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Engagement and Education

Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement

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BACKGROUND: Engagement and education of ICU clinicians in disaster preparedness is fragmented by time constraints and institutional barriers and frequently occurs during a disaster. We reviewed the existing literature from 2007 to April 2013 and expert opinions about clinician engagement and education for critical care during a pandemic or disaster and offer suggestions for integrating ICU clinicians into planning and response. The suggestions in this article are important for all of those involved in a pandemic or large-scale disaster with multiple critically ill or injured patients, including front-line clinicians, hospital administrators, and public health or government officials.

METHODS: A systematic literature review was performed and suggestions formulated according to the American College of Chest Physicians (CHEST) Consensus Statement development methodology. We assessed articles, documents, reports, and gray literature reported since 2007. Following expert-informed sorting and review of the literature, key priority areas and questions were developed. No studies of sufficient quality were identified upon which to make evidence-based recommendations. Therefore, the panel developed expert opinion-based suggestions using a modified Delphi process.

RESULTS: Twenty-three suggestions were formulated based on literature-informed consensus opinion. These suggestions are grouped according to the following thematic elements: (1) situational awareness, (2) clinician roles and responsibilities, (3) education, and (4) community engagement. Together, these four elements are considered to form the basis for effective ICU clinician engagement for mass critical care.

CONCLUSIONS: The optimal engagement of the ICU clinical team in caring for large numbers of critically ill patients due to a pandemic or disaster will require a departure from the routine independent systems operating in hospitals. An effective response will require robust information systems; coordination among clinicians, hospitals, and governmental organizations; pre-event engagement of relevant stakeholders; and standardized core competencies for the education and training of critical care clinicians. CHEST 2014; 146(4_Suppl):e118S-e133S

ABBREVIATIONS: MCC = mass critical care

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Summary of Suggestions

1. We suggest integrated communication systems and a robust infrastructure of the electronic health record system to facilitate tracking the number of people affected by a mass event, including the types and severity of injuries and detection of secondary illnesses.
2. We suggest, when power is intact, virtual ICUs, point-of-care testing, portable monitoring systems with Global Positioning System, and telemedicine facilitate transfer and sharing of clinical information. Such technologies need to be established and used prior to mass critical care delivery in order to provide familiarity to the users.
3. We suggest aggregated essential clinical information be included with other key ICU logistical communication so that bidirectional transfer of information permits a consistent delivery of health care across the spectrum.
4. We suggest public health/government officials at centralized or regional emergency management coordinating centers use expert medical guidance, such as burn, neuro, or trauma critical care, specific to the nature of the incident to inform decision-making for mass critical care delivery.
5. We suggest every ICU clinician participate in disaster response training and education.
6. We suggest expectations regarding clinician response to pandemics or disasters be delineated in contractual agreements, medical staff bylaws, or other formal documents that govern the array of responsibilities to the health-care system.
7. We suggest hospitals employ and/or train ICU physicians in disaster preparedness and response.
8. We suggest hospitals ensure appropriate ICU leadership with knowledge and expertise in the management of surge capacity, disaster response, and ICU evacuation.
9. We suggest critical care leaders be invited to participate in health-care coalitions so they can facilitate sharing expertise, resources, and knowledge between ICUs in the event of a regional disaster.
10. We suggest incorporation of disaster medicine into critical care training curricula will facilitate future ICU clinician training and engagement in disaster preparedness and response activities.
11. We suggest expert opinions be considered in mass critical care education curricula.
12. We suggest an independent panel of multidisciplinary specialty society experts determine the core competencies for mass critical care education curriculum.
13. We suggest translating competencies into multidisciplinary learning modules become a core focus of academic, professional organizations, governmental, and nongovernmental organizations whose students and responsible agencies may be called upon to provide mass critical care.
14. We suggest standing committees in education, or a reasonable equivalent in relevant stakeholder groups, review and endorse the curriculum and competencies.
15. We suggest educational activities draw on all modern modalities of education (including access via web-based learning, simulation, or other modalities for remote learners) and include incremental (individual, organizational, community), realistic, and challenging training opportunities.

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16. We suggest stakeholder organizations determine the thresholds and milestones for trainer education and certification.

17. We suggest individuals with board certification in critical care medicine be tested on the core competencies (when developed) by their certification process.

18. We suggest those involved with critical care disaster education develop ongoing, internal process improvement methodologies and metrics to ensure their programs remain current, responsive, and relevant.

19. We suggest accreditation bodies that ensure safe and effective critical care delivery processes for hospitals consult with professional societies to develop metrics and tools of assessment to ensure ICUs can continue to provide quality care during a pandemic or disaster.

20. We suggest engagement of critical care clinicians in disaster preparedness efforts occur in advance of and in preparation for pandemics and disasters in order to enhance mass critical care delivery and coordination.

21. We suggest ICU clinicians and disaster planners incorporate community values into critical care decision-making through pre-event inclusion of clinicians and community perspectives.

