It is early June 2017 and you have been tasked to a ‘pedestrian vs car’ incident on London Bridge. Now, a few minutes later, you have arrived, and the scene is in chaos. There are multiple casualties strewn across the length of the bridge. You are told to get out of the area by armed police and snatch reports of critically injured victims need your help but you cannot get to them. How many are there? Where are they? Will you be too late? Am I trained for this? Will I do a good job? Will someone die because of a bad decision I make?

Another ‘you’ is in the emergency department of a receiving major trauma centre, putting on the ‘Incident Commander’ tabard as you realise the first casualties have already arrived, driven to you by bystanders. It is these bystanders who tell you of the incident. One of the first casualties has already had a massive transfusion. Should we carry on? There is already an emergency case in the operating theatre. Are critically injured victims who tell you of the incident. One of the first casualties has already had a massive transfusion. Should we carry on? There is already an emergency case in the operating theatre. Are
there reinforcements on their way? Will there be enough ICU beds? Am I trained for this? Will I do a good job? Will someone die because of a bad decision I make?

Uncertainty is the defining state of the first minutes and hours of a mass casualty event, created by its very nature. Scenes are described as ‘chaotic’, often as a criticism, but the very sudden and dramatic departure from ordered life is the hallmark of these events. Incidents are sudden in onset, undetermined in scale, substantial in their impact, and present a situation that is rapidly changing. The myriad of ways this scene can develop compounds the uncertainty. Decisions must be taken, actions must happen, before the picture is complete. Everyone wants answers, but there are no answers. It may take days or weeks for the full nature and scale of the event to become clear.

Acting in an information vacuum is extremely uncomfortable, and is something that modern medicine tries to eradicate from everyday practice. We are only ‘comfortable’ when we have all the tests, all the imaging, and a multidisciplinary discussion before making a treatment decision. We crave certainty, yet, when the stakes are as high as they can get, certainty deserts us. Our clinical, evidence-based, protocol-driven environment becomes uncomfortably ill-defined.

We are rarely explicitly trained to recognise and work with uncertainty, and it is noticeably absent from the medical undergraduate curriculum. Clinicians who are less comfortable with uncertainty are less likely to discuss uncertainty or engage in shared decision-making, and are more at risk of disillusionment, self-doubt, and feelings of inadequacy. The source of uncertainty can be practical (how do I do this?), ethical (should I do this?), scientific (how do I interpret this?), personal (am I capable of this?), or as a result of the complexity or magnitude of the ambiguity. In mass casualty management, all of these apply.

Neither is the information vacuum acknowledged in major incident protocols. In most emergency preparedness training programmes, assessment, triage, decisions, and actions are presented as straightforward and obvious. This leads to unrealistic expectations of ordered triage, experienced leadership, clear decisions, sufficient staff, resources, and communications. These ideals can be far removed from reality. The training manuals pronounce that the triage officer must ‘guard against committing all resources to the first arrivals before establishing the full anticipated number of casualties’, but the scale of the event is unknown, the anticipated number of casualties is unknown, and their requirement for resources is not known. First contact with reality can be so jarring and confusing as to be paralyzing.

Whether the incident even justifies raising a mass casualty response may not be obvious as the first patients encountered may have mild injuries, be treated using normal trauma pathways without realizing they are part of a larger incident, or be conveyed by bystanders without pre-hospital triage. Multiple conflicting reports may make the scale of the event unclear, especially if distributed between multiple sites. Who has the authority to declare this a major incident may also be an unanticipated stumbling block.

The uncertainty of whether we will have sufficient staff, space, and supplies has become uncomfortably familiar since experiencing the COVID-19 pandemic. Critical resources are more urgently at risk in a sudden onset mass casualty event when the need for life-saving intervention is immediate and the surge more acute. Simultaneous, parallel facets of response must form out of sight of one another: even within hospitals, there is the initial reception of patients in the emergency department, the preparation of operating theatres, discharge of appropriate in-patients to primary care, creation of bed spaces on critical care, transfusion services, security, care of relatives, and the hospital control room overseeing the response. Communication between clinical areas may default, for efficiency, to personal communication between individuals in coordinating roles and bypass central command hubs. How each area is coping, and will cope, is never fully known. Yet each component relies on all the others to function. There are demands for information that cannot be met, because of lack of data, clarity, or time. These demands are multiplied between different parts of the response, between emergency services, between hospitals, and to government and security services. There is an inherent appearance of chaos and loss of control, even if constituent parts are operating optimally.

To move forwards in face of uncertainty, we must acknowledge that there will be insufficient information for us to be comfortable in our decisions and actions. This recognition needs to occur at a personal level, and within and between departments, institutions, and services. Uncertainty must be embraced and incorporated into our thinking, planning and training. We need to learn to operate in an information vacuum; to tolerate, or even flourish, in uncertainty.

