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**NAVAL
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MONTEREY, CALIFORNIA

THESIS

**ALTERNATE CARE SITES FOR THE MANAGEMENT
OF MEDICAL SURGE IN DISASTERS**

by

Gail A. Stewart

December 2013

Thesis Co-Advisors:

Robert Bach
Kathleen Kiernan

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**ALTERNATE CARE SITES FOR THE MANAGEMENT OF MEDICAL SURGE
IN DISASTERS**

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ABSTRACT

This research compares federal and state approaches to managing disaster medical surge. The comparison identifies the varieties of regulations, assets, and response methods available for federal and state responses to mass casualty incidents, from which local communities can develop plans and acquire resources to create a seamless disaster medical care system.

Following a disaster, survivors self-evacuate or are transported by EMS to a nearby hospital. Arrival of disaster survivors, combined with an often high daily number of non-disaster patients leaves the facility overwhelmed both in terms of medical resources and personnel. The lack of local resources to manage the incident may require state and federal assets to be deployed. The time it takes for the additional resources to arrive from outside the area leaves the facility unable to respond effectively for hours and even days.

A whole community approach to medical surge management organized by a collaborative regional healthcare coalition may provide a solution. Such a coalition can engage stakeholders to assess and manage resources (space, staff, and stuff) and develop surge response plans that will integrate with state and federal resources when needed. Seamless coordination will minimize the complexities of medical surge needs and lead to doing the best for the most.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACS	Alternate Care Site
AHA	American Hospital Association
AHCA	Agency for Healthcare Administration
AHRQ	Agency for Healthcare Research and Quality
ALS	Advanced Life Support
AMTS	Alternative Medical Treatment Site
ASMRO	Armed Services Medical Regulating Office
ASPR	Office of the Assistant Secretary for Preparedness and Response
AST	Ambulance Strike Team
ASTHO	Association of State and Territorial Health Officials
ATS	Alternate Treatment Sites
BLS	Basic Life Support
BPR	Bureau of Preparedness and Response
CA	California
Cal-EMA	California Emergency Management Agency
Cal-MAT	California Medical Assistance Team
CBRNE	Chemical, Biological, Radiological, Nuclear, and Explosive
CCP	Citizen Corp Program
CDC	Centers for Disease Control and Prevention
CDHV	California Disaster Healthcare Volunteers
CDPH	California Department of Public Health
CEMP	Comprehensive Emergency Management Plan
CHA	California Hospital Association
CHD	County Health Department
CHDS	Center for Homeland Defense and Security
CHE	Catastrophic Health Event
CMCHS	Civilian Military Contingency Hospital System
CMS	Centers for Medicare & Medicaid Services
CRAF	Civil Reserve Air Fleet
CT-Scan	Computed Tomography Scan

DEMO	Division of Emergency Medical Operations
DHS	Department of Homeland Security
DHV	Disaster Healthcare Volunteer
DHHS	Department of Health and Human Services
DMAT	Disaster Medical Assistance Team
DMSU	Disaster Medical Support Unit
DOD	Department of Defense
DOH	Department of Health
DSOC	Domestic Security Oversight Council
ECO	Emergency Coordinating Officer
ED	Emergency Department
EM	Emergency Management
EMA	Emergency Management Agency
EMAC	Emergency Management Assistance Compact
EMEDS	Expeditionary Medical Support
EMS	Emergency Medical Services
EMSA	Emergency Medical Services Agency
EMTALA	Emergency Medical Treatment and Labor Act
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
EOM	Emergency Operations Manual
ESF	Emergency Support Function
ESS	Emergency Status System
FCC	Federal Coordinating Center
FDOH	Florida Department of Health
FEMA	Federal Emergency Management Agency
FHA	Florida Hospital Association
FL	Florida
FMS	Federal Medical Station
FS	Florida Statue
GAO	United States Government Accountability Office
HCO	Health Care Organization

HICS	Hospital Incident Command System
HPP	Hospital Preparedness Program
HHS	Department of Health and Human Services
HRSA	Health Resources and Services Administration
HSEEP	Homeland Security Exercise and Evaluation Program
HSPD	Homeland Security Presidential Directive
ICS	Incident Command System
IMAC	Interstate Mutual Aid Compact
JCAHO	Joint Commission on Accreditation of Healthcare Organizations
LSA	Logistical Staging Area
MASH	Mobile Army Surgical Hospital
MCI	Mass Casualty Incident
MFH	Mobile Field Hospital
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MMA	Mobile Medical Assets
MMAA	Master Mutual Aid Agreement
MMRS	Metropolitan Medical Response System
MRC	Medical Reserve Corps
MSCC	Medical Surge Capacity and Capability
MST	Medical Support Team
MTF	Medical Task Force
NDMS	National Disaster Management System
NEMA	National Emergency Management Association
NGO	Non-Governmental Organization
NIMS	National Incident Management System
NPG	National Preparedness Guidelines
NPS	Naval Postgraduate School
NRF	National Response Framework
NRP	National Response Plan
OA	Operational Area
OADMHC	Operational Area Disaster Medical and Health Coordinator

ODP	Office for Domestic Preparedness
OPPAGA	Office of Program Policy Analysis & Government Accountability
PH	Public Health
PHEP	Public Health Emergency Preparedness
RDMHC	Regional Disaster Medical and Health Coordinator
RDSTF	Regional Domestic Security Task Force
REC	Regional Emergency Coordinator
RERA	Regional Emergency Response Advisor
SLRC	State Logistical Resource Center
SMRS	State Medical Response System
SMAT	State Medical Assistance Team
SMRT	State Medical Response Team
SPEARR	Small Portable Expeditionary Aero Medical Rapid Response
SPOT	Strategic Plan Oversight Team
TCL	Target Capabilities List
US	United States
UTL	Universal Task List
VA	Veterans Administration

EXECUTIVE SUMMARY

Natural and manmade disasters can be severe enough to cause multiple casualties. The number of survivors requiring medical care can overwhelm a healthcare system. The surge of disaster survivors entering the healthcare system causes the demand for resources to exceed the supply. A shortage of supplies and medical staff leaves those in need of care to wait and risk the potential of a poor patient outcome. During a disaster, entry into the healthcare system is most often through the emergency department of the closest hospital. To compensate for the surge into these facilities, hospitals may institute disaster protocols to move supplies and staff to the emergency department. They may also delay or cancel previously planned and scheduled elective medical procedures. This shift of resources may mitigate the surge in necessary treatment, but large disasters can easily overwhelm the capacity of any single facility to meet both existing and new needs.

Disasters like Hurricane Katrina and the attack on the World Trade Center demonstrated the importance of managing disaster medical surge. In response, the Federal Government has provided funding and guidance to States to develop plans for building medical response teams, acquiring medical supply and equipment caches, and building expanded capacity. Some States have built mobile hospitals to help augment healthcare capacity and capability during a disaster induced medical surge. States have also collaborated by entering into mutual aid agreements and interstate compacts to share resources during disasters.

Still the response time for State and Federal resources to reach local hospitals and clinics may reach days. Until then, the burden for managing medical surge rests squarely with the capabilities and responsibilities of local healthcare systems.

The development of local Disaster Healthcare Coalitions can be valuable for the whole community to collectively access medical resources. This is especially important during the first hours to days when a local community is managing medical surge or awaiting State and Federal resources to arrive. Local Alternate Care Sites can manage

medical surge by providing non-complex medical care to patients away from the hospital, leaving valuable space and resources for the most critical at the hospital.

This thesis reviews the literature that aims to provide guidance, frameworks and directives for managing disaster medical surge. It compares what this literature indicates is available among federal agencies and state level medical departments to help identify how local management of survivors of catastrophic disasters may be the most effective and efficient approach to handling medical surges.

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I. INTRODUCTION

Present public health and medical preparedness plans incorporate the concept of “surging” existing medical and public health capabilities in response to an event that threatens a large number of lives. The assumption that conventional public health and medical systems can function effectively in catastrophic health events has, however, proved to be incorrect in real- world situations. Therefore, it is necessary to transform the national approach to health care in the context of a catastrophic health event in order to enable U.S. public health and medical systems to respond effectively to a broad range of incidents. (HSPD-21, 2007)

A. OVERVIEW

This research provides alternatives for the management of medical resources to lessen the impact of disaster medical surge which can become overwhelming on a communities healthcare system. Natural disasters like Hurricane Katrina or manmade disasters like the World Trade Center cause multiple casualties to simultaneously seek medical care from the local healthcare system. The surge of patients becomes problematic as the demand for medical supplies, staff and space may exceed the available supply. To manage surge and build healthcare system capability and capacity requires commitment, communication, and coordination of local, state, and federal resources.

In 2003, the Health Resources and Services Administration (HRSA) created a benchmark for hospitals which identified the need for bed capacity of five hundred (500) per million population for the acutely ill requiring hospitalization from a bioterrorist incident. To meet the benchmark requires the burden of medical surge management to be placed on the whole community not one facility or healthcare system. It is not sufficient for healthcare facilities to develop individual disaster plans without coordination within the healthcare delivery system. Communities should carefully and creatively examine their current assets and expand upon existing relationships to build response capability (Joint Commission on Accreditation of Healthcare Organizations 2005).

Disaster healthcare coalitions representing stakeholders within the whole community can provide the platform to develop surge plans. The plans can identify strategies to utilize pooled medical resources and define the integration with state and federal plans. A key element to managing medical surge is the seamless coordination of plans across the local, state and federal levels. To rapidly deploy and effectively manage medical surge requires collaboration and efficient planning. Success for managing medical surge is measured by providing the best care for the most patients.

B. PROBLEM STATEMENT

In the immediate aftermath of September 11, 2001, 85 percent of the patients arriving at New York City hospitals sustained minor injuries classified as the walking wounded. Of the rest, 13 percent underwent surgical procedures, with an overall critical mortality rate of 37.5 percent. During disasters, those with minor injuries, often self-evacuate from the scene and arrive at the hospital before the more severely injured can be transported by ambulance. Those with minor injuries are classified as the walking wounded and do not require complex surgical procedures or specialized equipment. In fact, the walking wounded may be moved outside the hospital emergency department to a less acute healthcare setting or to an alternate care site.

Shifting patients to an Alternate Care Site (ACS) leaves available bed space at the hospital for the critically injured arriving by Emergency Medical Services (EMS) ambulances. The time EMS takes on scene to triage and carefully package patients allows self-evacuees to create a bottleneck that limits the hospitals capacity and capability to manage the disaster. Healthcare systems without disaster medical surge plans and without mutual aid agreements can become unable to provide care once overwhelmed.

