

Development of a Mass-Gathering Triage Tool: An Australian Perspective

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Abbreviations:

ATS: Australasian Triage Scale
ED: emergency department
PPR: patient presentation rate
TTHR: transport to hospital rate

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Abstract

Many health service organizations deploy first responders and health care professionals to mass gatherings to assess and manage injuries and illnesses. Patient presentation rates (PPRs) to on-site health services at a mass gathering range from 0.48-170 per 10,000 participants. Transport to hospital rates (TTHR) range from 0.035-15 per 10,000 participants. The aim of this report was to outline the current literature pertaining to mass-gathering triage and to describe the development of a mass-gathering triage tool for use in the Australian context by first responders. The tool is based on the principles of triage, previous mass-gathering triage tools, existing Australian triage systems, and Australian contextual considerations. The model is designed to be appropriate for use by first responders.

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Introduction

A mass gathering can be defined as an event where a group of people come together for a common purpose within a particular space or venue, such as a sporting event, music festival, or agricultural show.¹ Patient presentation rates (PPRs) to on-site health services at a mass gathering range from 0.48-170 per 10,000 participants.^{2,3} This variation in patient presentations is dependent on biomedical, psychosocial, and environmental factors of an event.⁴ Similar to variation in PPRs, there is reported variation in the literature pertaining to transport to hospital rates (TTHR) from mass gatherings. Transport to hospital rates range from 0.035-15 per 10,000 participants.^{2,3} The disparity between the PPR and the TTHR demonstrates that the majority of mass-gathering participants who present for clinical assessment and/or management at mass gatherings are managed by on-site health services. Case series reported in the literature highlight that the majority of patient presentations to on-site health services at mass gatherings are of a low acuity.⁵

Many health service organizations deploy first responders and health care professionals such as, doctors, nurses, and paramedics to mass gatherings to assess and manage injuries and illnesses; these clinicians can be professional, volunteer, or a mix of both.⁶ First responders usually are laypersons with additional training. At times, first responders may need to prioritize the initial assessment and management of patients. However, formal triage as a way to prioritize care is not well established in the mass-gathering environment for first responders. Additionally, they do not have similar clinical experience or expertise to undertake triage when compared to health care professionals.⁶

Aim

The aim of this report was to outline the current literature pertaining to mass-gathering triage and to describe the development of a mass-gathering triage tool for use in the Australian context by first responders.

Development of a Mass-Gathering Triage Tool

This report proposes the introduction of an Australian mass-gathering triage tool (Figure 1). There were five key considerations in the development of a mass-gathering

Category	Description	Vital Signs	Example	Time to see clinician	Rx area
RESUSCITATION	Clinically unstable Requiring active resuscitation Risk of death or severe morbidity without emergent intervention	*Any red BTF criteria RR: <5 or >30 Spo2: <90% HR: <40 or >140 BP: <90 or >200mmHg LOC: responding to pain only, or sudden decrease of >2 points on GCS Pain: severe, uncontrolled pain Temp: <34.5 or >40.0C BGL: <2.0mmol	<ul style="list-style-type: none"> • Respiratory or Cardiac arrest • Airway obstruction / choking • Severe respiratory distress • Severe anaphylaxis • Life-threatening bleeding • Major trauma 	Immediate	Resus / Acute +MERT
URGENT	Clinically stable At risk of deterioration Needs urgent intervention Potentially life-threatening presentation	*Any yellow BTF criteria RR: 5 – 10 or 25 – 30 Spo2: 90 – 95% HR: 40 – 50 or 120 – 140 BP: 90 – 100mmHg or 180 – 200mmHg LOC: Decrease in LOC from alert to responding only to voice, or new onset confusion Temp: <35.5 or >38.5C BGL: 2.0 – 3.9mmol	<ul style="list-style-type: none"> • Shortness of breath • Chest pain • Asthma (moderate) • Systemic allergy • Abdominal pain • Hypoglycaemia 	<5 minutes	Acute +HCP review
MINOR	Minor injury or illness requiring assessment or treatment only	Normal vital signs	<ul style="list-style-type: none"> • Wound (minor) • Soft-tissue injury • ?Fractured limb (distal) 	<10 minutes	Fast-track +/- HCP
SELF-HELP	Patient could have self-helped if at home	Not required to measure vital signs unless suspicious presentation	Request for: <ul style="list-style-type: none"> • Band-Aids 	<60 minutes	First Aid

Modifiers:

