

Modified Critical Care and Treatment Space Considerations for Mass Casualty Critical Illness and Injury

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Mass critical care events are increasingly likely, yet the resource challenges to augment everyday, unrestricted critical care for a surge of disaster victims are insurmountable for nearly all communities. In light of these limitations, an expert panel defined a circumscribed set of key critical care interventions that they believed could be offered to many additional people and yet would also continue to offer substantial life-sustaining benefits for nonmoribund critically ill and injured people. They proposed Emergency Mass Critical Care, which is based on the set of key interventions and includes recommendations for necessary surge medical equipment, treatment space characteristics, and staffing competencies for mass critical care response. To date, Emergency Mass Critical Care is untested, and the real benefits of implementation remain uncertain. Nonetheless, Emergency Mass Critical Care currently remains the only comprehensive construct for mass critical care preparedness and response. This paper reviews current concepts to provide life-sustaining care for hundreds or thousands of people outside of traditional critical care sites. *Key words: mass casualty medical care, disaster medicine, surge capacity.* [Respir Care 2008;53(1):67-74.]

Introduction

Recently, the global emergence of the H5N1 influenza epizootic and ongoing human cases, the severe acute respiratory syndrome outbreak of 2003, as well as the con-

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tinued threat of major industrial, intentional, or natural disasters has made many in health care, emergency management, politics, and communities-at-large begin to consider how to care for countless seriously ill people.¹⁻¹⁰ This exploration has concluded, not surprisingly, that expansion of complex, everyday critical care for hundreds to thousands of additional people is immensely difficult for nearly all communities because of limited reserve critical care medical equipment, specialized staff, and traditional intensive care unit (ICU) treatment space.^{5,11} These resource limitations are not easily remedied, as increasing "stuff, staff, and space"¹² to augment critical care requires substantial investment. If plans for critical care surge are

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made in the midst of the response, therapeutics and interventions will probably be determined by resource availability rather than deliberate consideration by critical care professionals regarding which care practices are most appropriate to maintain. Alternatively, if the intended scope of critical care is defined pre-event, preparedness efforts can maximize the likelihood that key resources will be available during a response. These resources must be identified and prioritized within a comprehensive strategy to deliver standardized, adequate critical care with sufficiently trained staff in acceptable treatment spaces.

Surging critical care capacity is fraught with challenges, but preparing to provide sufficient rather than unrestricted critical care for numerous disaster victims may allow many additional community members to access life-sustaining interventions during disasters. Such a strategy, termed "emergency mass critical care" (EMCC), does exist.⁵ EMCC is a nascent conceptual model that defines acceptable, limited critical care therapeutics and interventions, treatment-space requirements, and staffing paradigms. The large panel of critical care and disaster experts that conceived of EMCC believed that even with the modifications of usual critical care, beneficial impact on critical illness outcomes would be retained for most nonmoribund patients. Importantly, EMCC has significantly greater theoretical surge capacity than traditional critical care practices. EMCC, through being considerably less resource-intensive than usual critical care, was conceptualized to allow health care systems to undertake considerable mass critical care preparedness while still expending the majority of disaster preparedness finances and personnel resources on prevention, early treatment, and community outreach efforts.

This paper will present the foundation for critical care surge capacity with specific focus on scope of care and treatment spaces.

Scenarios

Mass casualty events occur frequently worldwide, with hundreds of country-level disasters happening annually.¹³ Most disasters have been dominated by traumatic injuries, and typically the majority of survivors are not critically injured.^{14,15} Even in events that result in high proportions of critically injured survivors, such as enclosed-space explosions or structure fires, the number of victims is usually limited to fewer than 100 casualties with critical injuries.^{16–19} Traumatic injuries that are severe enough to cause coma, shock, or respiratory failure are frequently fatal, either immediately or at least before rescue and stabilization occur.¹⁴ Consequently, in nations that have widespread critical care capabilities, the relatively few critically ill survivors of disasters have not had to forgo critical care management.^{20–24} Critical care response, while not neces-

sary for the majority of survivors, should still be recognized as an important response element to achieve the best outcomes for critically ill and injured victims.^{24,25} Because critical care response is still important for these more frequent multiple-casualty critical care events, they have largely been the focus of critical care disaster preparedness and response.

