triage decisions. Additionally, very few studies have satisfactorily identified, compared, and discussed the actual real time decision-making criteria used by experience-rich providers, in order to create an accurate and usable prioritization algorithm for mass casualty events.

To better understand both the reactive and situational awareness factors influencing the primary triage decision-making process among pre-hospital responders, both experienced and not, this study was designed to investigate and analyze those factors that actual medical providers during MCI’s perceived that directly and indirectly impacted and influenced how their primary triage priority decisions were processed.

METHODS

To evaluate how triage decisions are initially processed, this study distributed an electronic survey to EMS and pre-hospital medical providers to help identify and rank the factors that influence primary triage decisions made by those with and without disaster experience. The survey questionnaire was designed by the authors, in English, to ascertain what attributes healthcare workers value and utilize when evaluating a patient for triage and treatment priority. The initial survey was piloted with a small sample of ten healthcare workers who work in an academically affiliated emergency department and have had previous disaster response experience. Based upon the feedback received, the final survey instrument was revised and the modified questions were entered into SurveyMonkey®. The survey was available on-line for 2 months (April-May 2010). The survey was then distributed electronically via a variety of methods: personal email addresses to disaster responders, emergency medicine and disaster listservs, and a hyperlink on a medical website frequented byprehospital EMS medical professionals (http://www.jems.com/articles/2010/05/mci-triage-techniques-survey.html). Respondents were not provided any financial or other incentives for participation. The survey study received approval by our hospital’s institutional review board prior to the start of data collection. Surveys that were not completed in their entirety were excluded from the final analysis.

Survey Instrument:

The introductory paragraph described the intent of the survey, provided assurance of anonymity, and indicated that the approximate time to complete the survey would be less than 20 minutes (this was based on Beta testing of the survey on SurveyMonkey®). By survey design, all questions were required to be answered and the respondent could not advance without answering; The only exception was for specific stand-alone questions asking for opinion-based write-ins, if these were not answered, the respondent’s survey was still included.

General information required, aside from date of birth and gender included:

- Primary professional role (e.g., physician, nurse, EMT (emergency medical technician, Paramedic)
- Medical specialty (e.g., emergency medicine, prehospital care)
- Years in medical profession (dichotomized as 10 or fewer years vs. >10 years)
- Disaster training if any (military, NDLS, ARC, FEMA, decontamination, CDP-Noble, or other)
- Triage system used in both non-disaster and disaster practice (ESI, CDP-Noble, MASS, SAVE, START, SALT, STM informal “gut feeling”, or other)
- Disaster triage experience (yes/no)
- Experience of triaging a “live” patient to an expectant category (yes/no)
- Specific disaster deployments if applicable

Patient attributes contributing to triage placement: Six patient and disaster attributes were to be ranked in the order of importance to the respondent (1-6 with 1 being the most important); to help that would determine the preferred ranking of these attributes by the respondent.

- Ability of the patient to speak to you
- Age
- Gut feeling, by the responder performing triage, of the severity of injury
- Perfusion-peripheral pulse
- Respiratory status
- Supplies or resource availability

In addition, for those who claim prior disaster response experience, a comment box was added to allow for additional observations to be added besides the six listed attributes and/or factors that might influence the triage priority of patients.
RESULTS

Data Analysis

A total of 495 surveys were returned, with 92 deemed incomplete and thusly excluded from data analysis. The 403 completed surveys were analyzed using SAS 9.3 for Windows. Descriptive findings are presented as numbers, proportions, means, frequencies, and standard deviations. Respondents, for further analysis, were classified into three groups based on their disaster triage experience: no disaster triage experience (NoExp), performance of disaster triage without the “expectant” category (ExpNoExpectant), experience, and performing disaster triage with an “expectant” category, those people who are not expected to survive based upon logistical and or skill limitations. Those with “expectant category” (ExpBT) experience (n=47) were classified as the most triage experienced respondents of the three groups. Wilcoxon (non-parametric) tests compared mean rankings between the different triage experience groups. Bonferroni adjustments to the alpha level were made for 12 comparisons, and for these comparisons, alpha level was set at p<.004 (.05/12). Chi-square statistics were used to compare the dichotomous top four vs. lowest two rank order of the supplies/resource availability factor and of the patient age factor between the NoExp vs. ExpNoExpectant groups and between the ExpNoBT and ExpBT groups.

Fifty three percent of the 403 respondents were pre-hospital providers (Table 2).