22. We suggest hospitals provide education, training, and community conversation opportunities for their ICU clinicians on the topic of mass critical care delivery.

23. We suggest successful critical care clinician-community engagement strategies include: (a) physician-related initiatives, (b) public-private partnerships with governmental agencies and hospitals, (c) community partnerships, (d) sharing of best practices, and (e) family engagement and community guidance during resource allocation.

Introduction

During a pandemic or disaster critical care clinicians may be unprepared to provide appropriate crisis standards of care unless they have received rigorous

training or have experience in military or disaster medicine. In the event of resource scarcities and excess demands, access to care will be restricted, and the level of care will be altered (see “Surge Capacity Principles” article by Hick et al¹ in this consensus statement). Overall, this involves a shift from individual patient-based medicine to population-based medicine. The requirement to restrict and alter standards of medical care inherent in the shift to population-based medicine is perhaps one of the most challenging transitions for clinicians to make in delivering critical care to an overwhelming number of patients. Addressing these issues during the planning and training process is essential to ensuring appropriate use and stewardship of resources during a disaster.

Very little information exists on the best method to proactively engage clinicians so that they are prepared to effectively implement and coordinate the care of critically ill or injured patients during a pandemic or disaster. Furthermore, strategies to incorporate the viewpoints and preferences of the public in all aspects of disaster and pandemic planning are essential to maintain trust, transparency, and community support for crisis standards of care plans.^{2,3} Preincident engagement between the hospital and multiple entities is critical to success (Fig 1). Although individual hospital plans are important, these regional relationships can contribute to a more robust community response and resilience in any disaster.

The American College of Chest Physicians (CHEST) Mass Critical Care Task Force believes that clinician engagement and education is an important aspect of pandemic and disaster preparedness and is a major gap in our preparedness efforts. ICU care involves a multi-disciplinary approach typically led by critical care physicians; however, disaster training often has focused on hospital-based administration and some ancillary staff. The suggestions in this article should assist hospital disaster planners, medical education societies, and public health systems in the engagement of critical care clinicians in ICU disaster preparedness. Although it is important for all providers to be familiar with all aspects of the critical care response to a pandemic or disaster, Table 1 provides an overview of the suggestions of most interest to each group.

Materials and Methods

Following the CHEST Guidelines Oversight Committee’s methodology, the Engagement and Education topic panels separately developed key questions and conducted systematic literature searches to identify evidence on which to develop recommendations. Key questions and corresponding search terms with detailed methodology are provided in

e-Appendix 1. Literature searches were conducted for articles published from 2007 to April 2013. All relevant identified English-language articles were included for review. No studies of sufficient quality were identified upon which to make evidence-based recommendations. Therefore, the panel developed expert opinion-based suggestions using a modified Delphi process. The results from the two groups were combined and summarized in this article.

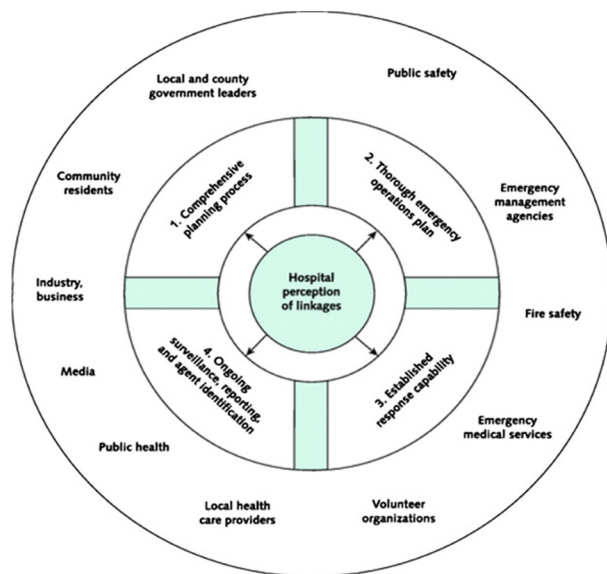


Figure 1 – Influences on a medical system during a disaster where relationships and priorities may be shifted significantly from routine operations. (Reprinted with permission from Braun et al.⁴)

Results

Situational Awareness

1. We suggest integrated communication systems and a robust infrastructure of the electronic health record system to facilitate tracking the number of people affected by a mass event, including the types and severity of injuries and detection of secondary illnesses.

In the absence of accurate and meaningful communication during a disaster, clinicians may become frustrated, fragmented, and disheartened, especially if resources become scarce.⁵ During a pandemic or disaster, the collection of real-time information regarding the total scope of the event (eg, the number of patients affected, the types of injuries and illnesses sustained, the severity of injuries and illnesses) as well as a clearly defined source of updated clinical guidance for the event is vital for all hospitals involved in caring for the affected patients. This requires rapid activation of vertical communication networks within hospitals as well as a horizontal flow of information among hospitals; nongovernmental organizations; and local, regional, and national public health jurisdictions to adequately respond to the event. Although many systems allow collection of regional information (eg, bed availability), facilitate resource management, or permit information sharing through electronic health records, few systems focus on ICU clinician engagement with subject matter experts and incident command leaders in pre-event planning and disaster response. Although this can be facilitated quickly

on a regional level, defining participants, platforms, and goals ahead of time should substantially improve clinician acceptance, effectiveness, and engagement.

