

**Improving Homeland Security:  
Innovations for Better Medical Care in Disasters**

Summary of the Proceedings of  
Medical Readiness and “Surge” Hospital Conference



Texas A & M University College of Architecture  
*and*  
The Texas A & M University System Health Science Center  
Office of Homeland Security

## *Table of Contents*

1.	Introduction – Dr. Richard Carmona, Surgeon General	3
2.	Introduction – Dr. Nancy W. Dickey, President, The Texas A&M University Health Science Center, Vice Chancellor for Health Affairs A&M System	4
3.	Summary	5
4.	Innovations for Better Disaster Medical Care	6
	a. Private Sector Innovations	8
	b. “Surge” Hospitals: Design Projects	18
	c. Federal Agency Innovations	32
	d. State Agency Innovations	35
	e. Local Agency Innovations	38
5.	The Future	39
6.	Summary	40
7.	Bibliography	41

Brayton Fire Training Center  
College Station, Texas

1 December 2004

*cover art : “Surge Hospital” logo, designed by Lindsay Hieb, Allison Prehn and Lindsay Widener, students of the School of Architecture to serve as public sign, much like the fallout shelter sign of the Cold War era*



This booklet was prepared by The Texas A&M University Health Science Center via a grant from Mobile Medical International Corporation. We greatly appreciate their efforts to further national preparedness!

## Introduction:

There is an ancient Chinese greeting, “May you live in interesting times.” Truly, the challenges of homeland security in the 21<sup>st</sup> century are complicated, difficult, and interesting. How do we conduct business as usual for prolonged periods of time, then respond effectively and efficiently to a terrorist attack or natural disaster? What new tools do medical personnel have that can help them in this daunting task? Where should the government focus its efforts in organizing, training, and equipping our health care system for disaster response?

The “Medical Readiness and Surge Hospital” conference, held at the Texas A&M University in early December, 2004, showed the great progress we have made on these issues since September 11, 2001. There are elegant solutions to some of the complex tasks of disaster response, solutions that are ‘off-the-shelf’ and ready today. We saw state-of-the-art devices that allow us to find a living patient in a collapsed building, or better monitor his status during transport to a hospital. We saw innovative architecture projects for dual-use structures, designed to serve a community need during normal operations, but quickly convertible to a temporary medical facility during times of disaster. We saw successful networking and education between medical organizations, working across political jurisdictional lines, to create a safer environment for large groups of Americans. And we saw new opportunities for further progress.

In my job as Surgeon General of the United States, I am often asked, “When will we be prepared for the all the threats we face?” My answer is – not in my lifetime. The threats are evolving and complex. We must strive to stay ahead of our adversaries. Improving the medical response is a difficult, ongoing task. That said, we have made enormous progress toward better protecting the citizens of the United States from terrorist and natural catastrophes. We have produced much better disaster and WMD response education for medical personnel. We have far better equipment, and the training to use it. We have organized ourselves to create mutual support partnerships, pooling our resources for a more robust response when disaster strikes.

The conference at Texas A&M gave us much to celebrate, and demonstrated some opportunities we have for improving the medical response to catastrophe. There is much reason to feel safer from the complex 21<sup>st</sup> century threats, and look to a better, more secure future.

**Vice-Admiral Richard H. Carmona, M.D., F.A.C.S.**  
**Surgeon General of the United States**  
**United States Public Health Service**  
**Department of Health and Human Services**

The Texas A&M University System Health Science Center is dedicated to advancing the safety and health of our country. One way we meet that mission is to explore new ways to use existing resources to meet emerging challenges. A university is the ideal setting to bring together groups or perspectives that do not routinely work together to share insights and capitalize on the synergies created by the group.