Healthcare organizations have long recognized that in an emergency situation, institutions and agencies must work with each other and with first responder and public safety organizations and with the public to manage the casualties (Joint Commission on Accreditation of Healthcare Organizations 2005). As the Joint Commission has argued, coordination of emergency healthcare services across a community can lessen the impact of surge on individual facilities. It becomes a difficult task when during a disaster there

are no clearly defined plans for community collaboration and coordination. The reality from lessons of past disaster is that communities will be on their own for the first 24–72 hours before receiving outside assistance. It is therefore important to recognize the causes of medical surge, and build partnerships that can develop plans and include the use of alternate sites for care and methods of care to minimize the impact of disaster medical surge on the healthcare system (Joint Commission on Accreditation of Healthcare Organizations 2005).

C. RESEARCH QUESTIONS

Following are research questions to take into consideration.

- What are alternatives for medical surge management during a disaster?
- How can alternate care sites improve the capacity and/or capability of a healthcare system during a disaster?
- Would using an alternate care site for medical surge, challenge community and healthcare system policies, procedures, practices, and regulations?

D. METHODOLOGY

The research for this thesis involved a review of literature accessed through Internet searches, federal and state Websites, and library holdings of books and journals. Documents related to medical surge, building healthcare capacity and capability, and coordination of state and federal level resources. The intent was to explore disaster response and resource management for the ability to augment local healthcare systems during medical surge. A comparative analysis of the literature was conducted to identify policies, guidelines, plans, and assets that could lessen disaster medical surge on the U.S. healthcare system.

The resources deemed most important to evaluate include the following: the nature of the asset (state or federal), how it becomes activated, the number of personnel, and the type of equipment and supply caches, expected deployment times and special

considerations for using the asset. Each element is examined to determine the rand for alternate methods that could be used to provide medical care during disaster medical surge that exists outside the daily operations of healthcare systems.

E. SIGNIFICANCE OF RESEARCH

The goal of this study is to identify available federal and state assets and implement effective and efficient strategies to increase disaster medical surge capacity and capability in healthcare systems. Planning for, responding to and recovering from medical surge through the effective use of space, stuff and staff improves healthcare organization resiliency.¹ There is no one coordination model that mitigates medical surge rather the analysis shows the need to efficiently and effectively manage and utilize all available resources within a local, regional and federal medical system. The thesis highlights healthcare options, the range of available and needed resources and a list of recommendations for local healthcare systems to manage disaster induced medical surge.

F. ORGANIZATION OF STUDY

Chapter I provides an overview of the research project. Chapter II discusses the relevant literature about disaster resources and assets, response teams, using federal and state government policies and guidelines, and elements related to alternate care site models. Chapter III outlines the methods used in the study. Chapter IV presents the data collected through a comparative analysis. Chapter V provides conclusions and recommendations related to success factors and barriers in current policies and practices for mitigating disaster medical surge.

¹ Healthcare system resiliency refers to the ability of healthcare organizations to survive a hazard impact and rapidly recover compromised services. This ensures that a reliable platform is available to address medical surge needs and minimize any interruption of routine healthcare service delivery.

II. LITERATURE REVIEW

We must create a firm foundation for community medical preparedness. We will increase our efforts to inform citizens and empower communities, buttress our public health infrastructure, and explore options to relieve current pressures on our emergency departments and emergency medical systems so that they retain the flexibility to prepare for and respond to events. (Bush 2007, HSPD 21)

A. HISTORY AND BACKGROUND

1. Introduction

This chapter provides the background that connects existing literature about disaster medical surge response and management to the research questions. The literature in this overall field of inquiry is diverse. The researcher limited the scope by identifying federal and state documents including legislation, guidance, reports, plans, and frameworks to support the inquiry. Included were documents that identified medical assets, response actions, healthcare coalitions, and the use of alternate care sites for medical surge management.

A review of literature can place the existing body of knowledge into the following categories:

- Federal Disaster Medical Planning and Response
- Legislation, Guidance, and Reports
- Medical Assets and Management
- Federal Funding Support
- State Disaster Medical Planning and Response

The research proposes to examine the intersection of these various bodies of information to determine how to best manage state and federal resources when healthcare systems are overwhelmed with disaster medical surge.

2. Federal Disaster Medical Planning and Response

The federal literature provides specific reference to medical surge management. Legislation, guidance and framework documents outline expectations for capabilities to meet the needs of mass casualties. The literature stops short of clearly identifying consequences for non-compliance of the expectations. The result is often poor patient outcomes that indeed would be of consequence to the healthcare system that was unable to acquire the resources to care for a surge of patients.

Much of the federally-enacted guidance is assigned to a specific agency that is accountable to oversee the implementation. It is, however, difficult for federal agencies to have direct oversight of local disaster operations. Failures like in the Katrina response often result in a change of federal leadership at a federal agency. Craig Fugate of FEMA often states, “Failure is not an option.” The concept is certainly commendable for FEMA; however, it does not necessarily equate to seamless coordination across all levels of response down to the individual that needs care following a disaster. To better understand federal response it is prudent to review the documents that have been important to the management of medical surge.

The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), PL 100-707, was signed into law November 23, 1988 and amended the Disaster Relief Act of 1974, PL 93-288. Since its inception, the Stafford Act gives statutory authority for disaster response to the Federal Emergency Management Agency (FEMA). The Stafford Act provides FEMA with the authority to coordinate disaster response on the federal level. FEMA’s mission is to support our citizens and first responders to ensure that as a nation we work together to build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all hazards (U.S. Department of Homeland Security Federal Emergency Management Agency 2013).

In 2002, Congress created the Department of Homeland Security (DHS) and FEMA was placed under DHS. The responsibility for emergency response including the National Disaster Medical System (NDMS) that was transferred from the Department of Health and Human Services (HHS) allows for federal assets assigned to emergency

response to remain available to the states with a disaster declaration. Federal asset response was seen in disasters like Katrina, Joplin Mississippi and during the 2004 Hurricane season in Florida. The responsibility for disaster management lies with the local government as FEMA assets may not be available for the first 24–48 hours of an incident. Coordination of federal assets with the state and local governments provides for a seamless transition of services and resources.

The National Strategy for Homeland Security provides a set of guiding principles called the National Response Framework (NRF). Key to the NRF is the use of National Incident Management System (NIMS) and Incident Command System (ICS) (Federal Emergency Management Agency 2003). This NIMS and ICS is important to all levels of government including private sector partners to ensure the same understanding of the mission while preparing for and responding to disasters.

On February 28, 2003, President George W. Bush signed the Homeland Security Presidential Directive (HSPD) 5, *Management of Domestic Incidents* establishes the National Incident Management System (NIMS). The intent of this directive is to provide a consistent process for Federal, State, and local governments to work cooperatively to prepare for, respond to, and recover from domestic incidents, regardless of cause, size, or complexity.

The NIMS core set of concepts, principles, terminology, and technologies covers the incident command system; multi-agency coordination systems; unified command; training; identification and management of resources (including systems for classifying types of resources); qualifications and certification; and the collections, tracking, and reporting of incident information and incident resources. HSPD 5 creates a single common command structure, and enables the use of a common vernacular across disciplines (Bush 2003 HSPD 5).

The NIMS ICS Emergency Support Function 8 (ESF-8) is the support for health and medical in emergency management. ESF-8 operates on local, state and federal levels for coordination of health and medical resource requests and assignment of missions. ESF-8 working within the NIMS framework links private sector hospitals with state and

federal resources. Emergency managers must be prepared to manage any type of disaster resulting in mass casualties. Preparedness is focused on an all hazards approach.

On December 17, 2003, HSPD 8 established national policies to strengthen the preparedness of the United States (Bush 2003 HSPD 8).

The goal was to prevent, protect against, respond to, and recover from threatened or actual terrorist attacks, major disasters, and other emergencies. It directed the Secretary DHS to develop a national domestic all-hazards preparedness goal in coordination with the heads of other Federal departments and agencies in consultation with State, local, tribal, and territorial governments. HSPD 8 became part of the development of the National Preparedness Guidelines on September 13, 2007, which led to finalizing the National Preparedness Goal. The National Preparedness Guidelines outlines the capabilities and tasks to reach the goal of having a nation prepared for all-hazards and identifies volunteers, citizens and communities to be a part of surge planning (U.S. Department of Homeland Security Federal Emergency Management Agency 2007). As participants in the process, expectations for community preparedness to meet medical surge capacity and capability are outlined on the Target Capabilities List (TCL) and the Universal Task List (UTL). A review of the Target Capabilities List for Medical Surge under the Response Mission identifies three expectations that are relevant to this thesis. They are:

- Plans for the set-up, staffing, and operation of alternate care facilities are in place
- Plan for community based surge hospital bed surge capacity is in place
- A 50-bed nursing subunit—per 50,000 population—can be staffed
- (U.S. Department of Homeland Security Federal Emergency Management Agency 2007).

The Universal Task List (UTL) provides specific measurable tasks toward meeting medical surge capability. A way for communities to evaluate progress without having a real world disaster is to use the Homeland Security Exercise and Evaluation Program (HSEEP) (U.S. Department of Homeland Security Federal Emergency Management Agency 2013), to develop and evaluate medical surge exercises and identify

best practices and areas for improvement. The exercise after action report allows for the development of an improvement plan to identify gaps in training, resources, and plans to ensure the ability to manage medical surge.

Specific to sudden surge and building surge capacity, the CDC has proposed solutions. Hospitals should be able to triage and treat up to 300 patients in the first four hours of an incident by increasing staffing, making available, supplies and equipment, and increasing bed capacity. Personnel and caches should not be expected from federal assets for the first 72 hours following the disaster is specifically referenced, making hospitals to be self-sufficient for three days (U.S. Department of Health and Human Services, Disease Control and Prevention 2007).

The CDC provides plans however does not specifically identify how to access and where to acquire the necessary supplies, staff and staff for medical surge management in a moment's notice. Hospitals may struggle to achieve recommendations for surge without outside assistance. The importance of a benchmark of treating 300 patients is that hospitals and public health may preplan for this type of disaster by soliciting resources through community partnerships. Hospitals and healthcare agencies outside the impacted area may provide staff, augment medical supplies and allow for patient transfers. Pre planning and memoranda of agreement may be an asset to communities trying to meet the CDC guidance.