In some countries with national health-care systems, electronic health records may already be in place. In the United States, electronic health records are fragmented and lack interoperability. Current opportunities to partner with public health officials to discuss the meaningful use of data programs should be leveraged to develop the ability to share such information. Sharing of health information in developing countries is addressed in the “Resource-Poor Settings” articles by Geiling et al^{6,7} in this consensus statement. The ability to track affected people also relies on standardization of registry processes and shared information that are currently not in place in most areas of the United States and other countries.

2. We suggest, when power is intact, virtual ICUs, point-of-care testing, portable monitoring systems with Global Positioning System, and telemedicine facilitate transfer and sharing of clinical information. Such technologies need to be established and used prior to mass critical care delivery in order to provide familiarity to the users.

These technologies may help overcome some barriers that may occur due to limitations of personnel and resources during a mass casualty event.

3. We suggest aggregated essential clinical information be included with other key ICU logistical communication so that bidirectional transfer of information permits a consistent delivery of health care across the spectrum.

Hospitals should share updated daily patient information without personal identifiers (Table 2). Clinical data variables for reporting during mass casualty events should be established and standardized in advance in collaboration with key medical and public health partners.⁸⁻¹⁶ A mechanism for clinical discussions across regional systems (see “System-Level Planning, Coordination, and Communication” article by Dichter et al¹⁷ in this consensus statement) during and after events will greatly facilitate dialogue among critical care physicians about treatments, clinical trends, and outcomes, thereby enhancing engagement and participation.

4. We suggest public health/government officials at centralized or regional emergency management coordinating centers use expert medical guidance, such as burn, neuro, or trauma critical care, specific to the nature of the incident to inform decision-making for mass critical care delivery.

TABLE 1] Primary Target Audiences for Suggestions

Suggestion Number	Primary Target Audience			
	Clinicians	Hospital Administrators	Public Health/Government	Medical Societies
1		✓		
2	✓	✓	✓	
3	✓	✓	✓	
4	✓	✓	✓	
5	✓	✓		
6	✓	✓		
7	✓	✓		
8	✓	✓		
9		✓	✓	
10	✓			✓
11	✓			✓
12				✓
13	✓	✓	✓	✓
14				✓
15				✓
16				✓
17	✓			✓
18				✓
19			✓	✓
20	✓	✓	✓	
21	✓	✓	✓	
22	✓	✓		
23	✓	✓	✓	

The emergency management coordinating center should ask professional medical societies or governmental organizations with expertise specific to the type of disaster event to collaborate, develop, and keep updated evidence-based or best-practice clinical guidelines.¹⁸⁻²² Critical care physicians should be engaged to provide expertise with prioritizing transfers, allocating resources, developing treatment protocols, supporting providers through telemedicine or other means of consultation, and contributing to policy development for facility and regional response. Event-based engagement of clinicians requires platforms and processes to attain situational awareness along with adequate clinical information

transmission to provide consistent, timely mass critical care (MCC).⁸

Roles and Responsibilities

5. We suggest every ICU clinician participate in disaster response training and education.

Successful hospital engagement in the United States has resulted from preparedness funds from the Department of Health and Human Services, Office of the Assistant Secretary for Preparedness and Response, Hospital Preparedness Program grants and from expansion of The Joint Commission preparedness requirements.²²

TABLE 2] Types of Aggregate Clinical Information (Without Patient Identifiers) Suggested for Reporting by Hospitals During a Mass Casualty Event

Illnesses/Injury	Number Affected	Resources Used	Mortality	Number Discharge
Axxxxxxxx	Axxxxxxxx	Axxxxxxxx	Axxxxxxxx	Axxxxxxxx
Bxxxxxxxx	Bxxxxxxxx	Bxxxxxxxx	Bxxxxxxxx	Bxxxxxxxx

Engagement of ICU clinicians in disaster preparedness activities needs to occur in a similar manner as for hospital preparedness and regional coalition formation^{23,24} (Table 3). This requires mandates for collaboration, communication, and preparedness for all ICUs in every region. However, much evidence exists that competition and lack of cooperation commonly derails efforts at collaboration.²⁵⁻³⁰ Effective engagement will require consistent and uniform roles and responsibilities so that collaboration occurs on the same platform of knowledge.^{31,32}

Although The Joint Commission standards for emergency preparedness are implemented in most US hospitals (and government standards exist in other nations), in practice, these standards revolve around incident management and primarily affect the ED and

administrative levels of the organization. Multidisciplinary clinician training has yet to transcend all departments of the hospital system. Specific to the ICU, critical care physicians have many time constraints and often are working in a variety of locations either within the hospital, at multiple hospitals, or in dual roles meeting outpatient needs. The body of experiential evidence and consensus opinion supports regular drills, exercises, training, and disaster preparedness education for these physicians.³³⁻³⁶

6. We suggest expectations regarding clinician response to pandemics or disasters be delineated in contractual agreements, medical staff bylaws, or other formal documents that govern the array of responsibilities to the health-care system.

