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Role of Intensivists in Emergency Mass Critical Care

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Emergency Mass Critical Care (EMCC) is limited, essential critical care during disasters when critical care demand surpasses traditional resources. The intensivist must play an integral EMCC planning and response role.

Introduction

Disasters and pandemics can result in large numbers of critically ill patients that can overwhelm our current capacity to deliver critical care services. Such imbalance between critical care demand and resources can result in lives lost, as evidenced during disasters such as Hurricane Katrina and the Japanese Tohoku earthquake and tsunami. However, loss of lives can be prevented or at least decreased with adequate preparation, which includes coordination of services and resource allocation involving critical care capacity and readiness at the regional, hospital, unit, and individual provider levels. This preparation is best achieved using the principles of crisis standards of care and a surge capacity continuum as outlined for Emergency Mass Critical Care (EMCC) response.

Emergency Mass Critical Care Overview

EMCC delivery can improve patient outcomes and lives saved by conserving, optimising and better matching critical care resources to critical care demand. EMCC was well described by the Task Force for Mass Critical Care (Devereaux et al. 2008a). It encompasses a system-wide approach of matching critical care resources to critical care demand during disasters, utilising the principles of crisis standards of care and a surge capacity continuum. Unfortunately, critical care providers still receive little training in disaster medicine and response and are often uninvolved in hospital disaster preparedness efforts. This current lack of EMCC awareness, training, and preparation by critical care providers

became clearly evident during the Hurricane Sandy intensive care unit (ICU) evacuations (Powell et al. 2012).

The goal of this review is to educate the ICU provider about the principal concepts of EMCC so they may be better prepared and organised to provide care and save lives during future disasters. We also hope to provide the ICU provider with a new perspective about their integral role in disaster response so that they may take an active role in preparing their own hospital and broader community for delivery of EMCC. Delivery of critical care during a disaster will only be successful if ICU providers work in partnership with the larger disaster preparedness system. Given the very specialised nature of critical care, intensivists have a professional obligation to participate at all levels of EMCC decision-making.

Crisis Standards of Care

Critical care resources, including ICU bed spaces, critical care staff, and critical care supplies, can limit our ability as critical care providers to improve patient outcomes, even during routine surge situations. During disasters, critical care demand can overwhelm standard resource levels and definitions of critical care space, staff and supplies need to be modified. The United States Institute of Medicine (IOM) issued guidance for healthcare facilities and providers entitled *Crisis Standards of Care* that provides a systems framework for catastrophic disaster response (IOM 2012). This framework, with minor variations in names depending on country nomenclature, provides the broad principles on which any EMCC response system can be designed. Within this report the IOM described the Foundation of Crisis Standards of Care as an edifice with 5 pillars: Hospital Care, Public Health, Out-of-Hospital Care, Emergency Medical Services (EMS) and Emergency Management & Public Safety. Hospital care is just one pillar that must work in conjunction with these other 4 pillars to execute an effective mass crisis response. The IOM also recommended utilising standard nomenclature to describe the three categories of surge capacity: conventional, contingency and crisis, as described below (Hick et al. 2009).

Surge Capacity Continuum

Conventional, contingency and crisis capacities exist along a surge capacity continuum during critical care disasters, both when incident demand and/or resource imbalance increases and patient morbidity/mortality risk increases as well as during the recovery phase.

Conventional capacity denotes usual care standards (implemented in major mass casualty incidents and representing care as usually provided at that institution.)

Contingency capacity denotes different but functionally equivalent care standards (using adaptations to medical care spaces, staffing constraints and supply shortages without significant impact on delivered medical care).

Crisis capacity denotes true crisis standards of care (implemented only in catastrophic situations with a significant impact on standard of care.)

One can conceptualise an initial step in expanding critical care space and capacity by providing critical care in lesser acute units (Rubinson et al. 2008). Progressive expansion of critical care in sustained crisis conditions such as pandemics (Stiff et al. 2011) includes critical care encompassing a much larger proportion of hospital care with further expansion in other areas of the hospital.

Transition from conventional to contingency capacity should be triggered when a potential for crisis standards of care is identified. This often happens in resource-limited areas on a regular basis and in others during self-limited surges in patients. Transition from contingency to crisis capacity should only be triggered by a true initiation of crisis standards of care at the hospital and/or regional level and usually after discussions involving senior critical care clinicians, administrators and regional disaster coordinators. Thus this transition to crisis capacity should only occur via official hospital and/or regional policy, and these principles cannot be cavalierly applied by individual providers. However, it is paramount that the critical care provider understands these principles and their role in both identifying critical care demand/resource imbalances and responding under altered care environments.