The Joint Commission for Accreditation of Healthcare Organizations is an independent, not-for-profit organization that accredits more than 20,000 healthcare organizations and programs in the United States (Joint Commission for Accreditation of Healthcare Organizations 2013). There is a myriad of reasons why hospitals choose to become accredited including state requirements, financial, risk management and safety reasons and others for the performance standards that are achieved through the accreditation process (Joint Commission for Accreditation of Healthcare Organizations 2013). The JCAHO process is rigorous and the section for the Environment of Care provides performance standards for emergency preparedness utilizing AHRQ resources to achieve preparedness objectives. To meet the CDC guidelines, becomes problematic for individual hospitals especially those that are utilization driven. This means that

staffing is based on patient census leaving less staff to be immediately available for surge management. In addition, healthcare organizations have moved to a vendor-managed supply chain leaving less medical supplies onsite. The impact of less staff and less supplies causes less capability for surge management.

The JCAHO has written and updated a white paper *Health Care at the Crossroads: Strategies for Creating and Sustaining Community-wide Emergency Preparedness Systems*. It identifies how hospitals and communities must work together to manage catastrophic events (Joint Commission for Accreditation of Healthcare Organizations 2003). Hospitals within large corporate networks have the ability to share staff and supplies within that network. The supplies and staff are moved by a request to a corporate office and may or may not include notification to the local emergency management. Although having the needed resources during a disaster is essential this in-network support may not be part of a community-wide strategy.

Unlike the larger hospitals or hospital systems, it is less likely that rural and non-accredited hospitals will utilize the planning tools and resources to achieve disaster preparedness. In rural communities, free-standing community hospitals, or critical access hospitals, have little surge capability and scant resources and are less likely to plan for medical surge. Rural hospitals often refer medically-complex patients to larger hospitals with specialty care outside their community. This same referral process may apply to disasters when rural communities are faced with a disaster. It is likely that rural hospitals would receive assistance from neighboring communities with larger healthcare infrastructures (Joint Commission for Accreditation of Healthcare Organizations 2003). Hospital networks and rural hospitals may be less inclined to be part of building strategies within the community. A network hospital can access supplies through an internal supply chain and rural hospitals lacking supplies may refer patients outside of their community.

Many hospitals and other healthcare organizations do not yet participate in fully functional healthcare coalitions, which are necessary to CHE response. In an attempt to assess the preparedness of the hospital system, HHS/ASPR commissioned The Center for Biosecurity of UPMC to examine various responses to catastrophic health efforts. The

report *The Next Challenge in Healthcare Preparedness: Catastrophic Health Events* (Center for Biosecurity of UPMC 2010), revealed the following challenges:

- Most existing coalitions do not yet have the ability to share information, resources, and decision making with neighboring coalitions during a CHE.
- There are inadequate systems to perform the necessary triage, immediate treatment, and transport of patients outside of the immediate area stricken by a CHE.
- Existing plans and resources for patient transport are grossly inadequate for moving the expected numbers of patients.
- There is not enough guidance on the crisis standards of care that will be necessary throughout all stages of a CHE.
- There is no plan that sufficiently outlines healthcare roles, responsibilities, and actions during the response to a CHE.

As the literature suggests, community-wide strategies to manage disasters are important and in particular for hospitals to have the necessary resources to manage medical surge. Healthcare stakeholders and community partners can benefit from working within a Disaster Healthcare Coalition. A coalition can provide an organizational framework to engage the whole community for the purpose of developing response plans and accessing shared resources. A coalition can be instrumental for bringing healthcare competitors together to develop plans that will allow state and Federal resources to integrate within the local healthcare system during a disaster. A government-centric approach to emergency management is not enough to meet the challenges posed by a catastrophic incident. Local events require the planning and participation of the entire community (Fugate 2011).

Coalition members can develop mutual aid agreements that allows for resource reallocation and sharing, patient redistribution, and a coordinated utilization of alternate care sites (Courtney, Toner, Waldhorn, Franco, Rambhia, Norwood, Inglesby, and O'Toole 2009). The literature frequently use the terms, mutual aid, coordination, collaboration, communication and coalition, and indicates a need to work together interdisciplinary and across geographical boundaries. At the state and local levels, federal resources are available to deploy and augment response operations under a disaster

declaration and through a request to emergency management. Requests for resources are made for staff or medical teams, medical equipment and supplies, pharmaceuticals and for infrastructure to support patient care. The hierarchy of requests from local to state to federal ensures that each level will expend the available resources prior to moving the request to the next level. This model for requests ensures that resources closest to the incident are used first before those further away are deployed.

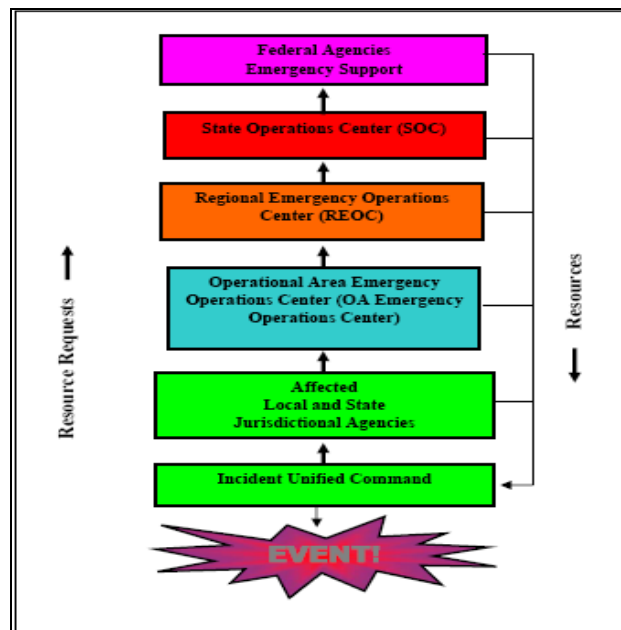


Figure 1. Hierarchy of Requests (From California Department of Public Health Standards and Guidelines for Healthcare Surge during Emergencies Hospital Training Presentation 2008)

3. Medical Assets and Management

Local and regional healthcare systems have a range of federal medical assets that may be available to them. The literature identifies assets that if well-coordinated with local hospitals and community organizations, could augment and support medical surge effectively. The National Disaster Medical System (NDMS), for instance, provides medical services collaboratively with U.S. Public Health Service, the Department of Defense (DOD), the Federal Emergency Management Agency (FEMA), Health and

Human Services (HHS), and the Department of Veterans Affairs (VA) (U.S. Department of Health and Human Services 2013).

The NDMS mission provides medical response, patient evacuation and definitive medical care. The NDMS definitive medical care system concentrates on major metropolitan areas with airports and landing zones to coordinate a nationwide medical mutual aid network utilizing public and private sector assets. The concept was developed from the Civilian Military Contingency Hospital System (CMCHS), which in 1980 was established by the DOD. The idea was to augment military medical capacity and capability without enlarging the hospital system. Instead, the CMCHS solicited the cooperation of civilian hospitals, 100 beds or more to meet the nation's medical requirements during a short-term conventional war or nationally declared emergencies.

The Federal Coordinating Center (FCC) coordinates bed availability with the Armed Services Medical Regulating Office (ASMRO) of NDMS. To prevent a patient from becoming lost in the transfer process, the Federal Coordinating Center (FCC) tracks and distributes disaster patients to healthcare facilities for appropriate treatment, outside the impacted area (U.S. Department of Health and Human Services Assistant Secretary for Preparedness and Response 2012). Patient evacuation under the Department of Defense (DOD) relies on the aero medical resources of the U.S. Air Force and the Civil Reserve Air Fleet (CRAF). The NDMS profile includes 72 Coordinating Centers over 107 geographic areas, and approximately 2,000 hospitals committing 110,605 beds.

The U.S. Army National Guard is another federal asset that can transfer patients from one location to another. This asset has several components to assist with patient movement during medical surge, to decompress a hospital or for evacuation. Air and ground transport assets may include medics and medical teams however much of the National Guard medical personnel is in reserve status meaning there may be a delay for activation. The National Guard has caches of medical supplies that can be deployed to augment community needs. To deploy these assets requires a request through emergency management and will take 24–48 hours to mobilize and some assets will then require assembly.

A federal asset to support the integration of emergency management, health, and medical systems in 124 jurisdictions, with guidance from the Department of Health and Human Services, is the National MMRS Program, located in the Office of Health Affairs under DHS. The MMRS assists with sustainment and enhancement of regionally integrated mass casualty preparedness and response and assists with all hazards planning, training and response for mass casualty incidents. Primarily designed for densely populated jurisdictions, the MMRS provides capacity and capability to improve disaster survivor outcomes. The MMRS can acquire pharmaceuticals and personal protective equipment (PPE) needed for WMD incidents. An MMRS response is a 24-hour period that augments the existing local operational response system (U.S. Department of Homeland Security 2011).

One federal asset, that brings medical supplies and personnel to augment or supplant a healthcare facility that has been destroyed, is the Disaster Medical Assistance Team (DMAT). In Joplin, Mississippi, DMAT teams were able to restore medical services to the community in the parking lot when the hospital was completely destroyed by a tornado. DMAT teams are self-sufficient and can mobilize with supplies to support medical operations for 14 days with 35 member teams (U.S. Department of Health and Human Services Assistant Secretary for Preparedness and Response 2011).

A federal organization that provides support to local units of volunteers to strengthen public health, emergency response and community, is the Medical Reserve Corp (MRC). Credentialed volunteers may provide service within their local jurisdiction, in their home state, or may volunteer to be activated nationally. During a disaster or public health emergency, volunteers accepting a mission are provided with travel orders, mission assignments, and receive information directly related to the deployment. The Secretary of HHS may appoint the MRC volunteers as Intermittent Disaster Response Personnel, to grant legal protections when working within the scope of Federal employment including liability protection, workers' compensation and employment protection. Federal response to large-scale national emergencies can allow for the MRC to integrate with DMAT (U.S. Office of the Surgeon General 2013).

“Uniting communities, preparing the nation” is the motto of the Citizen Corps Program (CCP), which brings together citizens and community leaders to plan and coordinate emergency preparedness. The CCP engages participants with training, exercises, and volunteer opportunities to build awareness for how to prevent, protect/mitigate, prepare for, and respond to disasters. CCP includes all 50 states, the District of Columbia, Puerto Rico, American Samoa, Guam, Northern Mariana Islands, and the U.S. Virgin Islands (U.S. Department of Homeland Security Federal Emergency Management Agency 2013).