1. Mechanism of injury, i.e. fall >3metres
2. Effects of alcohol and drugs needs to be considered. Abnormal behaviour, especially where there is a serious risk to the patient or others should be up-triaged.
3. Time sensitive medical condition e.g. (i) 12-lead ECG shows ST elevation myocardial infarction; (ii) motor findings suggestive of stroke; (iii) septic shock.
4. Acute effects of exercise may increase RR and HR. This should resolve shortly after cessation of exercise, usually within 5 minutes in healthy individuals

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Figure 1. Proposed Triage Tool for the Australian Context used by First Responders.

triage tool for use by first responders in the Australian context. These considerations include a tool based on: (1) the principles of triage; (2) previous mass-gathering triage tools; (3) existing Australian triage tools, such as the Australasian Triage Scale (ATS) and SMART Triage; (4) Australian contextual considerations, such as between the flags; and (5) the target population of first responders.

The Principles of Triage

As a principle, triage historically originated during the 1800s by Baron Dominique Jean Larrey who prioritized the surgical intervention of patients with battlefield injuries.⁷ Since, triage has been used in many contexts where the number of patients presenting exceeds the resources available to treat patients.⁸ The purpose of triage is to ensure the greatest good in terms of patient outcomes for the greatest number of patients. Triage is a process designed to prioritize patient assessment and management, ensuring resources are available to patients who need them most urgently.⁹

In the development of an Australian mass-gathering triage tool, having an understanding of the principles of triage was important. This understanding keeps the tool orientated towards doing the greatest good for the greatest number of people. Additionally, the proposed tool takes into context the Australian mass-gathering environment and the available resources in this environment.

Previous Mass-Gathering Triage Tools

Previous research has been conducted in the mass-gathering environment reporting on mass-casualty incidents.¹⁰ Additionally, research has reported on the ability of ambulance paramedics to apply triage within the mass-gathering environment. This research showed a statistically significant level of sensitivity and specificity for differentiating patients who require transport to hospital or those patients who can be managed onsite.¹¹ However, first responders have not been a sample of any studied populations relating to the application of triage in mass gatherings.

In 2012, Turriss and Lund¹² published a discussion paper on a series of interlinking research projects relating to mass-gathering triage in the Canadian context. This discussion paper reviewed mass-gathering triage as a concept and discussed the need for a mass-gathering triage tool that is versatile, simple, evolving, supportive of communication, and practical. At the conclusion of their work, Turriss and Lund¹² suggested that the University of British Columbia (Vancouver, British Columbia, Canada) Mass-Gathering Medical Triage Acuity Scale/Discharge Acuity Scale be implemented within the Canadian mass-gathering environment. The authors stated that this triage tool was based on the Canadian Triage Acuity Scale and the principles of mass-casualty incident triage. However, while the principles of this triage tool were outlined in the discussion paper, the details of the triage tool as a product were not published.

Triage Category	Maximum Waiting Time	Description
1	Immediate	Immediate Life-Threatening – conditions that are threats to life (or imminent risk of deterioration) and require immediate aggressive intervention.
2	10 minutes	Imminently Life-Threatening – The patient's condition is serious enough, or deteriorating so rapidly, that there is the potential of threat to life or organ system failure if not treated within 10 minutes of arrival; or Important Time-Critical Treatment – The potential for time-critical treatment (eg, thrombolysis or antidote) to make a significant effect on clinical outcome depends on treatment commencing within a few minutes of the patient's arrival in the ED; or Very Severe Pain – Humane practice mandates the relief of very severe pain or distress within 10 minutes.
3	30 minutes	Potentially Life-Threatening – The patient's condition may progress to life or limb threatening, or may lead to significant morbidity, if assessment/treatment are not commenced within 30 minutes of arrival; or Situational Urgency – There is potential for adverse outcome if time-critical treatment is not commenced within 30 minutes; or Humane practice mandates the relief of severe discomfort or distress within 30 minutes.
4	60 minutes	Potentially Serious – The patient's condition may deteriorate, or adverse outcome may result, if assessment/treatment is not commenced within one hour of arrival in ED. Symptoms moderate or prolonged; or Situational Urgency – There is potential for adverse outcome if time-critical treatment is not commenced within one hour; or Significant Complexity or Severity – Likely to require complex work-up and consultation and/or inpatient management; or Humane practice mandates the relief of discomfort or distress within one hour.
5	120 minutes	Less Urgent – The patient's condition is chronic or minor enough that symptoms or clinical outcome will not be significantly affected if assessment and treatment are delayed up to two hours from arrival; or Clinico-Administrative Problems – Results, review, medical certificates, prescriptions only.

