Pre-hospital critical care at major incidents

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Summary

The identification, triage, and extrication of casualties followed by on-scene management and transport to an appropriate hospital after mass casualty incidents can be complicated, delivered to variable standards, and add significant delays to care. An effective pre-hospital pathway can both increase the chances of survival of individual patients and significantly influence the effectiveness of the entire emergency response.

Keywords: futility; major incident; massive transfusion; mortality; outcomes; predictors; triage

Major incidents and mass casualty incidents impact all areas of the health service and often have profound and prolonged effects, not only on victims and their families, but also on rescuers, healthcare workers, and wider healthcare and non-healthcare infrastructure. Effective management starts at or close to the incident. For the most seriously injured, the patient pathway has much in common with that of any patient with serious injuries: initial reception and resuscitation, definitive care, and rehabilitation. However, the pre-hospital phase of care at a major incident can be very different to ‘standard’ trauma incidents. Although formal investigations of the causes and responses to major incidents can take a long time to report their findings, rapid
reporting of ‘lessons learned’ from significant incidents are now commonly published and allow systems to quickly adapt to new and repeated threats.2–4

All pre-hospital clinicians supporting major incidents require both generic and locally specific training in major incident management. There are excellent examples of educational training, guidelines, and standard operating procedures available to healthcare responders,5–7 many of which also ensure interoperability between emergency services at local and national levels.8 Major incident exercises are essential to ensure clinicians are competent and the system works effectively. The importance of preparation, planning and exercise for trauma networks is well described by Gabbe and colleagues” in this issue of the British Journal of Anaesthesia.

Clinicians who are used to working in-hospital quickly appreciate that the majority of major incident training is designed to develop competence in major incident infrastructure, interservice working, and the rapid assessment and triage of casualties. Understanding and practice of these principles provides confidence and the ability to work effectively with all key emergency services in a range of incident types. However, analysis of real incidents often demonstrates deviation from guidelines. For example formal triage is often not deployed despite being widely acknowledged as a key tool in effective incident management.10 Although some may regard this as a failure of training, it is difficult to assess whether a degree of flexibility might be beneficial when applied to complex, dynamic scenes by senior clinicians. The independent panel investigating the 2017 Manchester arena bombing commented that ‘Although contrary to Joint Operating Principles, it is the Panel’s opinion that this key use of discretion by the Force Duty Officer illustrates clearly that flexibility must be allowed in decisions that involve life risk’, and ‘that when protocols become too constraining there is immense value in empowering and enabling responders to deal with incidents using situationally aware, informed and risk-assessed initiative’.11 To achieve the best performance, a combination of familiarity with guidelines and the ability to adapt to specific challenges may be necessary.

In pre-hospital major incident training relatively little emphasis is placed on advanced casualty management because priorities are triage and basic life-saving interventions, doing the ‘most for the most’. This approach is vital when rescuers are presented with large numbers of seriously injured casualties.12 However, not all major incidents are the same, and these principles may only need to be applied in the early phase of incidents. Although the terms ‘major incident’ and ‘mass casualty’ are often interchanged in press and medical reports, they are very different. Whereas major incidents present a threat to the health of the community and require special arrangements to be implemented, mass casualties are defined as ‘causing casualties on a scale that is beyond the normal resources of the emergency and healthcare services ability to manage’.13 Major incidents are mercifully much more common than mass casualty incidents, particularly in areas with well-resourced emergency medical services. The reality of major incidents is that, even when the initial numbers of casualties are significant, the ratio of emergency resource to seriously injured casualties can change quickly. When emergency service responders arrive at a scene they adopt major incident roles rather than their usual ‘treating’ roles, and the number of casualties may be high. With early declaration of a major incident and the rapid escalation of resources deployed to the scene, along with effective triage, the situation can evolve quickly. Recognition of the dead combined with removal of those with no or minor injuries from the scene (so-called ‘reverse triage’ where those who can move themselves away from the scene may leave the scene and get to hospital first) can rapidly mean that only relatively small numbers of severely injured ‘Priority 1’ casualties remain. This may then result in considerable capacity by the extraordinary resources on scene to deliver ‘normal’ levels of pre-hospital critical care.

There are numerous reports of ‘P1’ casualties with time-critical injuries at major incidents.2–4,14–16 In recognition of this, initiatives have been developed to educate and equip members of the public and the police to treat key reversible conditions (e.g. haemorrhage and airway compromise) before the attendance of ambulance services.17 As an example, in the UK, ‘CitizenAid’ provides a mobile telephone application to guide the initial actions, reporting, and treatment of incident victims.18 For time-critical injuries this should ideally be rapidly followed by the availability of advanced life support level care and then critical care interventions. The rationale for the provision of pre-hospital critical care to trauma victims at a major incident is as relevant as it is to major trauma victims encountered in normal practice, and some patients do receive advanced interventions before arrival in hospital.17–19