The medical impact of a mass casualty event will depend on specific characteristics of the disaster (eg, lethality of exposure, numbers of people exposed, types of injuries) and the interplay between the exposed population's and the response system's capabilities and vulnerabilities.^{5,26,27} Disaster characteristics that may directly influence the demand for critical care include the number of victims with life-threatening organ failure, the time from exposure to development of critical illness, and the duration of critical illness. Selected major characteristics that can be expected to affect the capacity of critical care response include (1) quantity of unaffected critical care units willing to receive evacuated patients, (2) critical care evacuation capacity, (3) maintenance of key commerce and utility infrastructure, (4) ability and willingness of staff to participate in the clinical response, and (5) pre-event regional critical care coordinated preparedness. The balance of need and capacity will determine whether usual critical care will be able to be maintained for all critically ill and injured disaster victims.

Modern health care systems have not experienced mass critical care events that yield hundreds or thousands of additionally critically ill and injured disaster victims. Though deliberate ignorance of lessons from past disasters would be reckless, turning a blind eye to possible mass critical care events because they have yet to occur is equally risky. Globalization, scientific advances making technologies that could be used to develop dangerous weapons more widely available, and population expansion have increased the likelihood that mass critical care hazards can happen. The United States Department of Homeland Security has prioritized 15 scenarios to guide disaster preparedness in the United States.²⁸ At least 10 of these scenarios could result in mass critical illness and injuries, including a severe influenza pandemic, earthquake, and widespread civilian exposure to chemical, biological and nuclear agents, either intentionally or accidentally (Table 1).²⁹ Without effective pre-event preparedness for these atypical but plausible occurrences, local, regional or even national critical care delivery may be pushed to the brink of dysfunction. Mass critical care events are apt to require a transition from individual patient-focused critical care to a population-oriented approach that is intended to provide the best possible outcomes for an entire critical care cohort. Though such a transition seems logical, few critical care health professionals have experience providing critical care when so many people in need cannot receive usual

Table 1. Potential Mass Casualty Scenarios and Patient Impact on Medical Systems

Scenario	Expected Number of Victims	Expected Number of Critically Ill Victims	Geographic Area Affected
Conventional explosion	10–100s	<100	Limited unless explosions in multiple locations
Chemical inhalation	100–1,000s	<1,000	Limited to local area
Bioterrorism/epidemic	1,000–10,000	>1,000	Large regions, multiple concurrent regions, possibly multinational
Detonation of nuclear device	10,000–10,000,000	>1,000	Limited to region
Natural disaster	100–100,000s	100–10,000	Limited to local area or region, occasionally multinational

(Adapted from Reference 29.)

clinical services. To minimize the anticipated chaotic delivery of care and ultimately to optimize the medical outcomes of these terrible events, this paper will focus on mass critical care rather than multiple casualty critical care.

Plausible events may require local hospitals to manage a surge of critically ill and injured patients for days before sufficient assistance can be provided.^{5,30} Thus, hospitals must prepare for such contingencies. Hospitals and regional jurisdictions that are interested in critical care surge, however, remain uncertain regarding how much surge capacity is warranted. The United States National Bioterrorism Hospital Preparedness Program, which was originally housed within the Health Resources and Services Administration and is now the Hospital Preparedness Program within the Assistant Secretary for Preparedness and Response’s office, as well as the Department of Homeland Security, have provided guidance on regional surge capacity goals (eg, triage, treat, and initially stabilize 500 victims with an infectious disease per one million people).³¹ These proposed benchmarks, however, lack enough detail to translate into actionable critical care goals (ie, are all patients critically ill or are just a percentage?). In the near future, a recently convened group of North American experts, the Task Force on Mass Casualty Critical Care, will be issuing recommendations regarding how many critically ill patients and for what duration hospitals should prepare to manage without adequate external assistance.

What is Emergency Mass Critical Care?

EMCC was initially defined by a group of North American experts within the context of medical response to epidemics, and described emergency changes from everyday critical care staffing, medical equipment, and treatment spaces to optimally augment care for the number of critically ill and injured people during a disaster (Table 2).⁵ These modifications are intended to maximize survival for the entire critically ill population in need. Some individual patients, though, may have worse outcomes by receiving EMCC instead of usual critical care services. Hence, EMCC

should be used only for disasters that cause high numbers of critically ill and injured patients, well beyond the capability of traditional critical care responses. The Task Force on Mass Casualty Critical Care, which convened in 2007 and included senior experts from the American Association for Respiratory Care and numerous other critical care relevant professional societies, will publish recommendations regarding when to initiate EMCC. Essentially, EMCC should be considered for disasters when, without modifying usual critical care, many victims will be expected to die with random, little, or no access to potentially life-sustaining critical care interventions.