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Table 1. Australasian Triage Scale¹⁴

Additionally, the reliability and validity of this tool has not since been reported.

The proposed Australian mass-gathering triage tool is based on the principles of the existing mass-gathering triage tools. In particular, the Australian tool includes strong elements of objective data, such as vital sign parameters to assist in guiding the decision making of first responders.

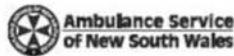
Existing Australian Triage Tools

In the Australian context, triage is used both in the in-hospital and out-of-hospital environments. In the emergency department (ED), triage involves a brief patient assessment that determines the clinical urgency of the patient's presenting problem and culminates with the allocation of an ATS category to prioritize patient care and resource use.^{13,14} The ATS places emphasis on the importance of the patient being seen by a medical doctor and is based on the premise that a patient should not wait longer than a set period of time for medical assessment and management (Table 1). For example, a patient who is allocated an ATS Category 2 should not wait longer than 10 minutes.¹⁴ Evidence shows that the ATS is a reliable and valid instrument for prioritizing patients according to their care requirements, and thereby optimizing clinical outcomes in the ED.^{15,16}

In the Australian in-hospital context, triage is an autonomous nursing role. Given the importance of the decisions the triage nurse

makes, which affect both patient outcomes and ED resources, triage must be performed by an experienced and specifically trained registered nurse with a minimum of two years' experience working in an ED.^{13,17} The ATS was not designed as a mass-gathering triage tool. In the mass-gathering environment, a medical doctor is not always present. Additionally, the ATS was not designed for use in settings outside of the ED, and the consistent application of the ATS is dependent on appropriate experience and training. The ATS was considered for adaptation within the Australian mass-gathering triage tool. However, a decision was made not to include the principles of the ATS because the tool is designed for use by specifically trained and experienced registered nurses.

Debate exists regarding the most appropriate triage tool to be used within the Australian out-of-hospital environment. However, there is a trend towards the use of SMART triage. In one study relating to SMART triage, doctors, nurses, paramedics, and defense medics participated in a prospective, randomized, cross-over trial exploring the use of various triage tools. This study concluded that SMART triage was the preferable triage system based on timeliness to categorize patients and preference of health professionals.¹⁸ Further, a number of Australian ambulance services have adopted SMART triage as their tool for mass-casualty incidents. The simple design of SMART triage, such as vital sign parameters and use of colors, was considered and incorporated into the Australian mass-gathering triage tool.¹⁹



CLINICAL REVIEW AND EMERGENCY RESPONSE ESCALATION CRITERIA (ADULT)

REFERENCE R14

Principles

1. **Identify** the patient at risk of deterioration
2. **Escalate** to the Clinical Review Criteria (yellow zone)
3. **Monitor** through the use of serial observations
4. **Respond** the Rapid Response protocols (red zone)

COMPLETE PRIMARY SURVEY	
CLINICAL REVIEW CRITERIA	
<ul style="list-style-type: none"> Poor peripheral circulation 	<ul style="list-style-type: none"> Decrease in Level of Consciousness from Alert (A) to rousable only by voice (V) in the AVPU or new onset of confusion/disorientation
<ul style="list-style-type: none"> Excess or increasing blood loss 	<ul style="list-style-type: none"> Temperature < 35.5°C or > 38.5°C
<ul style="list-style-type: none"> Respiratory rate 5 - 10 or 25 - 30 breaths per minute 	<ul style="list-style-type: none"> Failure to pass urine within previous 24 hours
<ul style="list-style-type: none"> SpO₂ 90-95% and/or increasing oxygen (O₂) requirements 	<ul style="list-style-type: none"> Blood Glucose level < 4 mmol/L
<ul style="list-style-type: none"> Systolic Blood Pressure 90 – 100 or 180 – 200 mmHg 	<ul style="list-style-type: none"> New or increasing pain (including chest pain)
<ul style="list-style-type: none"> Heart rate 40 – 50 or 120 – 140 beats per minute 	
<p>IF A PATIENT HAS ANY ONE (1) OR MORE CLINICAL REVIEW CRITERIA PRESENT YOU MUST:</p> <ul style="list-style-type: none"> Initiate appropriate clinical care Increase frequency of observations to every 15 minutes DO NOT delay transport to hospital <p>Remember:</p> <ol style="list-style-type: none"> 1. Abnormal observations typically indicate a severe injury or illness 2. An adverse trend in observations, even if within normal range usually indicates deterioration 	
EMERGENCY RESPONSE CRITERIA	
<ul style="list-style-type: none"> ALL respiratory and cardiac arrests Airway obstruction or stridor Seizures 	<ul style="list-style-type: none"> Heart rate < 40 or > 140 beats per minute Systolic Blood Pressure < 90 or > 200mmHg Only responds to central pain (P) or unresponsive (U), or sudden decrease in level of Consciousness of ≥ 2 points on GCS
<ul style="list-style-type: none"> Respiratory rate < 5 or > 30 breaths per minute 	<ul style="list-style-type: none"> Blood Glucose Level < 4 mmol/L and not responding to treatment
<ul style="list-style-type: none"> SpO₂ < 90% and/or increase in oxygen (O₂) requirement 	<ul style="list-style-type: none"> Uncontrolled pain
<ul style="list-style-type: none"> Decrease in respiratory rate in association with decreasing level of consciousness or exhaustion 	<ul style="list-style-type: none"> Patient deteriorates further, before or during Clinical Review
<p>IF A PATIENT HAS ANY ONE (1) Emergency RESPONSE CRITERION PRESENT YOU MUST PROCEED WITH RAPID TRANSPORT AND:</p> <ul style="list-style-type: none"> Initiate immediate appropriate clinical care Inform Control Centre of code 3 Repeat observations at 5 minute intervals 	
PHCR DOCUMENTATION ACCOUNTABILITIES and RESPONSIBILITIES	
Document all	
<ul style="list-style-type: none"> Patient Observations 	<ul style="list-style-type: none"> Clinical Interventions
	<ul style="list-style-type: none"> Treatment Outcomes