TABLE 3] ICU Staff and Physician Responsibilities

ICU Member	Responsibility	Comment
All ICU physicians, clinicians, and ancillary staff	Should have personal and family preparedness plans for disasters	Without family plans, ICU clinicians are unlikely to be able to come to work, stay at work, or concentrate on work.
All ICU clinical and ancillary staff	Should possess knowledge of recommended personal safety measures, including a demonstration of effective decontamination and appropriate use of personal protective equipment	...
ICU clinicians	Should have an understanding of actual and potential health hazards that may affect their ICU resources and delivery of critical care during mitigation, preparedness, response, and recovery disaster phases	...
	Should have knowledge of surge capacity assets and processes consistent with one's role in the ICU, hospital, or regional critical care alliance	...
ICU physicians	Should possess basic clinical knowledge regarding the principles and practices for the management of relevant populations and cultural competency for those affected by disaster	This applies to those populations and cultures in the area of service, including the home facility or locations where personnel go to provide disaster relief services.
	Should maintain knowledge of ethical and legal principles in providing critical care in a setting of constricted resources	Substantial variability exists in physician protections in each state. Physicians need to be aware of local laws. Employed ICU staff members may have different protections and liabilities in place.
ICU clinician leaders	Should have knowledge of their expected roles in the ICU, hospital, and regional critical care disaster response plans	This includes decision-making about obligations when the physician provides care at more than one facility.
	Should have knowledge of effective disaster communications to internal and external parties	Effective and concise communication to regional coalition partners and public health departments ensures that each ICU will be able to manage and receive appropriate resources.

A physician's duty to care in a pandemic or disaster is an assumption that requires careful thought and consideration by hospital systems. Unlike other employees of a hospital, physicians have unique privileges at hospitals and are not typically employed directly by the hospital system. Unless contractually delineated, efforts toward personal and professional preparedness will be voluntary and ad hoc and may be especially complicated when a physician has responsibilities at multiple facilities, unless expectations are defined in advance.

The Task Force panelists had mixed views and concerns regarding mandates for preparedness and legal ramifications of various labor contracts. Contractual mandates in uncertain hazardous situations, scope of practice, and enforcement of these agreements raise logistical issues outside of the task force's expertise. However, the task force believed that hospital systems should have a reciprocal obligation to clinicians to provide them with adequate planning, education, and infrastructure to meet patient care needs during a disaster to support engagement.^{2,31,37}

7. We suggest hospitals employ and/or train ICU physicians in disaster preparedness and response.

Based on experience following the 2003 Severe Acute Respiratory Syndrome epidemic and the 2009 influenza A(H1N1) pandemic, credible authorities in disaster clinical management and preparedness are essential to engender trust and mitigate confusion among hospital staff during a pandemic or disaster.^{4,19,38,39} A systems approach requiring expertise from a Critical Care Crisis team to coordinate efforts of various leaders, avoid duplication of efforts, and improve morale is ideal.⁵

8. We suggest hospitals ensure appropriate ICU leadership with knowledge and expertise in the management of surge capacity, disaster response, and ICU evacuation.

Hospitals should be responsible for ongoing education and training of ICU medical directors to maintain leadership and command skills. Hospitals also should be required to include ICU medical directors in system and regional planning for pandemics or disasters (currently, many do not).^{35,36,40-42} Critical care physicians should also be taking a more prominent role in disaster planning and research. Without this expertise and leadership, even response systems optimally resourced to provide critical care will fail.

9. We suggest critical care leaders be invited to participate in health-care coalitions so they can

facilitate sharing expertise, resources, and knowledge between ICUs in the event of a regional disaster.

Successful disaster response relies on collaboration and communication within the hospital system and in the region. However, critical care physicians have generally not been invited to participate in regional systems and often are learning about emergency management in the midst of providing critical care during a pandemic or disaster. Inviting ICU medical directors to provide input in regional systems will enhance engagement. Frameworks for regional communication of clinical information between critical care providers are rudimentary or absent and should be a high priority regionally and nationally.^{3,15,28,32,42-52}

Education

10. We suggest incorporation of disaster medicine into critical care training curricula will facilitate future ICU clinician training and engagement in disaster preparedness and response activities.