The premise for modifying everyday critical care processes is that the expansion of modified critical care to many more in need will be more beneficial to the population as a whole rather than well practiced, aggressive critical care for far fewer who are fortunate to have access to critical care. Typically, critically ill patients are treated with a number of critical care interventions. Clearly, not all interventions can be sustained during large-scale critical care events. Ideally, the relationship between interventions and outcomes, as well as the interaction among interventions, would be known for specific disaster situations. This would allow for quantitative determination of optimally modified critical care to maximize critical care population survival during disasters. Such data are lacking, so the scope of critical care for EMCC was instead developed based on expert opinion and extrapolation from similar clinical situations managed frequently in ICUs. Based on

- (1) interventions that have been shown, or are deemed by critical care experts’ best professional judgment to improve survival, and without which death is likely, (2) interventions that do not require extraordinarily expensive equipment, and (3) interventions that can be implemented without consuming extensive staff or hospital resources; hospitals [should] plan to be able to deliver to patients receiving EMCC a basic mode(s) of mechanical ventilation, hemodynamic support, antibiotic or other disease-specific countermeasure therapy, and a small

MASS CASUALTY CRITICAL CARE AND TREATMENT SPACE CONSIDERATIONS

Table 2. Planning Assumptions and Recommendations Regarding Emergency Mass Critical Care

Planning Assumptions Regarding Current Critical Care Medicine Response Capacity for Large-Scale Events

1. Future events could result in hundreds, thousands, or more critically ill victims.
2. Critical care will play a key role in decreasing morbidity and mortality rates.
3. Mass critical care could not be provided without substantial planning and new approaches to providing critical care.
4. A hospital would have limited ability to divert or transfer patients to other hospitals in the aftermath of a large scale event.
5. Currently deployable medical items of the federal government would have a limited role in increasing a hospital's immediate ability to provide critical care to large numbers of victims.
6. Hospitals may need to depend on nonfederal sources or reserves of medications and equipment necessary to provide critical care for the first 48 hours.

Recommendations for Hospital Planning and Response for Emergency Mass Critical Care

Modify Usual Standards of Care

1. Hospitals should develop a set of emergency mass critical care practices that could be implemented in the event critical care capacity of that hospital is exceeded.

Decisions Regarding Which Critical Care Interventions Should Be Provided: Essential Elements of Critical Care

2. To ensure the availability of essential critical care interventions, hospitals should give priority to interventions that fulfill the following criteria: (a) interventions that have been shown or are deemed by critical care experts' best professional judgment to improve survival, and without which death is likely, (b) interventions that do not require extraordinarily expensive equipment, and (c) interventions that can be implemented without consuming extensive staff or hospital resources.
3. Hospitals should plan to be able to deliver the following during emergency mass critical care: basic modes of mechanical ventilation, hemodynamic support, antibiotic or other disease-specific countermeasure therapy, and a small set of prophylactic interventions that are recognized to reduce the serious adverse consequences of critical illness.
4. Hospitals should plan to be able to administer intravenous fluids and vasopressors to large numbers of hemodynamically unstable victims and should stockpile sufficient equipment to do this without relying on external resources for at least the first 48 hours of the hospital medical response.
5. Hospitals should plan to provide at least 2 widely accepted prophylactic interventions that are used everyday in critical care: maintaining the head of a mechanically ventilated patient's bed at 45 degrees to prevent ventilator-associated pneumonia, and thromboembolism prophylaxis.

Decisions Regarding Who Receives Critical Care Services

6. If there are limited hospital resources and many critically ill patients in need, triage decisions regarding the provision of critical care should be guided by the principle of seeking to help the greatest number of people survive the crisis. This would include patients already receiving care in the intensive care unit (ICU) who are not casualties of an attack.

Who Should Provide Emergency Mass Critical Care

7. In the event that critical care needs in a hospital cannot be met by intensivists and critical care nurses, usual ICU staffing should be modified to include nonintensivist clinicians and noncritical care nurses, using a 2-tiered staffing model.
8. When there are inadequate numbers of intensivists, hospitals should plan for nonintensivists to manage approximately 6 critically ill patients and to have intensivists coordinate the efforts of up to 4 nonintensivists.
9. If a hospital has insufficient numbers of critical care nurses to appropriately manage patients, noncritical care nurses should be assigned primary responsibility for patient assessment, nursing care documentation, administration of medications, and bedside care (eg, head of bed at 45 degrees, moving patient to prevent pressure ulcers), and critical care nurses should advise noncritical care nurses on critical care issues such as vasopressor and sedation administration.
10. If possible, a noncritical care nurse should be assigned to no more than 2 critically ill patients, and up to 3 noncritical care nurses would work in collaboration with one critical care nurse.
11. Training for noncritical care practitioners should include basic principles of critical care management.