A disaster response of the magnitude requiring extended medical management can include a Federal Medical Station (FMS) (U.S. Department of Health and Human Services 2007, 7-20). The FMS is an HHS asset of the CDC, Division of Strategic National Stockpile (DSNS). This deployable healthcare platform delivers large-scale primary healthcare services within 48–96 hours from the time of request to delivery inside the continental U.S. and requires a 12-hour assembly time.

A staff of approximately 100 can treat 250 people for up to three days. The FMS contains beds and medical and pharmaceutical resources. Outside of the main mission, to mass vaccinate or supply antidotes from the Strategic National Stockpile (SNS), an FMS can provide pre-hospital triage and initial stabilization of mass casualty patients. Unlike DMAT teams that arrive with shelters, the FMS requires a 40,000 square foot structurally intact building with utilities and amenities. There must be available food service or a contract, laundry, ice, medical oxygen filling, and biomedical waste disposal. An additional service of the FMS is community outreach provided by a rapidly deployable light strike team-based platform. The strike team deploys with basic medical and pharmaceutical resources in Go Bags to sustain 50 to 100 stable primary care-based ambulatory patients.

4. Federal Funding

There has been an incredible amount of money spent on disaster preparedness in an effort to prepare for, respond to, and recover from all-hazards, natural and man-made, including terrorism. One estimate is that the U.S. Department of Homeland Security has

spent \$791 billion since 2002. During that same time, the U.S. Department of Health and Human Services has awarded more than \$916 million to 50 states, 8 territories and freely associated states, and 4 municipalities; Chicago, Los Angeles New York City, and Washington, D.C., for the purpose of improving preparedness and health outcomes for a wide range of public health threats (U.S. Department of Health and Human Services 2011).

Critics of the spending point to disorganization and a lack of coordination among agencies, between levels, federal, state, local, and with seamless articulation of resources to local communities. In fiscal year 2011, MMRS was allocated \$34,929,932, the Citizen Corps Program (CCP) was allocated \$9,980,000 (U.S. Department of Homeland Security 2011), and more than \$613 million was awarded through the Public Health Emergency Response (PHER) grant program and \$352 million through the Assistant Secretary for Preparedness and Response program (U.S. Department of Health and Human Services 2011).

In the context of medical surge management, there was a significant amount of equipment and supplies purchased, training, and exercising has occurred, and many good intentions toward becoming a prepared community have taken place. However, there is less evidence for the consistency of preparedness across jurisdictional lines and across disciplines. Although the funding has been necessary to support preparedness, it becomes less about the money and more about the continuum of care for the survivors of a catastrophic disaster where medical surge exceeds available resources.

5. State Disaster Medical Planning and Response

In June 2008, the U.S. Government Accountability Office (GAO) presented a report based on a literature review of state emergency preparedness documents and interviews with twenty state emergency preparedness officials. The report identifies four key components related to preparing for medical surge in a mass casualty event: (1) increasing hospital capacity, including beds, workforce, equipment, and supplies; (2) identifying and operating alternate care sites when hospital capacity is overwhelmed; (3)

registering and credentialing volunteer medical professionals; and (4) planning for appropriate altered standards of care in order to save the most lives in a mass casualty event (U.S. Government Accountability Office 2008).

The GAO examined these investments and found that efforts toward increasing hospital capacity, identifying alternate care sites, and registering medical volunteers was successful with more than half of the 50 states having met or were close to meeting the criteria for the five medical-surge-related sentinel indicators for hospital capacity (U.S. Government Accountability Office 2010). The 2008 report specifically identified alternate care sites as a method to increase hospital capacity and deliver medical care away from the hospital for patients who would normally be treated as inpatients. The report suggests patients should be able to sort and determine who needs critical attention and immediate hospital transport, from those with less serious injuries and can wait for medical intervention.

There are two types of alternate care sites—fixed and mobile. Fixed facilities are nonmedical buildings that, because of their size or proximity to a hospital, can be adapted to make non clinical space into a facility to provide medical care. This option for available space is especially important in the first few hours following a disaster when disaster survivors are seeking care. Mobile medical facilities can range from a tent to specialized units with surgical and intensive care capabilities based on tractor-trailer platforms. There a hybrid of the two containing a fully equipped hospital stored in a container system that can be mobilized and set up to treat patients.

A model for building alternate care sites is the Rocky Mountain Regional Care Model for Bioterrorism, developed by a working group representing seven states and federal partners. Although at the time of this research the model is archived, it is still useful and has been adopted in full or in part by states because of its consistent and coordinated response model for developing alternate care sites. The purpose for the group coming together, was as a result of the federal suggestion that a benchmark to provide 500 hospital beds per million population during surge was unachievable for many healthcare systems. Through a collaborative planning process in Federal Region VIII, surge capacity tools and products were developed to manage disaster medical surge away

from the already overwhelmed existing healthcare system (U.S. Department of Health and Human Services Agency for Healthcare Research and Quality 2004). The workgroup suggested that medical caches be stored for use in a fixed location or have the ability to be transported in a trailer to an alternate care site. Three cache levels were developed:

- Level I, Hospital Augmentation Cache (\$20,000)
- Level II, Regional Alternative Care Site Cache (\$100,000)
- Level III, Comprehensive Alternative Care Site List

Pharmaceuticals are not included in the caches, but are available through the Strategic National Stockpile (SNS). Deployable oxygen solutions were discussed as a separate issue and tabled in discussion due to the complexity and cost of oxygen storage. Each cache list does not include a facility though cots and other supplies are available to move into a designated hospital or any alternate care site. States may choose to pre-designate physical space to host an ACS and the Alternative Medical Care Selection Matrix provides a model for choosing an appropriate site.

Another way states have planned is through an agreement with the Emergency Management Assistance Compact. EMAC is a national interstate mutual aid compact which allows states to share resources during a disaster. EMAC is administered by the National Emergency Management Association (NEMA) and was ratified by Congress and law in all 50 states and some U.S. territories. The EMAC provides medical assistance, supplies, equipment, and personnel as a complement to the federal disaster response system when requested through emergency management. There are fifteen states that are developing Mission Ready Packages that are a way to asset type resources for response and recovery. MRPs related to the topic of disaster medical care are for emergency medical transport, acute surgical and trauma care and emergency and critical care. There are other MRPs for mass care, search, and rescue (National Emergency Management Association Emergency Medical Assistance Compact 2012).

EMAC used either in lieu of or in conjunction with federal assistance, provides for a flow of needed goods and services from one state or states to support resource

needs of the disaster impacted state. EMAC provides another venue for mitigating resource deficiencies by ensuring maximum use of all available resources within its member states inventories.

There are many variables when caring for patients during a disaster, especially when the disaster has the potential to overwhelm a healthcare system or community. Relevant to medical surge is having the resources where needed to support an increased number of patients arriving to the hospital simultaneously. A review of the literature shows most states have resources to respond to disasters specifically for the management of medical surge. Florida and California became smart examples by having robust plans and frameworks for preparedness and response, and by having fixed and mobile medical assets. These states have responded to natural disasters and have made an effort to meet federal priorities and NIMS compliance. To support the notion of rapid response, there are identified and dedicated assets like medical assistance teams, medical volunteers, alternate care sites, pharmaceuticals, and equipment and supply caches that can become available by request or by pre-existing automatic aid agreements to a disaster impacted area.

On the West coast of the U.S., California is the third-largest state geographically, and has a population of 38.04 million in 58 counties. In 2010, California was the number one travel destination in the U.S. There are over 40 U.S. military bases and installations, with over 212,000 military personnel. Wildfires, hurricanes, and earthquakes have been some of the natural disasters experienced by California.

In California, disaster management plans link local, state, and federal resources together to efficiently move patients from an incident scene through medical care and repatriation. The plan is reflective of the commitment of California to rapidly provide assets to augment local response and provide sustained support for disaster medical operations (California Emergency Medical Services Authority 2007).

On the East coast of the U.S., Florida has 67 counties, 19 million residents, and 87.3 million annual visitors. Florida has a strong military presence at over twenty bases and stations, and is host to the United States Central Command, and the United States

Southern Command. Federal assets are staged in Florida including pharmaceutical antidotes and the more metropolitan areas of Florida have MMRS, response teams, trauma centers and caches of medical supplies and equipment. Florida has experienced, and responded to, disasters like hurricanes, flooding, and wildfires.

Florida utilizes the State Comprehensive Emergency Management Plan, with the ESF-8 appendix, to identify responsibilities for health and medical response with the State Emergency Response Team (Florida Division of Emergency Management 2012). The FDOH Emergency Operations Plan provides the framework for response and recovery from disasters (Florida Department of Health 2011).

States like Florida and California have embedded federal resources like DMAT, the MRC, Citizen Corp, and MMRS. In addition, there are state assets like medical response teams and mobile field hospitals purchased with federal funding. The state coordination of resources can pre-position or enact MOUs that can lessen the disaster response time. Federal response, unless the assets are in the state, take time to deploy once a Presidential Declaration is executed. Consideration for the time it takes for responders to accept the mission, travel, and arrive at the requestor's location, leaves states having to fill the gaps between local needs and federal intervention. A disaster that impacts roads, airports, or is of the magnitude to destroy infrastructure, causes an increased delay in response. States and local jurisdictions may be responsible for managing medical surge for several days following a disaster.

B. CONCLUSION

The literature shows a commitment for preparing for catastrophic disasters by staging federal and state resources to rapidly respond to and support local communities. The importance of integrated medical disaster response in the U.S. is essential so as not to lose precious time with accessing and deploying resources to treat disaster survivors. Coordination of resources is accomplished by states and federal mechanisms; unfortunately, there is little that can be done to ensure that every community has an unlimited amount of medical resources when needed. Funding for preparedness has been robust; however, as time has passed, the funding has been declining. As healthcare

organizations, communities and states struggle to sustain the training, exercises and equipment maintenance and supply restock, strategies to manage medical surge must be enhanced. The need to do the best with less will be the prevailing message.

The various federal guidelines, reports, policies and models identify commitment toward providing care when surge impacts a community and shows how assets can move from the state and federal government to augment or supplant overwhelmed healthcare infrastructure. Although there are resources available to deploy from state and federal levels, the responsibility for managing surge within the first hours to days is placed onto the local community and healthcare facilities. Two states, California and Florida, show promise by their commitment for having a response system and medical assets available to manage medical surge during disasters. The federal, state, and local levels are making strides to provide the right stuff at the right place at the right time to effectively and efficiently to provide care that will be the best care for the most patients.