Much of the uncertainty in an event can be reduced by understanding the environment. Knowing the baseline capacity of a hospital during the day and out of hours aids decision-making, as does a working knowledge of the capacity of the transfusion service, number of staffed and potentially staffed CT scanners, operating theatres, and critical care beds, and space created by discharging patients. This information can be mentally matched with the estimated casualties, knowing that maximum surge in numbers will not peak immediately, and that different parts of the hospital experience this surge at different times. The trajectory of the casualty surge for any given event may vary and even the relative load on radiology, surgery, anaesthesia, paediatrics, or medicine may shift, but familiarity with the principles and priorities of mass casualty management will Ford a path through troubled waters.

Decision-making in the context of what is known and unknown is likely to be more effective than delayed decisions made with the complete picture. These decisions can be made easier by falling back on central principles of essential trauma care. In a ‘Damage Control’ mindset, the minimum is done to keep the ship afloat. In damage control surgery the ‘ship’ is the patient, and abbreviated surgery is utilised to maintain physiology. In a damage control approach to mass casualty events, it is the institution that must be protected, maintaining capacity to keep receiving new casualties. Immediate resource utilisation is limited to absolute necessity, until the scale and nature of the event becomes clear, and additional staff attend and supplies can be restocked. The parameters of this damage control approach will vary from institution to institution, and are another key output of scenario training and practice. Any proposed action, planned or improvised, should be in line with routine care as far as possible, so the core practices of injury care are recognised and upheld.

The discomfort of taking action in the midst of uncertainty can be alleviated by sharing the load, forming a command huddle. The benefit of combining the wisdom of different disciplines, emergency medicine, surgery, and anaesthesia in the tactical space, and managers and clinicians with different
perspectives in the strategic space, serves to improve the safety and accuracy of the patients’ expected management, and reduce the load on any one set of shoulders when requests for information are sent out but do not return with answers. Rapid informal huddles of command teams can quickly appraise the situation, available resources, likely trajectories of casualties, and future requirements. Shared leadership enhances internal and external communications and ensures consistency of message and response, providing a shared ownership of key actions.

Trust is an essential dynamic between leaders and followers and yet is not often mentioned in mass casualty response. It does not occur in a vacuum; it is not spontaneous and will not occur by luck. Trust is forged through the day-to-day well-established precedents of roles and leadership. Confidence in those relationships is reinforced through repeated exercising of the major incident plan, both at the front line and through the command hierarchies. Glynn Lunney, NASA flight director for the Apollo lunar mission, voiced the centrality of training together to establish trust before making high-value, split-second decisions: ‘When you run these simulations … you learn very fast who you can trust … Because we had simulated so much, we knew how to flex from our base even though this was a situation we had never faced before.’ The mental scope to innovate and adapt in that uncertain space is freed up when the basic structure of a response has been planned, understood, and rehearsed. In the heat of an event, the trusted relationships that are present on every normal day are the very same relationships that will be relied upon in the midst of these extreme events.

Each incident is unique and even a well-rehearsed response will have to be adapted. Decisions must be made, and by luck, by good planning, by training, by flexibility, and by already established trust, the formation of a response emerges. Flexibility is key, and everyone must be prepared to stray from ‘the plan’. Indeed, there should not be one plan, but rather a suite of contingencies. A set of ‘what if’ scenarios that describe a range of responses, within and above the capabilities of the hospital. Systematic planning and exercising can explore all aspects of the response and possible contingencies can be worked through.

Some have suggested that amongst the chaos an organic swarm intelligence emerges. Flexibility, robustness, and self-organisation are certainly pillars of a mature response, but each member of the team needs to perform their own role. Suggesting that under extraordinary circumstances individuals will ‘just know’ what to do sabotages preparation, increases the stress inherent in the response when this is not played out in reality, and acts to condemn those brave enough to lead teams that are formed out of whomever is available, whenever they become available. Mass casualty responses that appear to have been reflexive or innate look that way because of years of working together, investment in training, iterative learning, and improvement.

In medicine we train throughout our career to find the right answer: the right diagnosis, the right treatment, the right drug. But complex challenges do not have one obvious answer. In the uncertain environment of a mass casualty incident, the context is continually shifting. Rumination after a lived-through event will revolve around the question of whether we were good enough. Although there may be no shortage of opinions on what should have happened in retrospect, there are no clear solutions in the moment and aiming for perfection is futile. We have to work with undeniably flawed and absent data.

Healthcare workers can be protected by understanding that information will be sparse, the response will be imperfect, resources may be insufficient, and there will be discomfort and fear of failure. Candid tuition in this protective mindset of embracing uncertainty should begin in undergraduate training by equipping students with the knowledge of how to act wisely in states of ambiguity. It is a concept that will aid resilience throughout a vocation that is ironically intolerant of uncertainty, but especially should an individual find themselves leading in the amplified ambiguity of a mass casualty incident. The aim in this context should be for shared decision-making with flexibility and course correction as needed. The term ‘viable clumsy solutions’ communicates the need for forward momentum created from decisions despite the inherent uncertainty. Solutions emerge through changing our mindset, by having the will, humility, and ability to adapt, and eschewing an ill-placed confidence in the illusion of certainty.

**Declarations of interest**

The authors declare that they have no conflicts of interest.

**References**

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.1 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