<table>
<thead>
<tr>
<th>Emergency Managers</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advance Practice Nurse</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>EMT-Basic</td>
<td>84</td>
<td>21</td>
</tr>
<tr>
<td>EMT-Paramedic</td>
<td>129</td>
<td>32</td>
</tr>
<tr>
<td>Non-medical</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>Nurse</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Physician Assistant</td>
<td>115</td>
<td>29</td>
</tr>
<tr>
<td>Physician</td>
<td>60</td>
<td>15</td>
</tr>
</tbody>
</table>

Table 2. Self reported medical occupations of respondents, all of who worked in emergency management areas. (N=403)

Nearly all indicated that they practiced a structured triage approach (i.e., START, MASS, SAVE, STM, ESI) with 8% (32/403) reporting that they utilized an informal “gut feeling” triage methodology. The NoExp group comprised the majority, 60% (240/403), 29% (116/403) were in the ExpNoBT group, and 12% (47/403) were in the ExpBT group. Those in both the ExpNoBT and ExpBT groups, were able to expound on their personal disaster experiences. These included deployments to military conflicts, Oklahoma City bombing, 9/11 for both World Trade Center and Pentagon sites, and protracted disaster events such as hurricanes Katrina and Ike.

The mean (SD) ranking of each of the six-triage factors by the three experience groups is displayed in Figure 1.
‘Respiratory status, ability to speak, perfusion/pulse, and gut feeling’ factors were ranked in the top four by the majority of the 403 respondents. The mean rankings for five of the six variables (all but ‘gut feeling’) differed by experience groups and were all statistically significant depending on disaster experience (Table 3).

Table 3: Ranking differences of criteria separating experienced (163) vs. no experience (240). (p<0.05 sig)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Experienced (n=163)</th>
<th>No Experience (n=240)</th>
<th>Mean Diff</th>
<th>t</th>
<th>Df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory status</td>
<td>1 2.44 1.43</td>
<td>1 2.02 1.42</td>
<td>-0.42</td>
<td>-2.89</td>
<td>401</td>
<td>0.004</td>
</tr>
<tr>
<td>Ability to speak to you</td>
<td>2 2.93 1.78</td>
<td>3 3.29 0.36</td>
<td>0.36</td>
<td>2.04</td>
<td>328</td>
<td>0.043</td>
</tr>
<tr>
<td>Perfusion/Pulse</td>
<td>3 2.96 1.22</td>
<td>2 2.71 1.16</td>
<td>-0.25</td>
<td>-2.07</td>
<td>401</td>
<td>0.039</td>
</tr>
<tr>
<td>Gut feeling</td>
<td>4 3.63 1.58</td>
<td>4 3.73 1.38</td>
<td>0.10</td>
<td>0.68</td>
<td>315</td>
<td>0.498</td>
</tr>
<tr>
<td>Supply availability</td>
<td>5 4.29 1.61</td>
<td>6 4.96 1.59</td>
<td>0.67</td>
<td>4.17</td>
<td>401</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Age of patient</td>
<td>6 4.76 1.36</td>
<td>5 4.30 1.19</td>
<td>-0.47</td>
<td>-3.54</td>
<td>315</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Though there were slight differences in the order of ranking, both groups had the same top and bottom three criteria choices with ‘supplies and age’ showing strong significance in their ranking placement differences. Further analysis with a series of nonparametric Wilcoxon tests comparing the factor rankings across each of the disaster experience group pairs found the following significant between-group comparisons: the NoExp group ranked the ‘supplies/resource availability’ factor significantly lower than did the ExpNoBT group who in turn ranked the ‘supplies/resource availability’ factor significantly lower than did the ExpBT group. The Z proportion of each of the three experience groups ranking ‘supplies/resource availability’ in the top four is demonstrated in Figure 2.
The purpose of this survey was to query practicing field experts and identify factors that affect their triage category.

Identifying seriously injured patients potentially missed by other triage criteria further demonstrated the "independent predictive value" of the EMS provider's judgment, a gut feeling-like primary triage criteria. For the provider to follow to allow for the best patient transportation designation. However, triage is a very complex task that is dynamic, heuristic, and driven primarily by "provider judgment rather than specific triage criteria". Admittedly, triage is a fluid and dynamic process; it has multiple variables influencing the decision maker and should be adaptable to a myriad of situations. Most triage criteria endorsed by the American College of Surgeons, Emergency Nursing Association, and the American College of Emergency Physicians use a combination of physiological, anatomical, mechanism of injury, and special considerations categories to determine severity categorization. It is created as a step-by-step algorithm for the provider to follow to allow for the best patient transportation designation. However, triage is a very complex task that is dynamic, heuristic, and driven primarily by “provider judgment rather than specific triage criteria”. Newgard and colleagues further demonstrated the “independent predictive value” of the EMS provider’s judgment, a gut feeling-like primary triage criteria for identifying seriously injured victims, showing that the “cognitive reasoning processes encapsulated in this criteria can help in identifying seriously injured patients potentially missed by other triage criteria.”