ICU clinicians will need to interact with persons and organizations from across the spectrum of emergency preparedness and response.⁵³ Many events will require critical care assets (ie, equipment, facilities, personnel). Emergency management skills are not commonly taught in medical professional education or training,⁵⁴ nor are the abilities to triage patients or provide MCC. As disaster medicine principles and practices become incorporated into medical education, physicians will have access to uniform information to enhance preparedness, communication, and response at every medical facility. Successful models exist within military medical systems.^{42,55-57}

Core competencies in MCC, including development and deployment of an educational program, implementation with regulatory oversight (where applicable) of the competencies, and ongoing reevaluation of competency needs and effectiveness, are necessary.^{58,59} However, only one-third of US medical schools include disaster medicine within their curricula.⁵⁴ Similar deficiencies exist among education for nursing students, dental students, and residents.⁶⁰⁻⁶⁴ To address this need, international guidelines and standards of education in the multidisciplinary field of disaster health have been developed for medical professional education.⁶⁵ Who should oversee the approval and endorsement process and whether those core materials are relevant to all clinicians remain undefined.⁶⁵ Medical schools, professional and educational organizations, continuing

education accreditation, and regulatory bodies for health-care professionals should be involved.^{66,67}

Opportunities for intensive education in disaster preparedness and opportunities to reinforce MCC principles should be sought in various contexts outside medical school curricula (Table 4).

11. We suggest expert opinions be considered in mass critical care education curricula.

MCC education poses challenges to health-care systems and communities because advanced training, highly technical equipment, and critical resources (eg, oxygen, pharmaceuticals) are necessary. In addition, the development of an educational framework and approach that can increase the pool of trained individuals is hampered due to costs, logistics, and capacity.⁶⁸ To date, no educational methods have been rigorously tested in an MCC setting; thus, training approaches are unvalidated and must rely on expert opinion. However, the education methods used should conform to usual adult learning and curricula development principles.⁶⁹

12. We suggest an independent panel of multidisciplinary specialty society experts determine the core competencies for mass critical care education curriculum.

The American Medical Association, with input from 14 professional, governmental, and academic organizations, has developed a framework for health-care workers and students, practitioners, and leaders in seven core learning domains, 19 core competencies, and 73 specific competencies.⁶⁷ Schultz et al⁷⁰ similarly gathered a consensus panel to develop an educational framework for a disaster curriculum. They defined the objective by developing nine content domains with 90 specific performance objectives for health-care personnel to support an all-hazards disaster response. A similar, specialty-specific effort for critical care disaster education would be of immense value to the specialty and should help to define the basis for the core materials and competencies for critical care clinicians to respond to pandemics or disasters.

13. We suggest translating competencies into multidisciplinary learning modules become a core focus of academic, professional organizations, governmental, and nongovernmental organizations whose students and responsible agencies may be called upon to provide mass critical care.

There are limited data on MCC education theory and practice. However, critical care environments are stressful, and a catastrophic event with at least twice the

normal capacity of critically ill patients likely will stress the cadre of workers routinely available to care for the anticipated surge. Therefore, noncritical care specialists may be involved in expanding the necessary health-care team. What is unknown is the minimum amount of training or expertise needed by noncritical care clinicians to appropriately care for critically ill or injured patients in a pandemic or disaster. Another challenge is determining the timing and delivery of this education. A starting point in this process is to identify areas in which nonspecialists may contribute (as Project Xtreme's approach to mechanical ventilation⁷¹) and determine the education they would need, including just-in-time education, to support the extension of critical care under a critical care physician's supervision. ICU order and standard work templates may contribute greatly to safely engaging noncritical care physicians in these activities.

14. We suggest standing committees in education, or a reasonable equivalent in relevant stakeholder groups, review and endorse the curriculum and competencies.

By developing and promoting MCC educational standards, the overall preparedness of hospitals and health-care systems may improve,⁶⁸ yet, little has been done to assemble relevant critical care stakeholders and determine the standards and competencies for a disaster or pandemic response. After initial definition of needs, objectives, and key sources of material, a broader range of stakeholders should be engaged early in the process of MCC curricula development to ensure both educational fidelity and coverage of key content.⁷²

15. We suggest educational activities draw on all modern modalities of education (including access via web-based learning, simulation, or other modalities for remote learners) and include incremental (individual, organizational, community), realistic, and challenging training opportunities.

Many models, including high-fidelity simulations, are emerging to incorporate adult learning theory into modern medical practices.⁷³⁻⁷⁵ For instance, some health-care systems develop and mandate internal concept or task-focused online courses and quizzes to educate staff on particular regulations. Others discuss how social media may supplement classic learning approaches and promote learning. Finally, the emerging role of telemedicine in health care offers another viable mechanism for supporting inexperienced health-care teams in MCC.