Paediatric Surge Capacity Inadequacy

Special attention should be paid to the inadequate paediatric critical care resources that currently exist for disasters (Kissoon and Task Force for Pediatric Emergency Mass Critical Care 2011; Stamell et al. 2009). Children comprise approximately 25% of the general population, and are especially vulnerable during disasters for a variety of anatomic and physiologic reasons. There are other compelling reasons to include issues related to children in all planning exercises, such as the fact that 80% of disaster victims including children will transport themselves (or be transported by their caregivers) to the nearest medical facility (Gausche-Hill 2009). In addition, most paediatric hospital care is regularly delivered at relatively few large regional paediatric centres (Halpern and Pastores 2010), and paediatric hospitals can be inaccessible geographically and/or have far too few beds during times of disaster to meet the needs of critically ill children (Odetola et al. 2005). This disparity between paediatric and adult access to critical care resources can be glaringly out of proportion should both populations be equally affected. Paediatric populations are often disproportionately affected during pandemics, as seen during the H1N1 influenza pandemic.

Thus, one important area of surge capacity that all adult intensivists must consider is the potential need to expand their surge capacity to include paediatric care. Adult providers who do not routinely provide paediatric critical care must consider the staff (those with an interest or training), supplies, tools and education that could enable EMCC delivery to children. One simple tool that enables many EMS and emergency department providers to provide paediatric critical care is length-based colour-coded tape. Length-based colour-coordinated tapes improve the provision of properly sized critical care equipment and medications (Agarwal et al. 2005). Coordination with regional paediatric centres to share protocols and

staff and to obtain just-in-time consultation is also advisable.

Ethics During Disasters

The descriptions of crisis capacity may include: 1) operating in a damaged and/or unsafe facility; 2) having unavailable critical care staff for the number of patients; and/or 3) lacking basic critical care supplies such as mechanical ventilators. Functioning as a critical care provider under such extreme conditions can be both stressful and ethically complicated. Altered standards of care may require critical care providers to operate under different ethical principles compared to everyday practice, such as optimising population health over individual patient health. Many ethical issues encountered during disasters centre around the issue of allocation of limited life-saving resources. During Hurricane Sandy, the issue of mechanical ventilator allocation arose when power was threatened, and intensivists were put into the situation of attempting to determine how patients should be prioritised (Uppal et al. 2013).

Intensivists typically provide care on a first-come, first-served basis, and only perform critical care triage under rare circumstances, such as in the instance of limited extracorporeal membrane oxygenation (ECMO) circuits. Thus intensivists in the developing world receive little to no education about how to ethically conduct triage of limited life-saving resources. A basic principle of ethically sound triage is that the degree of rationing is proportional to the actual or anticipated resource deficiency (Barnett et al. 2009). It is also of paramount importance that hospitals within a given geographical region conduct consistent and coordinated triage between and among adult and paediatric critical care communities to ensure equitable allocation of resources among a population (Devereaux et al. 2008b). Intensivists must therefore be actively involved at all levels of critical care allocation decisions, from creation of the regional, national and international critical care triage policies, to adoption and testing of these policies at the hospital level, and practising as a member of a critical care triage team.

Communication and Evacuation

ICU providers should also consider communication and evacuation issues in regards to the special needs of their critical care patients. Communication has been extremely problematic for ICUs during disasters, as phone lines and computers can malfunction, and situational awareness is often poor. Redundant communication systems and tools must be developed for ICUs for communicating within each unit, with hospital incident command and potentially with outside hospitals. Specific to ICU evacuation, both paper and electronic evacuation forms should be available given the potential for no power, as seen during Hurricane Sandy. Perhaps most importantly, a system for regional communication in the event of a large scale disaster and/or evacuation must include critical care input, as inpatient critical care patients often require very specialised transport, staff or equipment needs that may not be appreciated by non-critical care providers (Schultz et al. 2003; Iwashyna et al. 2009; Fuzak et al. 2010; Verni 2012).

Where to Start?

After ensuring their own personal emergency preparedness plan at home, one good place for every intensivist to start is to ensure the preparedness of their own unit. We recommend referring to a checklist titled *Concise disaster planning checklist for intensive care unit clinicians* (Daugherty and Rubinson 2011.)

Although preparing one's unit is important for delivering EMCC, preparation is most dependent on collaborative work between critical care providers, hospital disaster planners and regional disaster planning groups, sometimes referred to as "Healthcare Coalitions." Thus, intensivists must become educated in disaster medicine, participate in hospital disaster planning and drills, and play active roles with regional disaster planning groups to help create disaster plans that support the unique critical care needs of patients in their geographical region.

Conclusion

In this manuscript we have reviewed the fundamental concepts related to EMCC as a primer for further education. The ICU provider must become better educated about Emergency Mass Critical Care (EMCC) so they may be better prepared and organised to save lives during future disasters. Intensivists also have a professional obligation to play an integral role along the continuum of EMCC planning and delivery.

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