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III. METHODOLOGY

A. INTRODUCTION

The goal of this thesis is to identify models, frameworks and medical assets and resources that can lessen the impact of medical surge upon a community during a disaster. At a moment's notice, local resources can be rapidly depleted as the healthcare system becomes overwhelmed when caring for multiple casualties. The need to manage scarce resources, access available resources, and deliver medical care, becomes the responsibility of the whole community not just the impacted hospital or medical facility. An understanding of the strategies for how federal and state assets can augment local community disaster response can provide a model of smart practices for the management of medical surge.

B. LITERATURE

The literature used in this thesis includes federal publications and reports, journal articles, operational plans, guidance, and framework documents, and was obtained from Internet searches, federal and state documents, and library holdings, including books and journal articles. Twelve state models were assessed for available guidance and resources for medical surge management.

C. EVALUATION OF THE LITERATURE

The evaluation of the literature was a two-phase process. Phase one was to gather federal and state literature related to management of medical surge and review for definitions, policies, recommendations and strategies. Phase two took the plans, strategies and policies from States that had sufficient literature to identify assets useful for medical surge management. The researcher chose California and Florida. A future researcher may consider a comparative analysis of other states not included in this research.

The literature was sorted and compiled into two categories.

- Federal
- State (California, Florida)

The sample could conceivably include all 50 states and U.S. territories, which would be difficult to analyze for this purpose. After review of the existing literature, the researcher chose to manage the sample size by choosing two states for the comparative analysis. The states of California and Florida were chosen for the following reasons:

- Large healthcare networks exist.
- Disasters have impacted and have been managed in the state.
- State level resources and plans, frameworks and strategies are robust.
- Federal resources are co-located in the state.
- The states are located on different coasts of the U.S.

Federal assets were chosen based upon the literature for their availability and the capability to either directly respond to or indirectly coordinate the management of disaster medical surge. The Federal resources with medical responsibilities identified are:

- Disaster Medical Assistance Team
- Metropolitan Medical Response System
- Federal Medical Stations
- Medical Reserve Corp
- Army National Guard
- Federal Coordinating Centers
- Community Emergency Response Team and Citizen Corp Program

D. METHOD

This thesis will use a comparative analysis with the goal of identifying available resources in California, Florida, and at the federal level for the management of medical surge. Once the resources are identified, they will then be analyzed for their effectiveness for managing disaster medical surge at the local level.

The comparative analysis process will be instrumental for developing recommendations for resources that may best integrate with local healthcare infrastructures. The analysis will attempt to clarify available resources and how best to integrate those resources in a timely manner when significant medical resources and interventions are needed at the local level.

The researcher will identify resources that individually or collectively can manage surge in an effective and efficient manner. Once the resources are accessed, they will be compiled for preparing recommendations and drawing conclusions for managing medical surge.

The following resources for managing disaster medical surge will be evaluated and compared to identify the best utilization.

- The source or level from where the resource will deploy from, federal, state, military or local.
- Response Time—the time it takes for the asset to ready, deploy and accept the first disaster survivor.
- Cache—(Stuff) the equipment and supplies available
- Staffing-(Staff) the number of people or medical professionals available to deploy
- Mission Served—describes how the asset will or can be utilized
- Special Considerations—to identify anything that is required for the asset to be used
- Fixed or Deployable—(Space) those assets which can move or may be used at a predetermined site to add capacity to the existing healthcare system.
- Number Available—identifies how many are available to be used to mitigate disaster medical surge in totality.

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IV. COMPARATIVE ANALYSIS AND FINDINGS

A. BACKGROUND

The Department of Homeland Security will consolidate federal response plans and build a national system for incident management in cooperation with state and local government. (U.S. Department of Homeland Security, Office of Homeland Security 2002)

The FEMA Administrator, Craig Fugate provided testimony before the U.S. House of Representatives.

An incident of catastrophic proportions has the potential to imperil thousands of people, devastate hundreds of communities, and produce far-reaching economic and social effects. The scope of needs will be large, immediate, novel, and profound, and the entire national emergency management, public health, security, law enforcement, critical infrastructure, medical, and all other components that make up community must be prepared to respond, and respond in ways that lie outside the normal paradigms in which we traditionally operate. (Fugate 2009)

Nearly 5,000 emergency departments (EDs) exist in the United States and provide care for patients with emergency medical conditions 24 hours a day, and 365 days a year (Derlet and Richards 2002). Annually, visits to the EDs have increased from 90.3 million in 1993 to 113.9 million in 2003 (Institute of Medicine Committee 2006). In 2002, a representative survey commissioned by the American Hospital Association, showed that many EDs are overwhelmed by the number of patients needing their services, with 62 percent of the nation's EDs reporting being "at" or "over" operating capacity (American Hospital Association 2002).

Disasters causing multiple casualties are frequent. The injured seek medical care from hospitals and healthcare facilities in close proximity to the disaster. Those less injured often self-evacuate the scene and arrive at the hospital before EMS completes triage and packages the injured patients for transport. The self-evacuees at the hospital create a bottleneck for space and an increased demand for scarce resources that would best serve the more critically injured. Once EMS with the more severely injured arrives, there is less space and fewer resources. The impact of a disaster can be

overwhelming to a healthcare system already challenged for resources on a daily basis. The Centers for Disease Control has developed a predictor based on time for arriving casualties to the emergency department following a disaster.

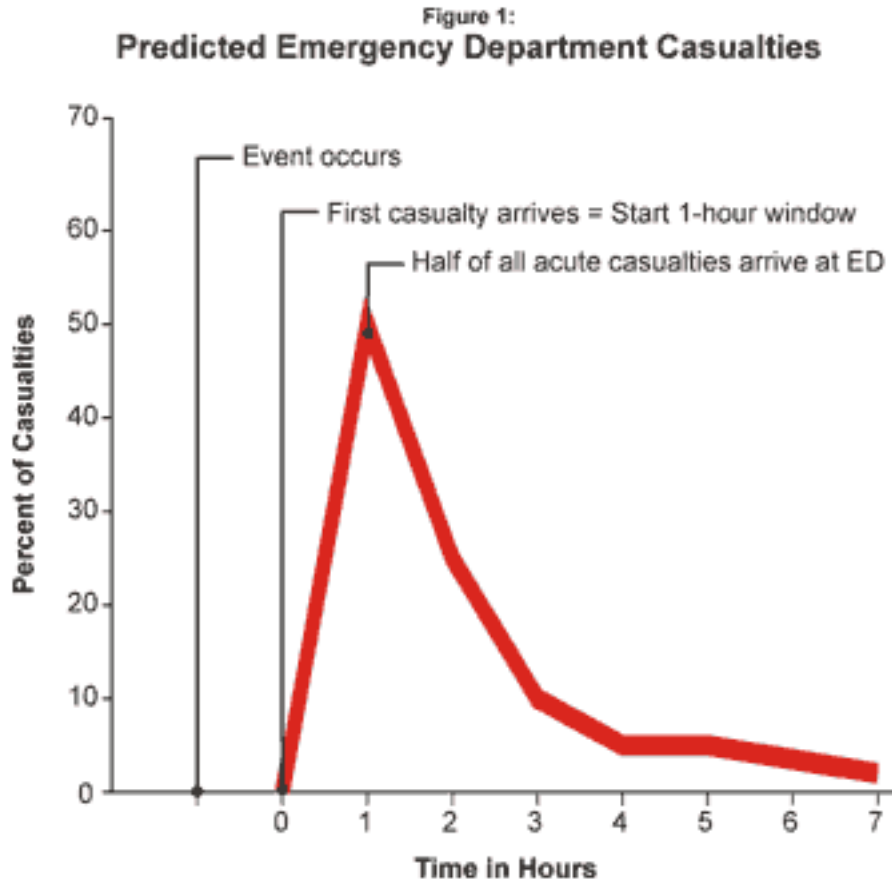


Figure 2. CDC Mass Casualty Predictor (From Centers for Disease Control and Prevention, Emergency Preparedness and Response 2003)

The total number of casualties that will present to the hospital from a disaster can be calculated by doubling the number arriving in the first hour (Centers for Disease Control and Prevention, Emergency Preparedness and Response 2003). The advantage of predicting the total number of casualties is that the facility can anticipate necessary

resources or initiate MOUs to transfer patients or request resources. The average time for patients to be admitted or discharged following a disaster is about six hours from arrival. This time indicates an extended impact on the facility.

Retrospective review of previous disasters has shaped plans, legislation, guidelines, and collaborative agreements on the federal, state, and local levels. The need to increase capacity and capability of healthcare infrastructure and services may be mitigated by community coordination, which will provide timely deployment by pooling of resources. Having the resources when and where they are needed in the right amount at the right time can make the difference between life and death for disaster survivors. Recommendations from the report *The Next Challenge in Healthcare Preparedness: Catastrophic Health Events*, identifies the funding and preparedness efforts that need to be in place at the federal, state, and community levels (Center for Biosecurity UPMC 2010).

B. FEDERAL GUIDANCE AND RESPONSE

Through the Departments of Health and Human Services, Homeland Security, the federal government, and the Centers for Disease Control, and the White House has developed guidance for managing medical surge. This guidance includes National Strategies, Presidential Directives, Acts, guidelines, frameworks, and task lists. In 2002, when Congress created the Department of Homeland Security (DHS), emergency response, including the National Disaster Medical System (NDMS), was placed under the Federal Emergency Management Administration (FEMA). The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) establishes structure and coordination for a declared emergency to deliver assistance and emphasizes the use of state and local resources first (U.S. Department of Homeland Security 2013).