Infection Control for Emergency Mass Critical Care

12. Hospitals should develop pre-event plans to augment usual or modified airborne infection-isolation capacity for critically ill victims with a contagious pathogen.
13. Hospitals should stockpile enough personal protective equipment to care for infectious mass casualties for up to 48 hours. Also, all hospital clinical staff should receive initial and periodic training on principles of health care delivery while wearing personal protective equipment.

Where Emergency Mass Critical Care Should Be Located

14. When traditional critical care capacity is full, additional critically ill patients should receive care in non-ICU hospital rooms that are concentrated on specific hospital wards or floors.
15. Hospitals should plan to be able to measure oxygen saturation, temperature, blood pressure, and urine output for the victims in emergency mass critical care conditions.

Learning During Emergency Mass Critical Care

16. Hospitals should have information-technology capabilities for analyzing clinical data from patients receiving emergency mass critical care and for quickly sharing new observations with a broader clinical community.

Medications for Emergency Mass Critical Care

17. Hospitals should develop a list of drugs to stockpile for up to a 48-hour response to a mass casualty event, using selection criteria that include likelihood that the drug would be required for care of most patients, proven or generally accepted efficacy by most practitioners, cost, ease of administration, ability to rotate into the hospital's formulary prior to expiration, and resources required for medication storage.

(Adapted from Reference 5.)

set of prophylactic interventions that are recognized to reduce the serious adverse consequences of critical illness.⁵

The scope of limited critical care described above allows for determination of essential medical equipment, staffing competencies, and treatment-space requirements, to assist hospitals to prepare for EMCC. This paper will focus on the treatment-space considerations.

The argument for EMCC is that modified care can still be very beneficial to most critically ill patients. However, if most patients in need require extensive resources (eg, large numbers of blood products, widespread renal replacement therapy, staff time) or have hypoxemic respiratory failure refractory to conventional mechanical ventilation, then EMCC may not be suitable. During such situations it may be more prudent to provide comprehensive critical care for far fewer patients and more aggressively to restrict critical care resources to a smaller population in need. If the risk to staff safety is very high (eg, outbreak of untreatable, severe, contagious disease), and the benefit of comprehensive critical care is minimal, then health authorities should even consider suspending critical care and reassigning the staff and treatment spaces for other purposes. Lastly, all the preparation for EMCC will be ineffectual without a highly functioning institutional and regional incident management system, a topic that will not be covered in this paper because of its extensive coverage elsewhere.^{32–37}

Treatment Space

Critically ill and injured patients have demanding environmental and medical equipment requirements because of the severe nature of their physiologic instability.³⁸ In most hospitals non-ICU patient treatment spaces have less optimal layouts and medical equipment for caring for critically ill and injured patients. Mass casualty critical care will nevertheless require that EMCC be delivered outside of ICUs, post-anesthesia care units, and emergency departments. To maximize safety, EMCC sites should be prioritized by degree of similarity to the environmental and equipment characteristics of ICUs. Ideally, advanced-care hospital floors (such as “step-down” units and those with telemetry capabilities) should be prioritized for EMCC, since these hospital floors have many design features and patient monitoring capabilities similar to ICUs. If needed, general hospital rooms also could be used to provide EMCC.

Though critical care may need to be delivered on a number of hospital wards, strategies to shift patients with more complex monitoring or treatment requirements to traditional ICU locations should be used. A multi-professional team of critical care health professionals should

establish patient-selection criteria for placement in the various critical care sites. Moreover, if the MCCC event is due to an epidemic of a potentially airborne-transmitted pathogen and critically ill patients are feared to be highly contagious, then infection control considerations may lead to another hospital ward being prioritized over those that are better equipped for critical care. Concentrating critically ill patients in specific locations on specific hospital floors would help optimize implementation of the necessary infection-control processes (eg, additional negative-pressure room capacity and control of who enters and leaves areas with contagious patients).

