Definitive Care for the Critically Ill During a Disaster: Medical Resources for Surge Capacity*

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Lewis Rubinson, MD, PhD; John L. Hick, MD;
J. Randall Curtis, MD, MPH, FCCP; Richard D. Branson, MS, RRT;
Suzi Burns, RN, MSN, RRT; Michael D. Christian, MD;
Asha V. Devereaux, MD, MPH, FCCP; Jeffrey R. Dichter, MD;
Daniel Talmor, MD, MPH, FCCP; Brian Erstad, PharmD;
Justine Medina, RN, MS; and James A. Geiling, MD, FCCP†

Background: **Mass numbers of critically ill disaster victims will stress the abilities of health-care systems to maintain usual critical care services for all in need. To enhance the number of patients who can receive life-sustaining interventions, the Task Force on Mass Critical Care (hereafter termed the *Task Force*) has suggested a framework for providing limited, essential critical care, termed *emergency mass critical care* (EMCC). This article suggests medical equipment, concepts to expand treatment spaces, and staffing models for EMCC.**
Methods: **Consensus suggestions for EMCC were derived from published clinical practice guidelines and medical resource utilization data for the everyday critical care conditions that are anticipated to predominate during mass critical care events. When necessary, expert opinion was used.**
Task Force major suggestions: **The Task Force makes the following suggestions: (1) one mechanical ventilator that meets specific characteristics, as well as a set of consumable and durable medical equipment, should be provided for each EMCC patient; (2) EMCC should be provided in hospitals or similarly equipped structures; after ICUs, postanesthesia care units, and emergency departments all reach capacity, hospital locations should be repurposed for EMCC in the following order: (A) step-down units and large procedure suites, (B) telemetry units, and (C) hospital wards; and (3) hospitals can extend the provision of critical care using non-critical care personnel via a deliberate model of delegation to match staff competencies with patient needs.**
Discussion: **By using the Task Force suggestions for adequate supplies of medical equipment, appropriate treatment space, and trained staff, communities may better prepare to deliver augmented essential critical care in response to disasters.** ***(CHEST 2008; 133:32S–50S)***

Key words: disaster medicine; influenza pandemic; mass casualty medical care; medical surge capacity

Abbreviations: CDC = Centers for Disease Control and Prevention; EMCC = emergency mass critical care; IMCU = intermediate care unit; NIPPV = noninvasive positive pressure ventilation; PPV = positive pressure ventilation; RT = respiratory therapist

The severe acute respiratory syndrome epidemic of 2002–2003, recent natural disasters, burgeoning concern about industrial and intentional catastrophes, and the looming threat of a severe influenza pandemic have stimulated much recent debate about how to care for a surge of critically ill people.[1–12] Still, most countries, including those with widely available critical care services, lack sufficient quantities of specialized staff, medical equipment, and ICU space to provide timely, usual critical care for a large

influx of additional patients (see "Definitive Care for the Critically Ill During a Disaster: Current Capabilities and Limitations"). Provision of essential rather than limitless critical care will be needed to allow many additional community members to access key life-sustaining interventions during disasters.

Without pre-event critical care surge planning, the quantities and types of medical resources that remain available will dictate which elements of critical care can be maintained. There is no guarantee that effective critical care interventions will be provided. Alternatively, critical care professionals could decide prior to an event what constitutes essential critical care practices and the associated staffing, medical equipment, and treatment space requirements. Critical care disaster preparedness efforts can then be focused to ensure that these crucial resources remain available in sufficient quantity during disasters in order to maximize delivery of essential critical care.

The Task Force for Mass Critical Care (hereafter referred to as the *Task Force*) was convened in January 2007 and defined emergency mass critical care (EMCC) as a circumscribed set of key critical care therapeutics and interventions, as well as the necessary supporting medical resources required to maintain continuity of sufficient critical care services during a catastrophe (Table 1 and "Definitive Care for the Critically Ill During a Disaster: A Framework for Optimizing Critical Care Surge Capacity"). The Task Force suggests that hospitals with ICUs plan to provide modified but sufficient critical care for a daily patient census triple their baseline ICU capacity for up to 10 days without adequate external assistance (see "Definitive Care for the Critically Ill During a Disaster: A Framework for Optimizing Critical Care Surge Capacity"). Additional details regarding the Task Force are summarized elsewhere (see "Summary of Suggestions From the Task Force for Mass Critical Care Summit"). This current document suggests quantities of essential medical equipment, treatment space expansion concepts, and staffing models to assist emergency planners, clinical staff, and public health officials to meet these capacity goals.

Development of Task Force Suggestions for Medical Resources

The majority of the 15 US Department of Homeland Security national planning scenarios have clear potential to cause mass critical illness and injuries.[13] These scenarios are likely to require additional medical supplies for the response, but at the same time they have a high potential to interrupt the supply of medical equipment at multiple points along the path from manufacturer to distributor to local health-care facilities. Current hospital reliance on "just-in-time" and stockless material management systems to reduce storage and inventory costs[14] leave institutions with vulnerably low reserves of key consumables and durable medical equipment.[15] Critical care equipment is no exception (Lewis Rubinson, MD, PhD; unpublished data; December 2007), so the quantity of additional critically ill patients a hospital can care for without resupply is impressively small. (See "Definitive Care for the Critically Ill During a Disaster: Current Capabilities and Limitations.")

Avoiding preparation to increase the availability of key medical resources will profoundly limit the capabilities of hospitals to offer many victims life-sustaining care when needed during a mass critical care event. Nevertheless, expecting all hospitals to stockpile multiples of every conceivable piece of critical care consumable and durable medical equipment for use only during low-frequency/high-consequence events is unrealistic and perhaps even reckless.[14] Optimal critical care disaster preparedness calls for a resource strategy between these two extremes. The limited scope of care suggested for EMCC (see "Definitive Care for the Critically Ill During a Disaster: A Framework for Optimizing Critical Care Surge Capacity") affords

*From the University of Washington (Dr. Rubinson), Seattle, WA; Hennepin County Medical Center (Dr. Hick), Minneapolis, MN; Harbor View Medical Center (Dr. Curtis), Seattle, WA; University of Cincinnati (Mr. Branson), Cincinnati, OH; University of Virginia (Ms. Burns), Charlottesville, VA; Mount Sinai Hospital/University Health Network (Dr. Christian), Toronto, ON, Canada; Sharp Coronado Hospital (Dr. Devereaux), Coronado, CA; Presbyterian Hospital (Dr. Dichter), Albuquerque, NM; Beth Israel Deaconess Medical Center (Dr. Talmor), Boston, MA; University of Arizona (Dr. Erstad), Tucson, AZ; American Association of Critical Care Nurses (Ms. Medina), Aliso Viejo, CA; White River Junction VA Medical Center and Dartmouth Medical School (Dr. Geiling), Hanover, NH.
†A list of Task Force members is given in the Appendix.
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Correspondence to: Lewis Rubinson, MD, PhD, University of Washington, Harborview Medical Center, Campus Box 359762, 325 Ninth Ave, Seattle, WA 98104; e-mail: rubinson@u.washington.edu
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