Beyond health professional schools, innovative methods of disaster education need to occur. A specific disaster

TABLE 4] Opportunities for Integrating Disaster Preparedness Into Medical Professional Education and Training

Curriculum Area	General	Case Studies or Examples	Examples of Online Resources
Ethics	Disaster ethical principles	Discussion of frameworks for disaster ethics	CDC: http://www.cdc.gov/od/science/integrity/phethics
	Resource allocation and triage	Pandemic scenario discussion of vaccine/resource triage	HHS: http://sis.nlm.nih.gov/dimrc/ethics.html
Infectious disease	Pandemics of naturally occurring diseases	Novel influenza viruses [eg, 2009 A(H1N1) or 1918 H1N1]	CDC: http://www.cdc.gov/flu/pandemic-resources
	Infection control and PPE	PPE definitions, use, protective factors	CDC: http://www.cdc.gov/flu/pandemic-resources
	Bioterrorism	Anthrax, other category 1 agent scenarios	NIOSH: http://www.cdc.gov/niosh/npptl/guidancedocs/rand.html HHS: http://sis.nlm.nih.gov/dimrc/bioterrorism.html
Pharmacology/toxicology	Chemical terrorism	Nerve agent effects	CDC: http://emergency.cdc.gov/chemical
	Cascade effects when people cannot access their medications	Cyanide effects/treatment Medical shelter issues (Hurricanes Katrina and Sandy)	HHS: http://sis.nlm.nih.gov/dimrc/chemicalemergencies.html
Radiation	Principles of radiation effects, both diagnostic and terrorist/accidental radiation release	Chernobyl	Radiation Injury Treatment Network: http://www.ritn.net
		Radiation medical countermeasures	CDC: http://emergency.cdc.gov/radiation
		RDD/IND modeling Hiroshima/Nagasaki long-term follow-up	HHS: http://www.remm.nlm.gov
Pediatrics	Pediatric vulnerabilities to toxins	Heavier-than-air agent incidents and effects	American Academy of Pediatrics: http://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/Children-and-Disasters
	Injury pattern differences and targeting of children	School shootings	CDC: http://emergency.cdc.gov/children
	Treatment differences Family separation/reunification issues	Psychologic impact and issues of mass violence on children and families Family separation during natural disasters (eg, Hurricane Katrina)	National Child Trauma Stress Network: http://www.nctsn.org
Nephrology	Requirements and indications for dialysis	Regional renal network education	The Renal Network: http://www.therenalnetwork.org/home/disasterplan.php
	Issues when dialysis is not available	Home planning information	End Stage Renal Disease Network of Texas: http://www.esrdnetwork.org/disaster-planning
		Hurricanes Katrina and Sandy or other discussion-based exercises	Kidney Community Emergency Response: http://www.kcercoalition.com

(Continued)

TABLE 4] (continued)

Curriculum Area	General	Case Studies or Examples	Examples of Online Resources
Pulmonary/ critical care	Home oxygen supply	Ventilator triage scenarios and resources	HHS: http://sis.nlm.nih.gov/dimrc/professionalcompetencies.html
	Home ventilators and critical care equipment Ventilator and other equipment triage	Home oxygen disaster discussions on hurricane, fire, and other experiences	National Organization on Disability: http://nod.org/disability_resources/emergency_preparedness_for_persons_with_disabilities The ALS Association: http://webdc.alsa.org/site/PageServer?pagename=DC_8_PALS_Resources_Emergency SCCM: http://www.sccm.org/Fundamentals/FDM/Pages/default.aspx https://cdp.dhs.gov/news-media/articles/ndms-builds-capabilities-with-fundamentals-course
Psychiatry	Disaster mental health	Psychologic first aid	HHS: http://sis.nlm.nih.gov/dimrc/coping.html
		Risks for PTSD and effects	National Child Trauma Stress Network: http://learn.nctsn.org/course/category.php?id=11
Geriatrics	Effects of functional limitations on disaster coping/response	Immunization principles to reduce acute stressors Effects of disasters on psychiatric diseases and their care discussion	Community Emergency Response Team: http://www.citizencorps.fema.gov/cert/training_mat.shtm
		Discussion of range of limitations (hearing loss, vision loss, dementia, etc) and impact on their ability to evacuate/comply with directions and implications for safety, sheltering, etc	CDC: http://www.cdc.gov/aging/emergency/index.htm
	Physiologic differences	Risks for pressure sores, chronic condition exacerbation, falls, etc, in shelter environment	Stanford University: http://sgec.stanford.edu/resources/emergency_preparedness.html University of Kentucky: http://www.uky.edu/publichealth/ovargec/emergency-preparedness-training-resources Portal of Geriatrics Online Education: http://www.pogoe.org/productid/18848

This is not designed to be a comprehensive list but, rather, to stimulate ideas on opportunities for short, targeted, and specific disaster educational materials to be integrated into existing curricula. ALS = amyotrophic lateral sclerosis; CDC = Centers for Disease Control and Prevention; HHS = Department of Health and Human Services; NIOSH = National Institute for Occupational Safety and Health; PPE = personal protective equipment; PTSD = posttraumatic stress disorder; RDD/IND = radiological dispersal device/improvised nuclear device; SCCM = Society of Critical Care Medicine.

medicine program has enhanced pediatric residents' knowledge,⁷⁶ and adding tabletop exercises to standard lectures may increase knowledge and comfort with disaster preparedness.⁷⁷ Virtual interactive exercises can also be useful.⁷⁸ Indeed, students have mastered basic disaster management content and understood their role on an interdisciplinary team using a virtual teaching program comprising interactive videos, board games, and high-fidelity disaster simulation.⁷⁹

16. We suggest stakeholder organizations determine the thresholds and milestones for trainer education and certification.