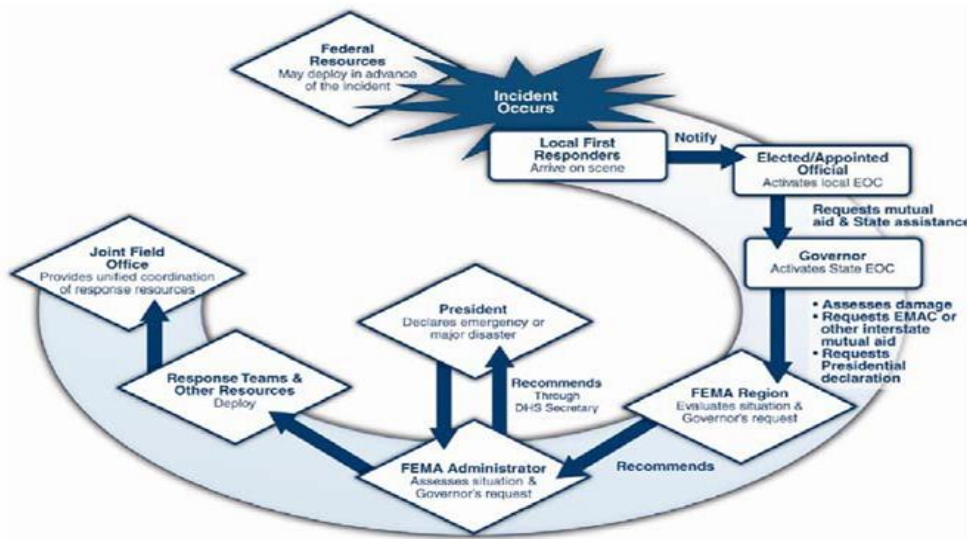


Figure 3. Overview of Stafford Act Support to the States (From U.S. Department of Homeland Security Federal Emergency Management Agency 2008)

Under the Stafford Act, an emergency presidential declaration will make federal assistance available by the request of the Governor of the impacted state. Federal assets are intended to support, not supplant, state, tribal, and jurisdictional response efforts. The National Response Framework provides a systematic process for requesting assistance.

In an attempt to ensure that ESF-8 at local, state and federal levels work together, the Public Health and Medical appendix to the National Response Framework identifies how Federal departments will ensure a timely response once a Presidential declaration is activated. Federal departments, agencies and organizations assigned primary or supporting ESF responsibilities implement those responsibilities. Incident-specific resources and capabilities, teams, medical equipment and supplies, shelters and pharmaceutical caches are activated and prepared for deployment to a National Logistical Staging Area (LSA) near the incident site. The LSA prioritizes and moves resources to where they will be best utilized to establish alternate care sites or to augment or replace healthcare infrastructure or to where the resources will best be utilized.

Homeland Security Presidential Directives provide federal agencies with direction to support states. HSPD 5, established the National Incident Management System (NIMS), a consistent interoperable and compatible nationwide system for federal, state,

and local governments for effective and efficient integration to prepare for, respond to, and recover from domestic incidents, regardless of cause, size, or complexity (Bush HSPD 5 2003).

A command system similar to NIMS is the Hospital Incident Command System (HICS). Both command systems allow for coordination across organizations and jurisdictions (U.S. Department of Homeland Security Federal Emergency Management Agency 2008). HICS allows hospitals to manage surge events internally or externally and provides a process for initiating command and control with language familiar to healthcare personnel (U.S. Department of Homeland Security Federal Emergency Management Agency 2008).

HSPD 8 in 2007 became part of the development of the National Preparedness Guidelines which led to finalizing the National Preparedness Goal. The National Preparedness Guidelines outline capabilities and tasks to reach the goal of having a nation prepared for all-hazards. It identifies volunteers, citizens, and communities to be part of surge planning (U.S. Department of Homeland Security Federal Emergency Management Agency 2007). Expectations for community preparedness to meet medical surge capacity and capability are outlined on the Target Capabilities List (TCL) and the Universal Task List (UTL). Under the Response Mission, the Target Capabilities List for Medical Surge identifies three expectations that are relevant to this thesis. They are:

- Plans for the set-up, staffing, and operation of alternate care facilities are in place
- Plan for community based surge hospital bed surge capacity is in place
- A 50-bed nursing subunit—per 50,000 population—can be staffed (U.S. Department of Homeland Security Federal Emergency Management Agency 2007).

Like DHS, HHS has a Concept of Operations Plan (CONOPS) for a unified approach to all mitigation, preparedness, response, and recovery activities (U.S. Department of Health and Human Services Assistant Secretary for Preparedness and Response 2013).

The coordination of Federal-level assets, for Bioterrorism and Mass Casualty Care, to support and augment state and local medical and public health response is outlined in HSPD-10. For mass casualty incidents requiring parallel deployment of multiple agencies, the Department of Homeland Security coordinates the overall Federal response in accordance with its statutory authorities for domestic incident management (Bush HSPD 10 2004).

Two sections of HSPD 21, October 2007, that are specific to this research—Mass Casualty Care and Disaster Health System—engage all levels of government, jurisdictions, and disciplines, private sector, academia, and other nongovernmental entities in preparedness and response efforts (Bush HSPD 21 2007). The use of the DHS and HHS documents are intended to identify levels of all hazards preparedness. Coordination however, is left to individual states and local healthcare infrastructures to ensure adequate levels of preparedness to make a difference for all hazards.

The Emergency Management Assistance Compact (EMAC), provides medical assistance, supplies, equipment, and personnel, and ensures the maximum use of all available resources within its member states inventories (U.S. Department of Homeland Security Federal Emergency Management Agency EMAC N.D). The EMAC administered by the National Emergency Management Association (NEMA) was ratified by Congress in 1996. An annex to the EMAC is the interstate mutual aid compact based on FEMA regions with the goal of receiving interstate assistance within twelve hours of request (U.S. House of Representatives 2007). The EMAC and IMAC is an important part of moving resources into the impacted area from neighboring states.

The National Disaster Management System (NDMS) has provided medical support since 1984 to federal, state, local, and private healthcare partners during disasters. NDMS support includes mobilizing DMAT teams, FCCs and MMRS. Through the Federal Coordinating Center (FCC), disaster survivors are distributed to hospitals and healthcare facilities away from the impacted community. The concept was developed from the 1980 DOD Civilian Military Contingency Hospital System (CMCHS) model. The idea was to augment military medical capacity and capabilities without having to enlarge the hospital system. Instead, the CMCHS solicited the cooperation of civilian

hospitals to meet the nation's medical surge requirements during a short-term conventional war or during a nationally declared emergency. Hospitals with at least 100 beds and are willing to accept disaster patients enter into an agreement with NDMS. These agreements allow for reimbursement to the hospitals for participation.

The Metropolitan Medical Response System (MMRS) is a national program in the Office of Health Affairs under DHS. The MMRS supports the integration of emergency management, health, and medical systems in 124 jurisdictions with guidance from the Department of Health and Human Services. The MMRS assists stakeholders within a region to integrate mass casualty preparedness and response plans and mass casualty incident response. The difference between NDMS and MMRS is that NDMS provides DMAT teams, transportation, and definitive medical care and MMRS provides coordination of medical resources in metropolitan areas like Tampa and Miami in Florida, and five cities in California.

The ten national disaster planning regions use Regional Emergency Coordinators (REC) to develop high level emergency preparedness plans and to coordinate response activities (U.S. Department of Health and Human Services, Assistant Secretary for Preparedness and Response 2011). The role of the REC is to build relationships to plan with federal, state, local, tribal, and territorial officials, and healthcare partners and stakeholders for effective federal emergency response activities. This is accomplished by cross-discipline integration among public health, medical, and emergency management partners; providing situational awareness to headquarters; responding to events and providing command and control for deployed resources and assets; and providing exercise support to stakeholders (U.S. Department of Health and Human Services Assistant Secretary for Preparedness and Response 2013). When a disaster occurs, the REC will lead the Incident Response Coordination Team comprised of the NDMS members and Federal public health staff, who act as the first responders to the incident.

Through a presidential declaration, resources like DMAT and MRC units and caches of equipment, supplies, and pharmaceuticals are pre-positioned across the U.S. (Redlener, Grant, Berman, Johnson, and Abramson 2006). Federal planning has focused on timely coordination of resources to reach the level of preparedness that can manage

disaster medical surge. Often times, coordination of resources for medical surge in the first hours is left to the state and the local healthcare infrastructure. The Institute of Medicine concludes that Emergency Departments are not prepared to handle surge from terrorist attacks and other incidents (Institute of Medicine Committee 2006). The reliance on federal resources to manage medical surge is short sighted and coordination among local stakeholders is essential for saving lives. The development of site-specific catastrophic incident response strategies includes pre-identifying resource requirements and corresponding deployment strategies to accelerate the timely provision of critical capabilities (U.S. Department of Homeland Security Federal Emergency Management Agency 2008). Healthcare facilities, including VA hospitals, must prioritize resources and consider postponing elective surgeries and redirecting staff to manage medical surge during disasters.

1. Response Teams

Federal funding supports DMAT and MRC, and states have used these models to develop State Medical Response Teams. The state teams are a resource for rapid deployment when there is no emergency declaration. These state or regional teams can fill the role of providing medical care when local assets are overwhelmed. State Medical Response teams modeled after DMATs provide local and regional response to impacted healthcare facilities and can integrate with MRC and DMAT teams should the disaster persist. Local healthcare communities can collectively develop a self-sufficiency plan including the development medical response teams to assist in the management of medical surge.

DMAT and MRC have credentialed medical personnel that are trained, background checked and equipped to mobilize to support local staffing shortages and provide backfill for staff who may be directly impacted by a disaster. The teams respond to a mission request under a disaster declaration and are provided sovereign immunity protections and job protection when deployed.

DMAT teams are typed according to capability and time to deploy. A Type I DMAT activated for two weeks, can be fully deployable within eight hours of

notification and is self-sufficient for 72 hours. These teams are equipped to treat up to 250 patients per day. Level II teams are not required to be self-sufficient and may be deployed to augment local resources or supplement a Level I DMAT team.

A deployable US Air Force military asset to support civilian disasters is the small portable expeditionary aero medical rapid response (SPEARR) team with eight medical personnel with medical supply backpacks. The team becomes complete with the addition of a trailer with a shelter, equipment, and supplies. (Skelton, Droege, and Carlisle 2003)

2. Surge Space

Hospitals have leveraged federal funding to increase clinical surge space by utilizing non-clinical space like cafeterias, training rooms, or tents and shelters. The benchmark for surge is to increase capacity by twenty percent of the licensed bed count. The action of moving and redirecting non critical patients away from the emergency department leaves space for the more severely injured. Some communities have explored the use of “facilities of opportunity” including the use of dark stores, concert venues and schools and medical facilities designed for another purpose (Joint Commission for Accreditation of Healthcare Organizations 2005). A surge option is to establish agreements with federal medical facilities like the Veterans Administration (VA) that has 1,384 medical facilities—90 percent of which are clinics or hospitals—located throughout the U.S. The connectivity of communities with the VA federal assets can improve the level of planning and response and provides additional surge resources.

When medical surge is sustained or when a facility is destroyed, assets are needed to provide health services through to the recovery phase of the disaster. Most states with mobile assets have strategically stored those assets across the State for a quick response within a few hours. Using canopies, tents, and modular systems, provide an option for surge space; however, some states have purchased more complex systems. States including CA and FL have purchased tractor trailer based 53-foot mobile hospitals that can care for up to fifty patients simultaneously.