During events when in-patient surge capacity is needed, some communities are considering repurposing nonmedical buildings of convenience.³³ Even with the acknowledgment that many processes of care for critically ill patients will be omitted during disasters, the logistic hurdles of creating environments outside of hospitals to even remotely resemble ICUs are not trivial. For a nonmedical treatment space (eg, gymnasium or cafeteria) additional hospital beds, which are expensive, would need to be stockpiled, since critically ill patients, unlike less sick patients, are extremely difficult to care for on cots for any prolonged period of time. Also, hospital beds require electricity to function, and most nonmedical spaces would be unable to offer enough well-placed and adequate electrical connections without introducing fire and trip hazards. Furthermore, delivery of large quantities of oxygen to many patients for prolonged periods without liquid oxygen storage and medical gas distribution plumbing is another daunting task in an alternate care facility. Though noncritically ill patients could be cared for at off-site care facilities, critically ill patients should be cared for in hospitals because of the need for integrated monitors, power supply, and oxygen delivery. In the setting of mass respiratory failure, general medical and surgical wards could be repurposed to serve as ICUs by moving these wards' normal patients to alternate care facilities or alternate care sites.²² Most physical hospital beds, which are available on all hospital wards, are sufficient for EMCC.

When local and regional critical care resources cannot meet need, mobile medical facilities may be considered. California is purchasing deployable medical facilities with a total of 60 ICU beds (plus an additional 540 general beds), for \$18–19 million, Connecticut purchased a field hospital that provides 30 ICU beds and 10 step-down beds, for approximately \$9 million. Carolinas MED-1 has 12 ICU/emergency-care beds (130 total beds), for \$1.8 million.^{39–41} These assets may be effective for a number of non-critical-care-dominant emergencies, yet when additional capacity for hundreds (let alone thousands) of critically ill patients is needed, they are not the entire solution to critical care surge, because they provide only a rela-

tively small increase in critical care capacity, despite considerable expense.

At some juncture, with increasing patient load, decisions will need to be made to transfer patients. In the setting of a nationwide pandemic, this is unlikely to be possible. However, in a regional disaster, to relieve the continued burden on the health care system, critically ill patients could be transported to unaffected locations. Critical care evacuation in fact may be desirable during mass critical care.⁴² Current national assets, via the United States Transportation Command, which is responsible for the evacuation component of the National Disaster Medical System, estimate that the system's critical care evacuation capability (which does not account for additional capacity from nonfederal air and ground critical care transport) is 81 patients in 54 hours versus 3,300 noncritically ill patients. Civilian aeromedical rotary-wing and fixed-wing assets will probably assist, but the total number of aircraft in the United States is limited (eg, 800 civilian rotary-wing aircraft), and they are designed for the transport of 1–2 patients at a time. The total critical care evacuation capacity early in an event may vary by situation, but the ability to move many hundreds or thousands of critically ill patients will assuredly take days.

If civilian response assets are insufficient, the United States Navy maintains 2 converted supertankers that function as mobile, floating hospitals. Commissioned the USNS *Mercy* and the USNS *Comfort*, each ship contains 1,000 hospital beds (of which 80 are functioning ICU beds and 20 post-anesthesia care unit beds), 12 operating rooms, as well as radiology, laboratory, and pharmacy services, and 2 oxygen-production plants.^{43,44} These ships can provide much-needed assistance, but one cannot expect them to arrive immediately. They take time to travel to areas where they are not stationed, and cannot assist landlocked regions.

The Air Force maintains an Expeditionary Medical Support (EMEDS) force, which is a system of modular medical facilities staffed by medical personnel. EMEDS can deploy to a single locale a kit that provides 25 mechanical ventilators and supplies to care for 100 casualties of a nuclear, biological, or chemical event. Both EMEDS and Navy resources have potential limitations as military resources; in a large-scale event they could be tasked toward military rather than civilian support.⁷

Some long-term care facilities may also be acceptable sites for EMCC, especially those equipped with hospital beds, liquid oxygen, wall gas, and wall suction in patient-care rooms. A substantial amount of enhanced treatment space would be required to justify the effort (since additional medical equipment and staff would need to be transferred from hospitals to these facilities). Specialty care and a broader range of laboratory and diagnostic services are more likely to be widely available in hospitals, so tradi-

tional hospital in-patient sites should remain the first priority for EMCC until acceptable alternatives are available.

As the largest integrated health care network in the nation, the health care branch of the Department of Veterans Affairs is tasked with supporting civilian disaster planning as part of the National Response Plan.^{45,46} However, Veterans Affairs resources are limited and will be subjected to the same demands from its usual patient population, and its capability to provide large-scale critical care remains uncertain.⁴⁷

Summary

Mass critical care events are increasingly likely, yet the hurdles to augment usual critical care for the surge of disaster victims are insurmountable for nearly all communities. In light of these challenges, an expert panel defined a circumscribed set of key critical care interventions that they believed would continue to offer substantial life-sustaining benefits and may be provided for many more people during mass critical care events. They proposed EMCC, which includes provision of basic mechanical ventilation, hemodynamic support, disease-specific treatments, and a set of care practices to reduce the general adverse consequences of critical illness and critical care treatment. This limited supportive-care construct can be provided to many more disaster victims than usual critical care, and for the anticipated events it may offer sufficient life-sustaining interventions to significantly improve the survival of the total critically ill population in need.