Published data on MCC education are limited.⁷² In addition, the core concepts needed for other related areas, such as pharmacy, respiratory care, and other technologies, are not known. The impact on an individual hospital may depend on its organizational structure, community affiliations, and partnerships in the region. Other centers may be limited by jurisdictional mandates that raise liability concerns for untrained health-care workers performing in a role for which they are not certified or credentialed. These concerns are surmountable but will require substantial stakeholder development, buy-in, and collaboration. Once the curriculum is developed and endorsed, then the larger issue is how the curriculum will be disseminated and evaluated in health-care settings. The thresholds for disaster preparedness are fairly low for the predominant hospital accrediting agency in the United States, The Joint Commission, so many hospitals may not implement such highly specialized training. Another barrier is identifying the appropriate authority to certify that individuals are qualified to perform MCC techniques. Research will be needed in this area, but a larger problem will likely be implementation.

17. We suggest individuals with board certification in critical care medicine be tested on the core competencies (when developed) by their certification process.

18. We suggest those involved with critical care disaster education develop ongoing, internal process improvement methodologies and metrics to ensure their programs remain current, responsive, and relevant.

Educational processes need to be formalized to address knowledge gaps in pandemic and disaster response. These actions should not only focus on content teaching but also include evaluation of education, pandemic, and disaster interventions as well as meaningful disaster and pandemic research.⁶⁹

19. We suggest accreditation bodies that ensure safe and effective critical care delivery processes for hospitals consult with professional societies to develop metrics and tools of assessment to ensure ICUs can continue to provide quality care during a pandemic or disaster.

Content and virtual drills alone do not suffice. Exercises must include assessment with feedback to improve preparedness capabilities.^{68,80} Translating these activities into standard operating procedures may prove useful as a checklist and as refresher tools for ICU providers faced with a disaster.⁷²

Adult learners prefer learning to be based on real-life experiences, problems, and expectations.⁸¹ They want to contribute to the design and follow-up. They are self-motivated and do not necessarily respond to external motives.⁸² Another important component of educational settings is the nature and timing of the pandemic or disaster. Plans often include training beforehand to prepare likely respondents for the identified hazards.⁸³ However, most education and training regarding MCC delivery is achieved at the time of a pandemic or disaster, and adult learners have difficulty finding relevance of education and training when a crisis is not imminent. To combat this tendency to wait and learn when necessary, planners should consider mechanisms for teaching in the moment when they have the attention of individuals affected by the crisis. Additionally, it is important to identify that many of the skills required for effective pandemic and disaster response (leadership, communication, teamwork, planning) are transferable to day-to-day practice as well. Considering all hazards, the timing of education for a particular crisis depends on the nature of the hazard:

- Adult learner principles should be used in developing MCC educational approaches.
- Disaster educators should develop competencies and lessons that account for the time needed to respond to a crisis.
- Disaster planners should determine the core competencies for each relevant job description in the Hospital Incident Command System approach appropriate to care for critically ill or injured patients during a pandemic or disaster.

Community Engagement

Burkle⁸⁴ and Hanfling² discussed the importance of connecting providers directly with the community when allocating scarce resources during a disaster or

administering crisis care. Extensive public health system efforts toward community engagement on this topic inform the following suggestions.⁸⁵⁻⁹⁴ Figure 2 illustrates an approach that was used successfully in Harris County, Texas.⁹⁴ Community engagement sessions in the United States on the topic of mass critical care and the allocation of scarce resources reveal that the American public has a great deal of confidence in medical providers to make sound clinical decisions during a crisis; however, the public believes that end-of-life care decisions should be made by the patient's family. This fact will require continued clinician and public conversation because during a pandemic or disaster, neither group will have ultimate control over allocation decisions.⁹³

20. We suggest engagement of critical care clinicians in disaster preparedness efforts occur in advance of and in preparation for pandemics and disasters in order to enhance mass critical care delivery and coordination.

Reviews by the Agency for Healthcare Research and Quality and the Institute of Medicine emphasized the engagement of the lay public and clinicians in pandemic and disaster preparedness efforts in advance of and during large-scale emergencies to enhance MCC delivery and coordination.^{85,88,91,92,95} The types of strategies used for the public often will be markedly different from those used to engage ICU clinicians.

21. We suggest ICU clinicians and disaster planners incorporate community values into critical care decision-making through pre-event inclusion of clinicians and community perspectives.

Experience from Harris County, Texas; Seattle & King County, Washington; and Michigan has shown that the public can comprehend difficult clinical scenarios and contribute to forming community values toward crisis standards of care.^{87,88,91,93} The public can be viewed as an equal partner able to understand complex issues and prioritize community values for incorporation into crisis decision-making.⁹⁶

22. We suggest hospitals provide education, training, and community conversation opportunities for their ICU clinicians on the topic of mass critical care delivery.