These interventions are only possible where rescuers can access the scene and the casualties. Actual or potential scene hazards can prevent or delay access to patients, and this problem has received considerable attention in the investigation of recent incidents.19 An important part of initial assessment of a major incident is the identification of scene hazards. Scene commanders have to make difficult decisions balancing rescue priorities with the safety of the public and their staff. Unstable structures and fire are examples of hazards that require technical knowledge to assess properly. Terrorist and firearms incidents have been common in recent years, and risks of secondary or ongoing assaults are very well recognised.20 However, in many incidents subsequent investigation establishes that little risk was present after the initial event and that delays to timely critical care can be caused by an inability of treating teams to access casualties.11,13 The demand for advanced assessment and intervention in Hot and Warm zones in difficult incidents has been recognised,21,22 and the knowledge and training that is required to work effectively at these incidents has also been proposed.22 There are proposed solutions to Hotzone rescue that enable advanced care by medical teams working with specialist ambulance providers and police firearms teams.5 In the UK all ambulance services are commissioned to provide specially recruited and trained Hazardous Area Response Teams (HART) to work inside the incident inner cordon at major incidents.23

Advanced pre-hospital care has been delivered by physicians and other providers in many European countries for many years. In the UK, Pre-hospital Emergency Medicine has been a recognised sub-speciality for more than a decade. Attendance and key roles at major incidents are an important part of the practice of these individuals, as is the delivery of advanced interventions such as pre-hospital emergency anaesthesia. Guidelines and clinical governance of advanced interventions are often comprehensive,24 and excellent performance has been reported.25 In some systems quality indicators even suggest that advanced pre-hospital interventions might be performed to the same or better standards than in receiving hospitals.26 As with in-hospital acute care there is evidence to suggest that only those with high
levels of training, experience, and continued exposure to complex interventions such as tracheal intubation deliver the best performance.\(^7\) An article in this edition of the journal takes this a step further and suggests that the number of cases of pre-hospital anaesthesia conducted in the previous year by pre-hospital doctors influences patient mortality.\(^8\) The study includes more than 4000 patients and multiple centres in Finland. Many will find it difficult to accept that a difference in one small factor in the often complex trauma patient pathway can deliver significant mortality differences. Unfortunately, the authors have not been able to report the overall or previous-year anaesthetic experience of the pre-hospital doctors, which would have allowed readers to interpret the results with more confidence. However, if the work presented can be confirmed with other studies it will add to the increasingly well-described principle that complex interventions are performed better in systems with higher case volumes\(^9\) by individuals with higher case numbers.\(^9\) This may have implications for training and skill maintenance and require rotation through higher volume services or mandated in-hospital practice.

To manage complex major incidents successfully, the pre-hospital phase of care is important. Optimisation of immediate care by bystanders using readily accessible guidance or telephone advice before emergency service attendance could be lifesaving. The principles of pre-hospital major incident management are widely accepted and relate to triage scene, rapid casualty assessment, and providing an extraordinary temporary infrastructure to treat and transfer patients to hospital. Learning from recent incidents indicates that incident commanders may need to be supported to interpret protocols and guidance to achieve optimal performance flexibly. Although mass casualty incidents require a different approach to casualty management, many well-developed emergency medical systems can deliver high standards of critical care at major incidents where there are limited numbers of severely injured patients. The full integration of embedded pre-hospital critical care teams with the initial response to major incidents is an important part of the major incident response. To deliver complex critical care interventions at trauma and major incidents, teams should have a high level of experience, which may include significant previous and ongoing case volumes.

**Declarations of interest**

The author declares that they have no conflicts of interest.

**References**

Provision of pre-hospital medical care for terrorist attacks

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Summary

The delivery of medical care to the severely injured during major incidents and mass casualty events has been a recurring challenge for decades across the world. From events in resource-poor developing countries, through richly funded military conflicts, to the most equipped of developed nations, the provision of rapid medical care to the severely injured during major incidents and mass casualty events has been a priority for healthcare providers. This is often under the most difficult of circumstances.1,2 Whilst mass casualty events are a persistent global challenge, it is clear in developed countries that patients and their families demand and expect a high standard of care from their rescuers, that this care should be delivered rapidly, and this should be of the highest quality possible.3 Whilst there is respect afforded to those who ‘run towards danger’ during a high-threat situation, first responders are subjected to a high degree of scrutiny for their actions, even when the circumstances they are presented with are considered to be extraordinary.4 Likewise, even for those who are catastrophically injured beyond salvage, society expects the response to be dignified, calculated, and thorough.5

Keywords: analgesia; major incident; mass casualty incident; pre-hospital medical care; preventable death; terrorist attack

Major incidents and terrorist events

The terms ‘major incident’, ‘mass casualty event’, ‘terrorist attack’, and others are often used interchangeably, with the former largely defined by the availability of ‘normal’ resources to meet the demands on the day of the event. The definition of a terrorist attack varies, with one of the broadest examples given by the global terrorism database as ‘the threatened or actual use of illegal force and violence by a non-state actor to attain a political, economic, religious, or social goal through fear, coercion, or intimidation’.6 The motives of...