Critical care is a crucial but small component of everyday health care in many countries, despite being very expensive and resource-intensive. By analogy, provision of critical care is an important but parochial piece of the disaster medical response. Critical care disaster response cannot be ignored. For most plausible mass critical illness scenarios there are no effective countermeasures to forestall critical illness in exposed populations. Even where effective countermeasures exist, insufficient quantities or distribution challenges make it likely that many disaster victims could develop organ failure. These vulnerabilities are unlikely to be mitigated even with considerable additional investment in community public health preparedness efforts. For this reason, hospitals must consider means to augment critical care during disasters, so that the populations they serve have a fair chance to survive catastrophic events.

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Discussion

Wilgis: First I want to say, very good work. I applaud you on this work. This is something that is severely needed across the continuum of health care, and we really need to start thinking out of the box, so I am excited to see what you have come up with after your drafts and final document. I have 3 questions. You can comment, or anyone on the panel can comment. Regional response: if you could talk or expand a little bit on mutual aid agreements and how that fits into your plan.

The second question is on surge hospitals. We've looked at some different programs, one out of Texas A&M University with Paul Carlton Jr MD.¹ They took a large animal veterinary hospital during hurricane Rita and used that as a surge facility so they could free up space for patients, creating critical care space in hospitals.

And then, third, I wonder what was your discussion and considerations of EMTALA [federal Emergency Medical Treatment and Active Labor Act]? I think that is probably the one thing that always creeps up when we start talking about surging people in and out and giving them alternate care standards. How much has that played into thinking about providing care? Those federal standards aren't going to go away, and I just wondered how you considered that?

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Rubinson: All excellent questions, John. So let me see if I remember them. First was regional coordination. So when we were in the task force someone came up with an idea that we would turn on a light switch and we would become Canada. So a disaster occurs in the United States and all of sudden we're Canada. And the reason is that in Canada, while they still have difficulties within their system, funds come from a regional source. And I think until we start having an incentive that either Medicare forces regional coordination and regional coordination is used on a daily or near daily basis, it will be difficult to build and sustain. But they shouldn't do that as an unfunded mandate, they (Medicare) need to do it as a funded mandate. It's mostly a bit of a pipe dream.

I work for the King County Health Care Coalition; we're one of the areas that was on the forefront of trying to create regional coordination so that all the health care facilities, including the ambulatory and specialty-care facilities such as out-patient dialysis, are part of it. It's still herding the cats.

I think, ultimately, the major problem will be sustainability, because the funds are eventually going to go away for these pilot projects. Even though the competitive grants for the upcoming year have ASPR [Assistant Secretary for Preparedness and Response] supporting regional coordination, we have to see if the funding will be sustained. Regional coordination has generally not been tested either. The question is, will everyone work to the good of all elements of the health care sys-

tem, because even with the MOUs [Memoranda of Understanding] and other agreements, when it starts getting to money, and facilities are at risk of actually going under, we are unsure how the system will respond.

This is different from normal disasters (temporally and geographically limited events), right, where facilities almost always do the right thing. This has generally been shown to be true, but we're talking about events where you need to make tough decisions that are going to cost each facility some serious cash. I think until we have incentives for this regional coordination aligning with the way systems operate, it's going to be a struggle to build and maintain regional coordination.

The second question was surge hospitals, so, what I didn't get to talk about, due to time limitations, is alternate care sites. It's not just hospitals; we're talking about hospitals and hospital-like areas, so we believe in places like chronic ventilator units, as long as you can find a place to house those other patients or what General Carlton did with the veterinarian hospital, because of wall gas and all of the things that existed there, to make it a logical surge treatment site. But what they didn't do was they didn't take—even though they took over a closed K-Mart and PMac arena in Baton Rouge, they didn't make the K-Mart into an ICU for sustained management; so that'd be the difference. I think a surge hospital that's got the medical gas and the suction and all of those things such as hospital beds to make care reasonably safe—surge

hospitals are fine ideas as long as you have the facilities with specific resources in your geographic area. What I cautioned against in the lecture was spending millions of dollars for mobile facilities that offer very limited additional surge critical care capacity.