Helping ICU clinicians understand community-based value decisions, train in implementation of resource allocation decisions, and incorporate community values into the process of delivering MCC are crucial components to effective provider engagement. Although the importance of clinician engagement has been recognized, there has been limited progress in this area.^{88,91} Having physicians complete a brief tabletop exercise on ventilator triage to illustrate some of the issues before introducing the key concepts of crisis care may be beneficial. This has been a successful strategy used in metropolitan Minnesota (J. L. Hick, MD, personal communication, September 2013).

23. We suggest successful critical care clinician-community engagement strategies include: (a) physician-related initiatives, (b) public-private partnerships with governmental agencies and hospitals, (c) community partnerships, (d) sharing of best practices,

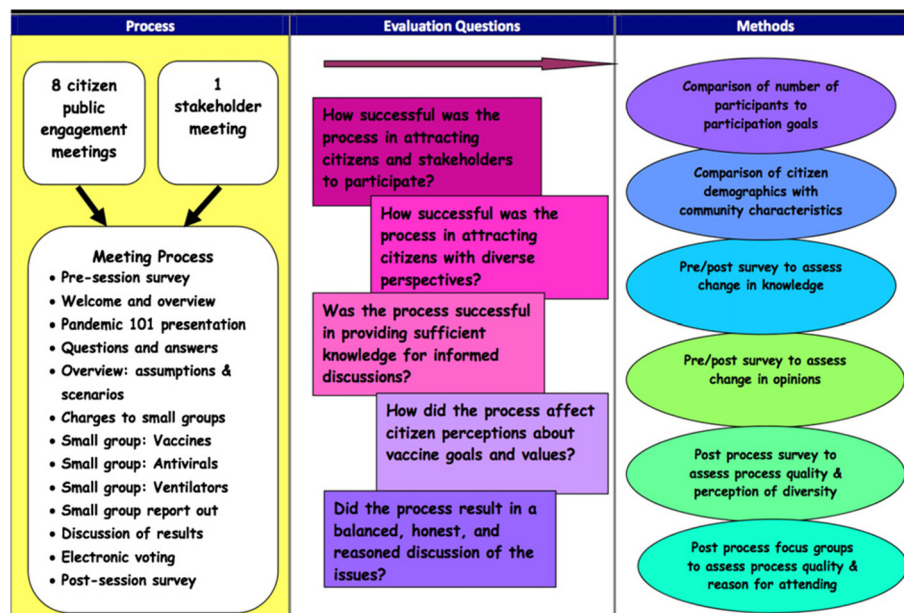


Figure 2 – Example of key issues and phases of the public engagement process in Harris County, Texas, 2011.

and (e) family engagement and community guidance during resource allocation.

Effective public engagement will require active and ongoing planning in concert with critical care providers to engender trust in MCC decisions.^{97,98} Suggested methods to increase physician-community engagement efforts include using credible and respected clinicians to play an active role in disaster planning deliberations and integrating these clinicians into public-private partnerships with governmental agencies and health-care institutions, including academic medical centers. Key community partnerships involve volunteer, faith-based, and nongovernmental community-based clinicians. Once these partnerships are established, it is important to share best practices and models that communities have undertaken to address MCC. The practices then should be implemented and deployed to engage families and, thus, effectively provide guidance during resource allocation situations. Particular attention should be given to especially vulnerable populations, such as those with specific functional needs and those who have historically been marginalized.^{99,100} Although the task force suggests that critical care providers need to be actively involved in community engagement initiatives, no clear mechanism to ensure these opportunities exists.

Areas for Research

Research initiatives are limited by the lack of seed funding to stimulate collaboration and explore issues. This has been highlighted as a limitation in ongoing public health disaster coalition formation.^{57,101,102} As reforms in health care, notably in the United States with the Affordable Care Act, begin to change the dynamics of provider employment, public and private institutions will increasingly bear the responsibility to ensure that all members are trained, prepared, and supported during a pandemic or disaster.

There are several key questions for which further research is needed. What is the impact of specific critical care education programs in transference of knowledge across all sectors? Whether the degree to which individuals engage in public education activities determines how prepared they are for mass critical disasters is unknown and should be explored. Do cultural differences indicate a need for different methods of disaster education for the public? What types of education are the most suitable to prepare for future pandemics and disasters? Is disaster education able to motivate clinicians to undertake specific preparedness activities vs experiencing a disaster?

Conclusions

Engagement of clinicians, administrators, and the public prior to a pandemic or disaster is an important aspect of preparedness so that there is an improved understanding of resources, triage priorities, and situational awareness. Failure to address these issues poses a risk for preventable morbidity and mortality and is just as important as the “space, staff, and stuff” that are the logistical portion of usual pandemic and disaster preparedness activities. We also need to improve our understanding of engagement gaps and commit to addressing these for future pandemic and disaster preparedness in health-care systems.

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Additional information: The e-Appendix can be found in the Supplemental Materials section of the online article.

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