

Commentary

Engendering enthusiasm for sustainable disaster critical care response: why this is of consequence to critical care professionals?

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Abstract

Disaster medical response has historically focused on the pre-hospital and initial treatment needs of casualties. In particular, the critical care component of many disaster response plans is incomplete. Equally important, routinely available critical care resources are almost always insufficient to respond to disasters that generate anything beyond a 'modest' casualty stream. Large-scale monetary funding to effectively remedy these shortfalls is unavailable. Education, training, and improved planning are our most effective initial steps. We suggest several areas for further development, including dual usage of resources that may specifically augment critical care disaster medical capabilities over time.

Disasters have been a part of human existence since ancient times, and so has disaster medicine [1]. We define disaster medicine as a human response to unexpected mayhem, with the intent to limit death, disease, and injury. In recent decades, disaster medical response has largely focused on prehospital care issues such as casualty evacuation, triage, and transport, without specific emphasis on hospital management. In the United States, this phenomenon is referred to as 'ambulances to nowhere'. Recent experiences with large-scale disasters have strongly reinforced the fact that hospital capacity is the major rate-limiting factor in the chain of medical response. This is especially true for critical care services and intensive care unit (ICU) bed capacity [2]. As we continue working to build adequate disaster medical response systems we must maintain our prehospital readiness efforts, and we must expand our focus to more precisely define the hospital and the ICU as critical links in the entire response process. The purpose of the present commentary is to explore ways in which this expansion of focus might be conceived.

A number of recent examples illustrate the importance of the hospital and the ICU in the medical response to disaster. Within a few hours of the Madrid bombing explosions in March 2004, 27 critically ill patients were admitted to the two

closest hospitals, which had a maximum ICU capacity of 28 beds, most of which were already occupied [3]. After the terrorist bombing in Bali, the Royal Darwin Hospital in Australia, with a capacity to care for a maximum of 12 ventilated patients, was presented with 20 critically ill patients, 15 of whom required mechanical ventilation [4]. Flooding due to heavy rain in June 2001 crippled the Texas Medical Center in Houston, and resulted in a sudden loss of 75% of the ICU bed capacity for a county of 4 million people [5]. And it is not just ICU bed capacity that is subject to being overwhelmed. Damage to the physical and organizational structure of the hospital may wipe out an entire critical care infrastructure. Some disasters may harm healthcare workers, thus limiting available ICU personnel. This was the case during the Tokyo Sarin gas subway attack in 1995, and more recently during the severe acute respiratory syndrome outbreak in Canada and Asia [6].

Viewed in the context of the everyday strain on our currently available resources, the challenge is even greater [7]. An analysis of the capacity of a 1200-bed hospital in the United States to handle patients in the setting of a toxic chemical exposure event revealed an ability to handle only two chemically contaminated patients at a time [8]. Add to this the fact that in many countries, because of efficiency and budgetary constraints, hospitals are shrinking in capacity. This has resulted in hospitals working at or near maximum capacity every day, with associated logistical concerns such as overcrowding, diversion of ambulance services, and lack of surge capacity. Particularly important is the inability of emergency departments to move critically ill patients to their inpatient setting [9] due to the unavailability of staffed critical care beds. With future projections for a shortage of critical care physicians [10] and critical care nurses [11,12], these logistical barriers to ICU care will persist [13] and will influence the provision of disaster critical care response.

Taken together, this means that we do not need a major disaster like a terrorist attack or an emerging infectious disease epidemic to tip the strained balance between the supply and demand of critical care resources. Disasters of a local scale alone can tip the balance, such as when a fire broke out at a nightclub in Rhode Island in 2003. The local hospital immediately received 40 critically-ill patients, most requiring intensive care support [14].

Education and training are effective modalities that tangibly enhance disaster medical response at every level. However, current disaster medical education programs for healthcare professionals are not coordinated in scope and content, and may not address the most pressing needs for critical care personnel. What are the imperatives that must be taught? For example, it would be an error to assume that principles of triage, recognition of smallpox, antibiotics for anthrax, proper dosing of atropine, and so forth, represent a sufficient knowledge base. The severe acute respiratory syndrome outbreak of 2003 emphatically demonstrated that scrupulous training and execution of infection control practices became a survival skill for ICU personnel. Unfortunately, this is not substantially represented in our current disaster medical education programs.

Does this mean we need to build more beds, hire additional specialized personnel, or stockpile antibiotics, antidotes, and equipment against a possible disaster situation? We think not; this would be unworkably expensive and would still leave us incompletely prepared for many of the disaster scenarios just described. So, what are the solutions? We offer the following suggestions in order of priority. These concepts attempt to build on existing resources. We do not pretend to offer evidence-based guidelines. Rather, our intention is to engender discussion and dialog.