Note: The most current version of this document is available on the ASNSW Intranet site.

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Figure 2. NSW Ambulance “Clinical Review and Emergency Response Escalation Criteria (Adult)” utilized the NSW Health “Between the Flags” Vital Sign Parameters in the Prehospital Context.²⁰

Note: USED WITH PERMISSION by Ambulance Service NSW, Australia.

Abbreviation: NSW, New South Wales.

Australian Contextual Considerations

Between the flags is a health initiative initially designed for hospitals and later implemented in the prehospital environment by the New South Wales Ambulance Service in Australia. Between the flags defines a set of vital sign parameters with the intention of identifying the sick or deteriorating patient and prompt appropriate action (Figure 2; used with permission by the Ambulance Service of New South Wales).²⁰ Using the between the flags initiative, paramedics are assisted in the recognition of the sick or deteriorating patient and are able to better communicate the patient's condition with other health care professionals. Standard physiological parameters ensure consistency and objectivity in the application of the between the flags initiative. Additionally, between the flags ensures all members of the multidisciplinary health care team are communicating using a common framework.

St John Ambulance Australia (Sydney, New South Wales, Australia), a major health service provider within the mass-gathering environment with volunteer and paid first responders and health care professionals, has implemented the between the flags initiative in their clinical practice guidelines. As such, the proposed Australian mass-gathering triage tool has incorporated the between the flags parameters and criteria.

The Target Population of First Responders

The proposed Australian mass-gathering triage tool recognizes that the tool will be used by both first responders and health care professionals (doctors, nurses, and paramedics). As such, to make the proposed triage tool appropriate for use by both cohorts, it was designed to be as simple as possible, with strong elements of objective data, such as vital sign parameters. Vital signs can be

obtained by first responders and applied to this mass-gathering tool to guide decision making.

Limitations

This Australian mass-gathering triage tool has been developed using tools that are readily available to Australian health care providers, and it is expected to be easy and safe for first responders to apply. The authors have strived to create a model which can be applied internationally. However, the tool is yet to be tested in a mass-gathering event. This model has been developed based on the context of applicability to the Australian Health System. It is designed to be simple so that volunteer first responders can apply it safely. The next phase of this research intends to test this model in a real-life setting at major events in New South Wales, Australia.

Conclusion

This is the first paper to discuss the development of a mass-gathering triage tool for the Australian context. The tool is based on the principles of triage, previous mass-gathering triage tools, existing Australian triage tools, Australian contextual considerations, and the target population of first responders. The proposed Australian mass-gathering triage tool has not yet been tested in a mass-gathering event. Further research should be conducted to test the validity and reliability of this Australian mass-gathering triage tool. In the absence of any other triage tool for the Australian mass-gathering environment, this triage tool should be considered for implementation for future clinical practice at Australian mass gatherings where first responders are providing clinical assessment and management of patients presenting for on-site care.

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