The December 2004 conference hosted by The Texas A&M University System Health Science Center and the Texas A&M University College of Architecture represents one of a series of conferences which have been convened to bring together individuals or institutions with a shared mission, diverse perspectives, and imagination to identify unique or fresh ideas. Ranging from the United States Surgeon General Richard Carmona to undergraduate architecture students, the attendees brought energy, enthusiasm, and expertise to the job of seeking solutions to the threats posed by disasters - natural and manmade.

The materials being shared through this booklet set forth concepts about potential use of currently available materials and technologies. Many of these products offer possible solutions to anticipated problems. The accompanying information also demonstrates the role that can be played by students as they use an emerging concept as the foundation for a classroom project. Giving their imaginations full rein in the realm of creating a "surge hospital facility", a variety of ideas emerged.

Whether it is generating ideas for needed but not yet available technology, or creating a wide spectrum of possibilities for applying an existing technology to a new problem, a university setting is an ideal incubator. The concepts discussed during the December conference demonstrate the richness of the possible product. As long as the United States faces challenges both external and internal, manmade and natural, The Texas A&M University System Health Science Center will remain committed to seeking solutions to the problems.

Nancy W. Dickey, M.D.  
President, Health Science Center  
Vice Chancellor for Health Affairs A&M System

## Executive Summary:

Some of the recommendations from the conference were:

- “Dual-use” facilities, busy during normal times with community use but rapidly converted into a disaster response surge capability, can be cost-effective, sustainable, and suitable for all hazards. Daily use can be superb training for disaster response use.
- Modular units of capability allow a flexible, stepwise creation of a properly-sized, cost-efficient disaster response.
- Mobile medical facilities are excellent models of both dual-use and modularity, and interface well with fixed ‘dual-use’ facilities.
- Building code considerations for dual-use, surge facilities will require innovative work. Codes may require wider hallways and stairways, to allow stretchers to pass each other, and emphasize horizontal construction with faster, larger elevators to avoid bottlenecks when moving patients to different floors. Redundant power, “clean” rooms, HVAC emergency power, additional communication capabilities and survivability, will all need to be addressed in the building code forum.
- Proven, innovative, off-the-shelf technologies can today greatly enhance disaster response capability in on-site trauma triage, remote patient assessment, rapid screening for biological agents, quick conversion of an air-handling system into a “clean” supply, and in other areas.
- Federal and state governments must aggressively organize, train, equip, plan, and exercise their disaster response “assets” to best prepare themselves and their jurisdictions.
- Partnerships between agencies and across jurisdictional lines - sharing personnel, equipment, training, and organization - create the best medical readiness and the best value for the taxpayers.
- Effective plans for disaster response must address appropriate resource allocation among people, equipment, training, and organization. To neglect one category will lead to a weak master plan.
- There are many valuable disaster response training programs and lessons learned from federal, state, local, and military organizations, which can be shared and exported to other regions for homeland security use.
- We must begin to address the differences between “Standard of Care” and “Sufficiency of Care”.

## Innovations for Better Disaster Medical Care:

On December 1, 2004, a group of energetic and innovative thinkers met at the Brayton Fire Training Center at Texas A&M University in College Station, Texas. Led by Dr. P.K. Carlton, Jr. host of the conference and Director of Homeland Security at The Texas A&M University System Health Science Center, the gathering discussed a series of innovative concepts in the medical aspects of homeland security. This booklet will describe much of this work. It is an arbitrary but impressive sample of a large body of work going on around the civilized world. Its goal is to protect the public from the many hazards of man-made and natural disasters, which have long been and remain a threat to the health of our citizenry.

The fact is that much has been accomplished since the wake-up calls in Oklahoma City in 1995 and New York/Washington, D.C. in 2001. Medical response to disaster is faster, more effective, and more innovative than it was before those sentinel events.

Innovative responses to the medical challenges of homeland security can be divided into four resource categories: People, Equipment, Training, and Organization. Each is an essential component to a master plan for overall success, much like the pie-shaped pieces of fabric in an umbrella. If one fails, the umbrella will not shed water, and the medical response to disaster will be less than optimal. Resources must be divided carefully among the four categories to achieve the best possible medical response.