The purpose of this survey was to query practicing field experts and identify factors that affect their triage category.
placement of patients. The assumption made is that medical providers with practical experience in triage situations will prioritize different attributes for the sorting of patients compared to those providers with no disaster experience. These findings in turn, could provide more attribute weighting of the factors used create a more accurate triage algorithm. For example, in this study, the top ranked categories regardless of experience level were ‘cardiovascular’ and ‘neurological’ with those respondents with disaster experience placing a higher value on the ability of the patient to ‘speak’ than on the ‘cardiovascular’ criteria. This suggests that brain perfusion to the experienced triage provider is considered a good indicator of injury severity.

After the physiological attributes, in our rankings, ‘Gut instinct’ ranked forth, regardless of disaster experience level with 8% reporting, that they used it as their primary form of triage guidance. Instinct or gut instinct is related to experience, which is a part of expert knowledge, and is very effective in cases of complex decisions such as triage. In the nursing literature, much has been written about experience and instinct in patient care, with an acceptance that experience creates ‘intuition’ which guides recognition of subtle deterioration and subsequent appropriate nursing action. In the prehospital literature the support of ‘gut instinct’ has been mixed. A review of the earlier prehospital triage literature is varied, with some studies suggesting that provider judgment is effective in increasing the sensitivity of triage. Other papers suggest it has no affect at all, which could be due to a lack of overall provider experience. There have been two large retrospective trauma studies examining prehospital triage and destination assignment to determine what historically prehospital providers have used for decision-making. These analyzed a three year period where >250,000 injured person were transported; 36% of the time, EMS provider judgment was the most commonly used triage criterion. This is further supported in a variety of published case reports which have noticed that ‘gut instinct’ played an enormous role in correctly assigning triage criteria to patients.

Supplies ranked 5th amongst the 403 factors analyzed, in toto, was found to rank in the top three in 68% of responses when subset analysis was performed on those claiming prior disaster experience. Other than being used in the SACCO scoring system, this factor is not part of the most popular triage algorithm decision trees, but is part of the MUCC criteria and SALT system. When the write-in sections were reviewed, respondents with Expectant Category experience “wrote in” that the reason for the placing of patients in the expectant category was due to the lack of ‘supplies/transportation’. This pivotal point is not unique to the pre-hospital or disaster arena. It has been described often in the critical care literature, where, during times of resource limitations in critical care units, patients who normally would meet admission/treatment criteria are refused a bed in favor of patients with a perceived more favorable set of sociological and medical parameters that might predict a better outcome.

This document supports the MUCC, as it provides an additional framework for the development of local and adaptable triage algorithms that include resource availability, sorting, lifesaving interventions, and individual patient assessment endorsing five triage categories. From the MUCC came the resulting CDC endorsed SALT triage (Figure 3)

![Fig. 3: SALT Triage](image)

This as an example of a disaster triage algorithm and is presently taught as part of the National Disaster Life Support (NDLS) course series. Triage is a fluid and dynamic process; it has multiple variables influencing the decision maker and should be adaptable to a myriad of situations.

**CONCLUSION**

Based upon this survey analysis, respondents both with and without direct disaster triage experience identified and ranked triage attributes that support the MUCC guidelines. What appears to best support a balanced disaster mass casualty triage
system and considered the most important factors among the surveyed respondents are ‘neurological/cardiovascular’ condition, ‘resource availability’, and the personal attribute of ‘gut instinct’. In addition, decision making in primary triage of a MCI scenario is multifactorial and encompasses life saving interventions, patient mobility, situational instincts and logistics all considered as critical components of a triage scheme that needs more study and analysis. Consensus places experience during MCIs as very important. Based on the success of this survey, the designed electronic survey tool is considered reliable for a second stage international EMS qualitative analysis study of factors influencing primary triage decisions.

Competing Interests

The authors have declared that no competing interests exist.

Data Statement

All relevant data are available within the paper.

Abbreviations

ARC: American Red Cross
CDP-Noble: Center for Domestic Preparedness-Noble Training Center
ESI: Emergency Severity Index
FEMA: Federal Emergency Management Agency
MASS: Move Assess, Sort, Send
NDLS: National Disaster Life Support
SALT: Sort, Assess, Lifesaving Interventions, Treatment/Transport
SAVE: Secondary Assessment of Victim Endpoint
START: Simple Triage and Rapid Treatment
STM: Sacco Triage Method

References