Third thing, EMTALA. I actually think EMTALA is going to be easier than some of the issues around liability. And I could be wrong on this, but the federal government can waive things as long as it's within their jurisdictional authority to waive them. So things like HIPAA [Health Insurance Portability and Accountability Act] and EMTALA are federal things, so with a signature they can go away. They'll go away for just a short period of time, but they can go away.

On liability issues, that rests at the state level, so we have to deal with it in all 50 states, and there's not a blanket ability to modify care where we know that what you do in Louisiana is going to be accepted in Florida or is going to be accepted in Oregon. We hope, since we've talked with lawyers, that precedent in other states will be taken into account within one's own state. There are no current guarantees, and I actually believe that criminal and civil liabilities will be bigger problems than the incident events of the \$50,000 per event issue with EMTALA. Again, I am not entirely sure that's how it will play out, but I think the state regulatory and liability issues will be much bigger issues than EMTALA for short-term catastrophic events.

Wilgis: Just for the audience, we should speak in plain English and not use acronyms. Can you describe EMTALA?

Rubinson: I believe it stands for the Emergency Medical Treatment and Active Labor Act. The impetus was people were doing wallet biopsies, before they were seeing folks in the emergency department or before folks were being transferred from an institution

to another, without a legitimate reason, like either you don't have the resources there, or the patient or family requests. So EMTALA is a federal law that essentially people talk about under COBRA [Consolidated Omnibus Budget Reconciliation Act] that prevents this kind of dumping. It requires a screening exam, and that's not well defined, as I am sure that Dan [O'Laughlin] has to go through this in the emergency department all the time. Before someone could be sent away they need some sort of screening exam, and if people are being directly redirected to alternate care sites without a screening exam or meeting the usual criteria for transfer, is that an EMTALA violation? Again, there are provisions for it being temporarily lifted. Is that a fair summary?

Wilgis: Just a follow up, you mentioned hospitals declaring a disaster. I wonder if you considered whether hospitals have that authority? I mean, we can call up to the local EOC [emergency operations center] and say we're at peak census, we're diverting, and I wonder how well that would be heard by our incident command, by our emergency operations? I don't know if that would come all the way up to the state emergency operation center immediately, unless you started having a regional response.

Rubinson: Unless immediately obvious to be catastrophic, it won't make it to the state immediately, because the region has to assess, and it really is going to be ESF-8 [emergency support functions] that will make that determination. Folks know about different emergency support functions; under the national response plan there are 15 emergency support functions, one which is ESF-8, and that's health care. Public health is usually the lead agency on that.

So what he's asking is whether the hospitals have the authority to declare a disaster. They absolutely have the authority to declare one within their

own institution, and that's what I was mentioning in the lecture. Because when you look back on a lot of disasters and you ask hospital personnel, "Did you declare a disaster and open up your EOC and do a modified staff callback and all the things that they're supposed to do?" they frequently reply, "Oh, we forgot to do that." So that's why it was a deliberate statement in the consensus recommendations.

The hospital declaration, though, has no impact on the decision whether the public health EOC will open or an area command of ESF-8 will be established, but I know in our jurisdiction in Seattle we'll be open immediately on that. It may be a modified activation or might not be full-scale until we get a situation report, but we'll absolutely pay attention to that, and that's different from the emergency management declaring a disaster, which is really an economic decision. Which emergency management is saying, "Are we ready to pay a lot for the emergency?" and remember that declaration is usually not based on medical need. So a disaster within ESF-8 to get additional regional resources is different from a formal declaration of disaster that would move up from local emergency management, to state, to the governor's office. But within their facility, absolutely they could activate their hospital command center. Public health, state department of health can also activate, even if the emergency management is just in a monitoring phase.

O'Laughlin: With regard to the regional coordination, I can't emphasize how important that is. Some areas of the country have done better than others with this, and I think others are still struggling with it. With the issue of mutual aid agreements and working together, we (hospitals) are all competing to bring in that acute coronary syndrome case, and others, and EMS [emergency medical services] is pretty cutthroat out there as well, but

when it comes to disasters we have to work together, and I think a lot of hospitals are finally figuring that out.

You had a slide up there earlier that had the diagram from Minneapolis, which included a regional hospital resource center that helps coordinate the activities of all of the hospitals in Minneapolis and St Paul. We have that one hospital act as that coordinating hub for the region, which then feeds up into the state. Minnesota has 8 different regions that would then have 8 different coordinating centers. I think there is also some protection in utilizing a system like that, because you talked about your concern—not being EMTALA issues so much, but more that of liability, and I agree completely. But if you show that a region is demonstrating the same application of resource use standards and triage—and I will talk more about this tomorrow—I think we will have more protection in that regard, even if we don't have clear legislative protection.