Education and training

Pre-emptive education is the single most effective tool we can employ to mitigate the future effects of a disaster. In terms of impact, the education of healthcare professionals is at the top of the list [15]. The educational initiatives we propose to accomplish this goal are as follows: heightened disaster response awareness, enhanced skill sets, understanding of roles and responsibilities, alternate communication methods, self-preservation training, and experience in how to cooperate and coordinate during mayhem.

Medical preparedness training should not be limited to first-line treatment, but must include targeted training that covers the entire disaster medical spectrum [16]. The challenge is distilling all of this into a curriculum that fits the very limited time availability of healthcare professionals. As one evolving example, the Society of Critical Care Medicine has developed a standardized and highly concentrated course (Fundamentals of Disaster Management) to equip critical care professionals with basic but essential disaster

medical knowledge. The content of this program is still in evolution.

Disaster response medical simulation approximating actual scenarios enables disaster planners and responders to test procedures and technologies, and to incorporate the lessons learned from past disasters [17]. This simulation has been shown to be effective [16,18]. The level of realism is much higher than in facility-based exercises, where time and personnel utilization are compressed and usually do not adequately teach disaster resource management.

Finally, there is a useful role for what is termed 'just-in-time training'. The intent of these programs is to make concise knowledge available to providers, at the time of an event and at the point of care. Most of these are Web-based knowledge collections that can be queried. This approach is less time intensive, less labor intensive, and less cost intensive than traditional educational processes. We should point out, however, that 'just-in-time training' serves as an adjunct, but alone it is not an adequate replacement for the other methods enumerated here. Any 'just-in-time training' program is only as effective as the skills of the professional in accessing the training when it is needed, which must be in place beforehand.

Interfacility cooperation

Experience has shown that the burden of disaster medical response largely falls to healthcare facilities proximate to an event. Despite the widely held impression that 'the government will be there', outside help and intervention typically does not have a large impact on the initial phases of disaster medical response. We have already outlined some of the obstacles, such as strained resources or lack of communication and training, that impede cooperation. While most hospitals have plans for response to local disasters mapped out, plans that looked good on paper often go awry during execution [19]. In terms of interfacility cooperation, given that many local hospitals financially compete with each other, teamwork in the event of a disaster is expected to materialize where it has not been previously encouraged. As such, the results are seldom efficient.

A rational approach to tackle this issue includes the development of flexible and scalable plans for interchanging resources to augment the existing capacity of individual hospitals [20]. For example, many communities currently divide disaster responsibilities according to the type and severity of injuries among the various hospitals. Unfortunately, a significant percentage of casualties make their own way to the hospital, irrespective of these plans. A better way would be to build flexible surge capacity that allows hospital personnel to move from one facility to another according to need. Such adaptation to circumstances will not happen spontaneously, and will require significant pre-planning. An additional example of efficient sharing is disaster medical education; many or all of the educational proposals outlined

in the previous section could be shared, increasing availability, cost-effectiveness and, probably, quality.

Dual usage of resources

As we have suggested, the cost of effective disaster planning is enormous. It is not realistic to expect budget-constrained facilities to absorb these additional costs, and yet relief from governments will not fill the gap. It therefore seems reasonable to seek economies of scale, such as dual-use modalities. For example, to increase ICU surge capacity, consider our ability to provide critical care outside of a designated geographical location. A significant volume of critical care is provided (nondeliberately) every day outside the geographical constraints of an ICU, hence the growing development of medical emergency teams in hospitals around the world [21]. With little additional training, these teams could provide a highly effective adjunctive capability during disaster medical response when critical care units are full but additional ICU services are required.

As a second example, ensuring patient safety in the hospital is also emerging as a significant resource-consuming, but essential, activity [22]. This is especially true as we move beyond compliance activities into multidisciplinary, tiered accident and error prevention. From this perspective, a medical catastrophe may encompass a single patient who receives improper medication through to mass casualty circumstances. While these events are fundamentally different in scope, magnitude, and cause, they share at their core a need for accurate and complete planning and education to prevent or mitigate their consequences. Is there sufficient overlap to merge some of the planning, education, and practice of hospital patient safety and disaster medical response?

In summary, where we have been will not get us to where we need to go for disaster critical care response. First, we must work around apathy, confusion of purpose, and a lack of monetary resources to widen the spotlight of disaster medical response from the prehospital arena to include the hospital. We must enhance our abilities and capacity across the whole spectrum of disaster medical response.

These efforts are the responsibility of society as a whole. All involved organizations including hospitals, emergency medical services, fire services, police, the public health system, local municipalities and government authorities, and other health care institutions will need to integrate into a well-developed disaster educational system and response team [23]. In the present article we have attempted to outline conceptual elements that may facilitate some of this integration. For this to happen, someone with comprehensive understanding and the necessary expertise is required nationally, regionally, and locally to provide the leadership imperative that drives integration of these disparate entities and resources. The first step is ownership, and as critical care professionals we are obliged to step forward and provide the leadership for these processes.

Competing interests

The author(s) declare that they have no competing interests.

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