Another surge option is the EMEDS, a flexible lightweight, rapidly deployable medical-delivery system. The basic EMEDS package has supplies and equipment is used

by fifteen personnel in two shelters. The EMEDS 10 package contains 31 persons, 3 more shelters, and 10 inpatient beds. EMEDS 25 package contains 30 persons, 3 more shelters, and 15 inpatient beds. The EMEDS capability can continue to expand with additional ten-bed packages or specialty sets.

The USNS Mercy (T-AH 19) and the USNS Comfort (T-AH20) are two naval hospital ships for use in civilian missions, when significant devastation is long lasting or the healthcare infrastructure is destroyed as in Hurricane Katrina. These ships can be staffed with 1,200 naval medical personnel and contain 12 fully-equipped operating rooms, a 1,000-bed hospital facility, digital radiological services, a medical laboratory, a pharmacy, an optometry lab, a CT-scan, and two oxygen-producing plants. Each ship is equipped with a helicopter deck capable of landing large military helicopters and has side ports to take on patients at sea. The ships are docked in Baltimore, Maryland, and San Diego, California, and with crew, can be activated within five days. This asset may be a planning consideration in California and Florida because of the coastlines and access to ports.

Some alternate care site models have been referred to as Mobile Army Surgical Hospital (MASH) units. A civilian version of the mobile tent hospital, it can provide care to patients of less severity and is usually much smaller in size. The military can act with precision to treat, transport and deliver extended care to soldiers which can be mimicked for civilian disasters. The logistical planning for deployment includes teams, mobile hospitals, and caches of equipment ready to deploy at a moment's notice

3. Equipment and Supplies

Medical caches of containerized pharmaceuticals, equipment and supplies, and shelters for surge can be deployed with or without specialty teams. The availability and access to these caches is an important aspect for achieving increased capability. Most are stored in large warehouses where logistics personnel assure the readiness for deployment. Caches under federal and some state control are pre-positioned in geographic locations to facilitate rapid deployment. The types of equipment and supplies matched with medical response teams can maximize positive patient outcomes.

Cache storage at the local level may take advantage of partnerships within the healthcare system in facilities that have space. A consideration may be for local communities to enter into agreements with a vendor management system or rental company to make shelters available when needed thus alleviating local storage space for these larger items.

Mobilization of caches requires trucks, trailers, pallets and in some cases planes to move these items into a disaster impacted community. The storage of supplies, in a climate controlled environment to prevent degradation, is costly. A plan to rotate medical supplies within the healthcare system will minimize the disposal of expired supplies. A vendor managed supply system contract is an option to keep supplies rotated. Maintenance and calibration of medical equipment is also costly. Similarly, maintenance contracts with a vendor or an agreement with a biomedical provider may be an option. Funding for sustainment of equipment and supplies becomes the responsibility of the cache manager and must be considered when committing to a cache.

C. HEALTHCARE SYSTEM SUPPORT

Triage is the process of sorting patients according to severity of injury. As patients are sorted the less injured may be treated and stabilized at the lowest possible level. Expansion of a healthcare infrastructure can be accomplished by having a contract to utilize the available resources in the most efficient and effective manner if community healthcare partners collaborate and plan together to route patients to the most appropriate facility for care. This practice would move surge from the closest impacted hospital to another less impacted hospital or alternate care site therefore distributing patients more equally throughout the healthcare system.

Developing a community-wide coordinated disaster response system is a challenge though some local jurisdictions have worked together to develop plans for disaster medical surge management. The lack of local coordination makes integration with state and federal resources difficult during disasters. An unplanned response is often reactive not proactive and risks the opportunity to fully utilize all available resources. Significant collaboration, communication, and trust are necessary to fully

coordinate a plan to utilize all community resources. Hospitals have worked together in non-disaster times to develop agreements for patient transfers. As patients are transferred there may be staff that moves with them. Credentialing of staff to work inter-facility may be a piece of these agreements.

The Assistant Secretary for Preparedness and Response funding has provided preparedness funding to hospitals to purchase equipment, train staff and conduct exercises. Part of the grant guidance to build community resiliency identifies hospitals and public health working together to provide outreach to other healthcare organizations and first responders to develop disaster healthcare coalitions. This model of building strong community relationships while preparing for the worst enables communities to measure capacity and capability and know what to expect before requesting support from state or federal agencies. California and Florida have areas within the states that have strong disaster healthcare coalition involvement and supporting agreements to share resources.

D. STATE PLANNING AND RESPONSE

1. California Plans

California has an Emergency Operations Manual developed cooperatively by CDPH, EMSA and CalEMA and coordinates medical and health resources to provide response support. Prior to 2011, EOMs gave the authority and direction for resource deployment to the six regions the OA and the individual entities to best meet disaster needs. The change moves the focus from individual entities to collective resource and response support (California Department of Public Health and Emergency Medical Services Authority 2011).

California coordinates disaster response at the local level by using designated Operational Areas (OA). In each OA, geographical and political area, there is an appointed Operational Area Disaster Medical and Health Coordinator (OADMHC) responsible for health and medical response. There are six mutual-aid regions with a Regional Disaster Medical and Health Coordinator (RDMHC) to support resource requests from the OADMHC. This coordination allows information to be shared and

resources to be moved from unaffected areas into the impacted area. In addition, medical personnel and teams and medical vendors and private partnerships can be used to obtain the necessary resources (California Department of Public Health and Emergency Medical Services Authority 2011).

Specific to sharing resources is the Master Mutual Aid Agreement (MMAA). The entities that sign the MMAA agreement become obligated to develop a plan that provides aid and includes mobilization of resources without the expectation for reimbursement. The advantage is that the agreement becomes reciprocal should an entity need disaster assistance. There is however no expectation for any entity to provide mutual aid that will completely deplete facility resources or space. California has emergency assistance agreements in addition to the MMAA. The emergency assistance agreements promote public and private collaboration for resources. These agreements can be less formal and allow for customization for providing specific resources or services between agencies and organizations (California Department of Public Health and Emergency Medical Services Authority 2011).

A five-level color system defines criteria for surge as green indicating no surge on the local healthcare system, and is fully operational to black. Local jurisdiction is not capable of meeting the demand and requires a local state of emergency declaration. Beyond the local criteria, there is a regional surge level requiring a State Emergency Declaration and a statewide surge level that requires a Federal Emergency Declaration. The *California Department of Public Health Standards and Guidelines for Healthcare Surge During Emergencies: Volume 1* gives hospitals and other healthcare facilities definitions, actions and expectations for managing medical surge (California Department of Public Health 2008) There are companion operational tools, manuals, and training guides with comprehensive information that is shared statewide with stakeholders. A priority for California EOM is training for all six mutual aid regions. Training by Public Health and EMA allows each region to share their surge plans and learn how to integrate the regional plans.

Statewide exercises in California are complex and involve many disciplines and the use of public and private resources, military response, state teams and caches of equipment and supplies. The exercises are used to validate notification and response systems and measure the integration of resources as written in the EOM. As exercises are evaluated and improvement plans are completed, California makes changes to improve the integration of resources among agencies. California's plan to quickly identify surge and take action to move resources to hospitals is supported by the location of medical caches and the expectations for medical response teams deployment. At the time of this research, California was planning an exercise to mobilize, deploy, and exercise two forty-bed alternate care sites with medical caches using the DMAT and other disaster volunteers.

2. California Response

There are many assets located across California that are dedicated to manage medical surge. Mission Support Teams (MST) coordinated through Emergency Medical Services Authority (EMSA) use the incident command structure to deploy Mobile Medical Assets (MMA). Team members are trained personnel that originate from local response agencies. Deployable assets include Ambulance Strike Teams (AST), Disaster Medical Response Units (DMSU), Medical Assistance Teams (Cal-MATs), Disaster Healthcare Volunteers (DHV), and Mobile Field Hospitals (MFH). The assets move into an impacted area and provide medical support for large mass casualty incidents.

Actual numbers in the literature vary; however, it is estimated that there are over thirty DMSUs that provide ASTs, and have three 40-person medical assistance teams at the ready for disaster response. Guidelines for EMS field treatment are being developed by EMSA and will be coordinated with ACS and medical shelter guidelines. There are five DMAT teams listed by EMSA, each with 100 or more members. Deployment of 35–50 members provides medical and health care services. The DMAT teams have been essential for supporting ACS operations.

Support teams in California include forty two Medical Reserve Corps with 7,000 members and a total of 20,000 registered disaster healthcare volunteers (DHV) across the State. The DHV system is divided into a Northern and Southern California division, with four local units in each division. The DHV is in the process of modification to reflect each unit as part of CAL-MAT deployment and mission management. Credentialed volunteers are an important part of medical response and are utilized to fill gaps in staffing.

The volunteer response common operational framework is outlined in the *DHV Deployment Operations Manual* operations manual and identifies management, credentialing and deployment of volunteers between operational areas. The use of guidelines and checklists provides consistency for using medical volunteers for medical surge response (California Emergency Medical Services Authority 2012). The MRC, through private sponsorships and disaster relief organization support, provides volunteers with basic life support supply backpacks used for mass casualty incidents. Three standardized equipment caches for CAL-MAT supports small specialty team deployments.

In 2006, California purchased three mobile field hospitals that include vendor support for maintenance and deployment. Each hospital has 200 beds, and is strategically located in California to facilitate a timely response. In an effort to support the mobile field hospitals a site selection tool is used to identify sites that would accommodate a MFH. Currently, there are eighty MFH sites identified.

In the event that patients need to be moved from the disaster impacted area to an un-impacted area, there is a Statewide Patient Movement Plan under development with input from UASI and the California National Guard. Patient movement requires significant resources and coordination. Developing a plan provides a framework and identifies resources to effectively move patients. One method to manage surge is to move patients to non-surged hospitals. The movement of patients within the first hours to days is the Ambulance Strike Teams/Medical Task Forces (AST/MTF). An AST Type I ALS and Type II BLS, consists of five ambulances, with two medical personnel, and one strike team leader in a separate response vehicle. Each AST is self-sufficient for 72 hours, and

can provide immediate local EMS integration to evacuate, respond to an incident or move patients during a disaster. An MTF as a mixed group of resources for example, Type I and Type II ambulances can together make up the five ambulance compliment and become a response asset. The AST can also provide longer term resources for medical and health support as needed. This asset has training for personnel, includes a task book for completion to become eligible to deploy. An operational manual and MOUs for AST deployment is available.