Historically, this has been a very difficult job for our government, at the local, state, or national level. Programs with better publicity or powerful supporters gain the bulk of attention and funding, while key programs in other categories are neglected. Different groups in the media and in government perceive the threats and solutions in quite dissimilar ways. Agencies within the federal government or between levels of government have not always communicated effectively, nor avoided redundant effort and expense. Large agencies like the Department of Defense struggle to work with many different "stovepipes" - relatively independent chains of command - of authority and funding. The complexity of optimizing the capability of all four resource categories, using funding from multiple levels of government, is enormous - but not impossible. The presentations at this conference show the way for progress in each of the categories. These innovations, along with many others, can offer the American public a safer, more secure future and the reassurance that every possible resource is ready to come to their aid when disaster strikes.

The focus of the December conference was to analyze the gaps between existing and needed capability and to discuss “off the shelf” solutions to these challenges that are available now, ready to provide value today. Part of the emphasis was also to showcase solutions that are sustainable and have “dual-use” capability, providing value both during the disaster and the long periods between crisis uses.

There was also an effort to examine the division of cost between local, state, and federal agencies. Ventilators, for example, can cost anywhere from \$40 to \$30,000, with increasing capability and sophistication at higher cost. Yet the lower cost version may suit the small community need to respond for a limited period of time on its own resources, before larger agencies can mobilize their resources to help.

Another perspective was to build modular units of capability that could be added to the response as needed. The ‘one-size-fits-all’ device or facility is neither cost efficient nor appropriately responsive, whereas smaller modular units could be mobilized in precisely the right amount for each unique scenario. In simpler times, mobile hospitals included huge amounts of gear, personnel, and expense. Recent giant strides in medical technology, combined with the modular units of capability model, allow the creation of a series of smaller, more flexible facilities that can be custom-built for the specific disaster.

Let’s look at some of the specific presentations of this exciting conference.

## Private Sector Innovations

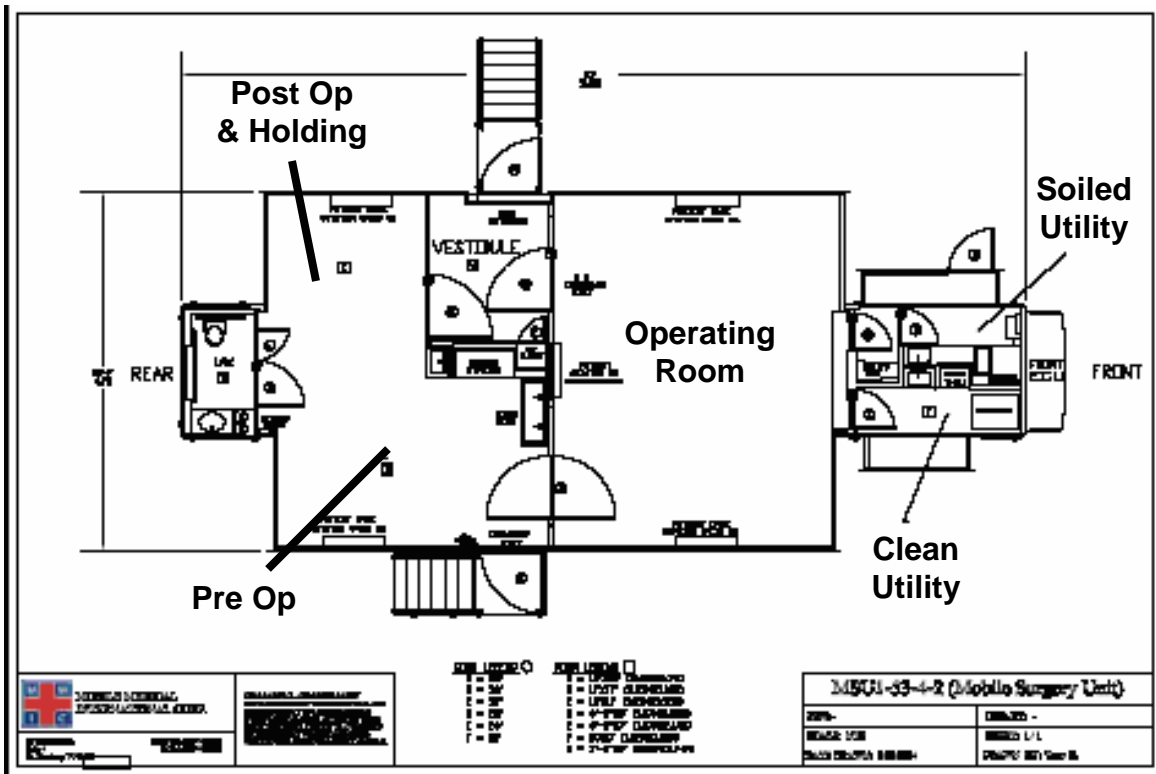
A great need for robust medical response to disaster in our large nation is portable medical capability. It is not possible to locate a hospital and intensive care unit at every location that could host a man-made or natural disaster. Yet we know that survival after trauma depends on quick availability of surgical care, during a “golden hour” after the injury occurs.