Rubinson: I think that's right, Dan, although we don't know until it actually happens. The lawyers are arguing that we do it from a regional standpoint until either Emergency Powers or until specific legislation is enacted.

Dan's additional point on a regional operational hub is a great one. In fact, Minnesota has probably got one of the best models out there. Dan and his colleague John Hick and several other people have done great work, and in fact that document that I was talking about, the MSCC [medical surge capacity and capability] document, they participated in its development and it really is a structural basis for a lot of the health care coalitions or regional collaborative efforts that are out there.

In Seattle/King County our health care coalition calls our regional operational coordinating entity the Regional Medical Resource Center rather than the Regional Hospital, because we are doing more than just hospital coordination. You absolutely need an operational arm of the regional coalitions. The only

down side with all of this to date is, as I mentioned before, that when push comes to shove and facilities are making decisions that actually could potentially put them under, we don't know if that shared collaboration is going to work anymore. But it is certainly better than not collaborating, and there's a lot of training and other shared use of resources for preparedness that could be brought to bear.

Branson: Pete [Muskat], I was curious what kind of support can the Air Force offer? Does the Air Force have any capability to assist civilian hospitals in a disaster, and at what capacity do you think that might be?

Muskat: The answer is yes, but it takes a national approval. If a hospital calls a local base and says, "Hey can I use your planes?" the answer will be no. They have to get orders from the Secretary of Defense, who gets it from the President. However, it can be done, and quickly.

Katrina was a good example. C130s, C17s were flown into the airport and transported a substantial number of patients out of the city to Houston and other areas. There's a picture of one aircraft completely floor-loaded with patients from stem to stern. They've done it with helicopters and aircraft, but it requires permission. That is part of the Posse Comitatus act, which prohibits the military from operating within our national borders without permission from the state and local authorities.

Rubinson: It also requires resources, and I think Pete's right on; they were some of the saviors in Katrina. But the critical care piece is separate. Again, the folks who are responsible for US Transcom [United States Transportation Command] state that 81 patients can be moved over the period presented in the lecture. There is the Civilian Reserve Air Fleet (CRAF), but my understanding is those commercial aircraft cannot

be converted for critical-care transport. Is that right, Pete?

Muskat: The CRAF is a wonderful system, but it is designed more for long-term problems, and not for acute response. We have a limited number of standing critical care transport teams, which is what it really comes down to. The air frames were there. It's the personnel to support that critical care patient on the air frame—that's the short resource. Many of our teams are currently deployed in Iraq and Afghanistan, but there are a number of them on standby throughout the country, and can be in place, but Lewis is right, as the number of patients who can be moved out *on ventilators* is relatively small.

Rubinson: HHS [Health and Human Services] last year was working with AARC [American Association for Respiratory Care] and Rich [Branson] to be able to have deployable respiratory care professionals in the face of a disaster. Obviously if it's an influenza pandemic and multiple regions are involved at the same time, it's a less effective strategy, but for something more like an earthquake, where NDMS [National Disaster Medical System] may have a big evacuation role, I think there are about 100 respiratory care professionals on the DMATs [Disaster Medical Assistance Team], but don't hold me to the number, since I am not truly sure of the number. For the AARC/HHS program right now my understanding is HHS trained 37 and had 60 in total sign up. So anyone who wants to sign up, you should go through AARC, I believe, to get through to the ASPR office.

I believe the USERRA [Uniformed Services Employment and Reemployment Rights Act] benefits have been accommodated as well. I am not sure they will deploy as a functional team, but this is where we can start staffing up, because you're just not going to see the staff coming in big numbers from DOD [Department of Defense],

because right now, as Pete said, they're deployed.

Muskat: The other issue with regards to transport is that if you have any patient with an infectious agent, there is no aircraft commander who is going to let your patient on that aircraft, because basically it contaminates the entire plane, so that for many of the epidemics that we talked about,

frankly, the answer is we are going to end up flying health care professionals to the patient and not move the patient.

Wilgis: Pete, I want to ask you a quick question for clarification for the audience. Is it also a requirement for military transport to have Department of Defense certification of your ventilators before that equip-

ment will be allowed on that aircraft?

Muskat: Currently we have 2 transport ventilators approved for flight: the Impact 754 Eagle and the recently approved LTV 1000. We do have a waiver authority to move larger ventilators, and have done so in the past, but these are two currently pre-approved ventilators.



More than 140 evacuees from New Orleans, victims of flooding caused by Hurricane Katrina
U.S. Air Force Photo by 1st Lt Neil Senkowski