Portable medical facilities offer part of the answer to this dilemma. For example, Mobile Medical International Corporation ([www.mobile-medical.com](http://www.mobile-medical.com)), a company in St. Johnsbury, Vermont, produces state-of-the-art surgical and intensive care suites on an eighteen-wheeler truck trailer (shown below), or as part of an integrated mobile field hospital utilizing International Standards Organization (ISO) containers. The commercial units have been in use for 9 years, are Medicare-approved, and licensed in four of our larger states. The mobile medical facilities have exciting potential for medical support of homeland security threats. Using them as portable clinics, for example, a rural county or large city can offer accessible care to underserved populations in targeted areas of their jurisdiction. A for-profit health plan might utilize one for preventive services for clients who otherwise would have transportation challenges accessing care. Dr. Carlton refers to this concept as the “Thursday hospital” – available to provide care in one location each Thursday, as an example, yet available for other uses at other locations on the other days of the week. The prison system of Florida has built a successful demonstration model for use of the portable facility, and North Carolina has signed a contract to use the units for its maximum prison facility.



**This 18 wheeler is already approved by Medicare, licensed in four states and has already passed a Joint Commission inspection. It could serve as the “dual use” base as a building block for our medical response system.**

Such 'dual-use' portable units could act as a reserve force, available on short notice, for disasters within their state or region, depending on the partnerships that are created. The state or region would defray some of the operating expenses of the portable 'reserve unit', while obtaining resources to address its own disaster threats. The solution for medical readiness is technology that is available today, has a proven track record, and is based on accepted standards. More importantly, if each state and federal disaster response agency had access to a fleet of mobile units, utilized for both daily and rapid disaster response use, then daily use becomes training for disaster use. Sharing the units across state lines allows all states to have substantial reserve capability with minimal cost, and deployment of a small portion of several states' units could create a large field hospital with little impact on daily operations in the contributing states. These concepts are familiar to military medical personnel, and is a key consideration for medical disaster planners and emergency managers.



This schematic diagram for the 53' expandable Mobile Surgery Units™ show its completeness. It can do everything a conventional brick and mortar facility can do and move to the next site in an hour. In the event of a disaster the unit can be rapidly reconfigured to an 8 bed trauma/triage/ICU unit very easily.

MMIC also provides a variety of other mobile applications using a similar mobile platform.



**Post Op and holding area, note wide doors on right for handicap access, wheelchair lift is further right**



**400 square foot operating theater**



**Nurse's station/scrub area. Operating theater is through door on right.**