3. Florida Plans

Florida Chapter 943.0313 F.S. identifies the Florida Domestic Security Oversight Council (DSOC) as the structure and organization for state preparedness and response to terrorism and other naturally occurring disasters. The DSOC is responsible for planning and coordination among state agencies. The structure provides state-level leadership for prioritizing emergency preparedness and response projects and expenditures. Shortly after 9/11, the state developed seven domestic security regions to manage and share information and intelligence in the state. These seven Regional Domestic Security Task Force (RDSTF) regions are able to collaborate by a multidisciplinary task force structure under Florida Chapter 943.0312 F.S. The seven RDSTF regions meet at least quarterly to share information, identify needs and initiate projects that are relevant to domestic security in their region. Health and medical business of a region is often conducted through a sub-committee of the RDSTF (Florida Department of Law Enforcement 2013).

Florida Chapter 252 F.S. identifies the Florida Department of Health Emergency Coordination Officer responsible for coordination of health and medical preparedness activities. The State CEMP ESF-8 annex identifies Health and Medical Services. Between 2001–2006, Florida received the maximum amount of federal bio-terrorism funds available through CDC, DHS, and HRSA, totaling \$334,156,294 (Office of Program Policy Analysis and Government Accountability 2007). Expenditures improved lab capacity, delivered training and exercises, hired public health staff, and bought equipment and supplies. Over \$14 million was spent on building regional surge capacity.

The Florida Department of Health uses a strategic planning process to develop a two year plan to address six goals and twenty one objectives to meet national and state domestic security priorities for minimizing loss of life, illness and injury from natural and man-made disasters. The plan is developed by a team of members of the RDSTF with healthcare partners. The Strategic Plan Oversight Team (SPOT) is comprised of interdisciplinary members that serve as the advisory body to focus on priorities, resource allocation, and for monitoring progress in meeting strategic objectives. The Division of Emergency Medical Operations (DEMO) with the Bureau of Preparedness and Response (BPR) provides support to the counties for healthcare system preparedness.

The Emergency Operations base plan with functional annexes and appendices provides guidance for the operational tactical plans. Standard operating procedures describe the process for Incident Command, coordinated situational awareness, and resource management to meet local mission needs. The Florida CEMP is the master operations document for the State (Florida Division of Emergency Management 2012). The base plan outlines the mission of ESF-8 as coordinating public health and medical resources, capabilities, capacities, and response in an all hazards environment during natural or man-made disasters. The goal is to develop an integrated and comprehensive statewide health and medical response system. Within the Florida CEMP, are appendices applicable to this research, ESF-8, Ambulance Deployment, Alternative Medical Treatment Sites, and hospital response. The ESF8 appendix outlines support agencies and organizations including public, private and non-governmental support organizations that provide resources to the Florida DOH (Florida Division of Emergency Management 2012). One support agency that is critical to the mission is the Agency for Health Care Administration (AHCA) for identifying available hospital bed space through Emergency Status System (ESS). The ESS system provides a website for hospitals to report current status and available resources to assist in daily and disaster operations.

At the State Emergency Operations Center, ESF-8 takes a prominent position to coordinate resources and share information between the Florida DOH Emergency Coordinating Officer and a Florida Hospital Association representative. These positions work directly with healthcare facilities and county health departments

during disaster operations to identify unmet needs. ESF-8 Incident Action Plans and Situation Reports are developed during each operational period and are shared with each of the seven RDSTF regions and local healthcare stakeholders.

Healthcare coalitions in Florida are either fully developed or in the process of being formed with the goal of having healthcare coalitions in all communities by 2017. ASPR has made healthcare coalition a priority in grant guidance. There are sixteen coalitions identified and are expected to have cooperative agreements and create an infrastructure where the community healthcare partners provide support to one another within the coalition for managing medical surge.

4. Florida Response

Florida has dedicated mobile resources to respond to medical surge. The State Medical Response System (SMRS) provides medical care and infrastructure operations to regional and local jurisdictions where public health and medical infrastructure are overwhelmed (Florida Department of Health 2012).

The State Logistical Response Center (SLRC) located in Orlando has \$32 million of assets in a 200,000 square foot warehouse. Florida has had frequent threats and landfall of hurricanes where resources are supported under a Governor and Presidential declaration. Each disaster has improved state preparedness through analyzing gaps in response. The evaluation of response and subsequent changes in plans, better serve response and recovery efforts for the citizens and visitors to FL. In addition to the EM asset the SLRC with dedicated space for DOH, there is a state warehouse specifically dedicated to storing supplies and equipment for health and medical response. This warehouse is augmented by other resource warehouses located in some of the RDSTF regions.

Caches of medical supplies and equipment, trailers, and dedicated prime movers are available to move resources when and where they are needed. In some instances, logistical support teams can pre-deploy resources to stage in anticipation of a need. State Medical Response System (SMRS) caches can provide primary care for 100 persons for 3–5 days. Through the ASPR program, hospitals have acquired supplies and equipment,

along with training and exercises, to best meet the potential impact of surge on their individual facility. Hospitals have also become a partner with the CDC to store caches of antidotes to manage the effects on patients from biological and chemical attacks.

State Medical Response Teams (SMRT) and/or caches are located in all RDSTF regions. SMRT teams can mobilize within eight hours of activation and become operational within 8–24 hours. SMRS teams are self-sufficient for a minimum of 72 hours. The personnel composition of SMRT teams is derived from the DMAT model and as a team can respond more quickly than federal DMATs because of the proximity to the area they serve. The MRC in Florida has 18,000 volunteers. The MRC units respond to mission requests for medical support and participate in exercises with DMAT and state medical response teams. Exercises have included the use of the MRC for providing medical surge support at alternate care sites.

Each RDSTF region has a Regional Emergency Response Advisor (RERA) who is a public health asset. A RERA can serve multiple roles and has a dedicated vehicle with emergency lights to respond to public health emergencies. During disasters the RERA moves equipment and supplies, respond to suspicious substance calls and do field damage assessments. The RERA may act as a regional coordinating officer with county coordinators to best manage regional disasters before requesting state resources. A public health preparedness county coordinator is assigned to each county to develop plans, conduct exercise, provide training, and to complete surveys and ensure the health department meets preparedness competency requirements. During disasters, the coordinator may become the ESF-8 representative at the county EOC. The coordinator position is dependent upon the goals of the county health department administrator.

Larger hospital systems have caches of equipment and supplies, prime movers, and disaster response personnel to manage medical surge. In past disasters, corporate hospital systems have provided resources to hospitals outside their system as a goodwill mission and as part of community support. In Florida, the Veterans Administration has two healthcare systems, seven medical centers and up to fifty clinics. The VA facilities have participated in countywide drills and exercises making them a valuable partner in the community to provide access to federal resources for medical surge management.

Florida has three tractor-trailer platform mobile hospitals. There are also available inflatable and shelter systems that can provide treatment and can expand to the needs of the mission. The mobile field hospitals can become a replacement for an inoperable emergency department or augment one that is overwhelmed.

5. Alternate Care Sites

California and Florida have similar plans and criteria for establishing alternate care sites for medical surge management. Each state identifies surge criteria to implement the use of an ACS.

California has an estimated 21,000 ACS beds, and has exercised medical surge and alternate care site plans. There are Healthcare Surge Standards and Guidelines Manuals, operational tools and training materials for facilities and counties. In the standards and guidelines document there are volumes specific to hospitals, alternate care sites, community care clinics and long term care facilities (California Department of Public Health, 2008). The California Hospital Association provides the *Hospital Surge Checklist and Resources* to assist with the development of plans for surge events (California Hospital Association 2013).

There are recommendations for patient throughput in an ACS that would effectively manage surge. In catastrophic mass casualty incidents, each ACS should prepare to treat 75–125 patients per hour (Florida Department of Health Pre-Hospital Planning Emergency Medical Response 2006, 32). Three documents guide ACS use: *Alternate Care Site Operational Guidance*, *Alternate Care Sites: Local Plan Development Guide*, and *Florida Alternate Care Site Standard Operating Procedure* (Florida Department of Health 2013, 2). Florida DOH has exercised ACS plans at the county levels, and through ASPR funding has enabled hospitals to purchase shelters and supplies to establish ACS when needed. There are thirty one local ACS plans on file with the Florida DOH and others are in different stages of development. Hospitals have made significant progress in identifying surge space. In addition, Florida has provided twenty three mass casualty trailers to EMS and Fire Rescue departments for the purpose of triage and field treatment.

E. SUMMARY OF FACTORS

Federal funding from HHS in 2013 includes \$332 million, decreased by -\$124 million from 2012, to support federal, state and local capacity and capabilities in emergencies. These funds support the hospital preparedness program (HPP) with the focus on six areas, three related to this thesis are; community-level medical surge planning, evacuation planning and maximizing public and private partnerships. The HPP grant guidance is changing from building preparedness capacity to a competitive grant program for innovation among healthcare coalitions and sustainment of preparedness capacity and healthcare coalitions and their partners. The HPP will advance the efforts of ASPRs to integrate state and local public health and medical surge capability by aligning the HPP and PHEP grants. There is \$5 million to support planned and unplanned emergencies including support of NDMS (DMAT) teams and supplies (U.S. Department of Health and Human Services, Public Health and Social Services Emergency Fund 2013, 18). A budget request for NDMS of \$52 million is to support among others, regional emergency coordination, medical response assets, and teams and supplies (U.S. Department of Health and Human Services, Public Health and Social Services Emergency Fund 2013, 32). The funding helps support the six DMAT teams each in Florida and California. Additional 2013 funding through HSPG grants to urban areas for California is over \$50 million, and for Florida is \$8.5 million. The HSPG priority focus is on strengthening governance integration to ensure resources support the coordination of funding streams based on risk and capabilities based planning. Program priorities that were added are the innovation and sustained support for the National Campaign for Preparedness and improve immediate emergency victim care at mass casualty events (U.S. Department of Homeland Security Homeland Security Grant Program 2013, 3).

More attention to the geographical and organizational coordination of NDMS, MMRS, and the disaster medical response teams is needed. It is not clear how the DMATs relate to the MMRS and how well each local MMRS functions and relates to key organizations such as the major hospitals, academic health centers, health care systems, and others in their community. (Cooksey 2004)

Seamless articulation of resources is an important part of managing medical surge. Initial medical staff response will benefit from having credentialed medical staff from outside the agency to augment care capability. The ability to obtain resources from various sources gives medical facilities the best advantage in medical surge management.

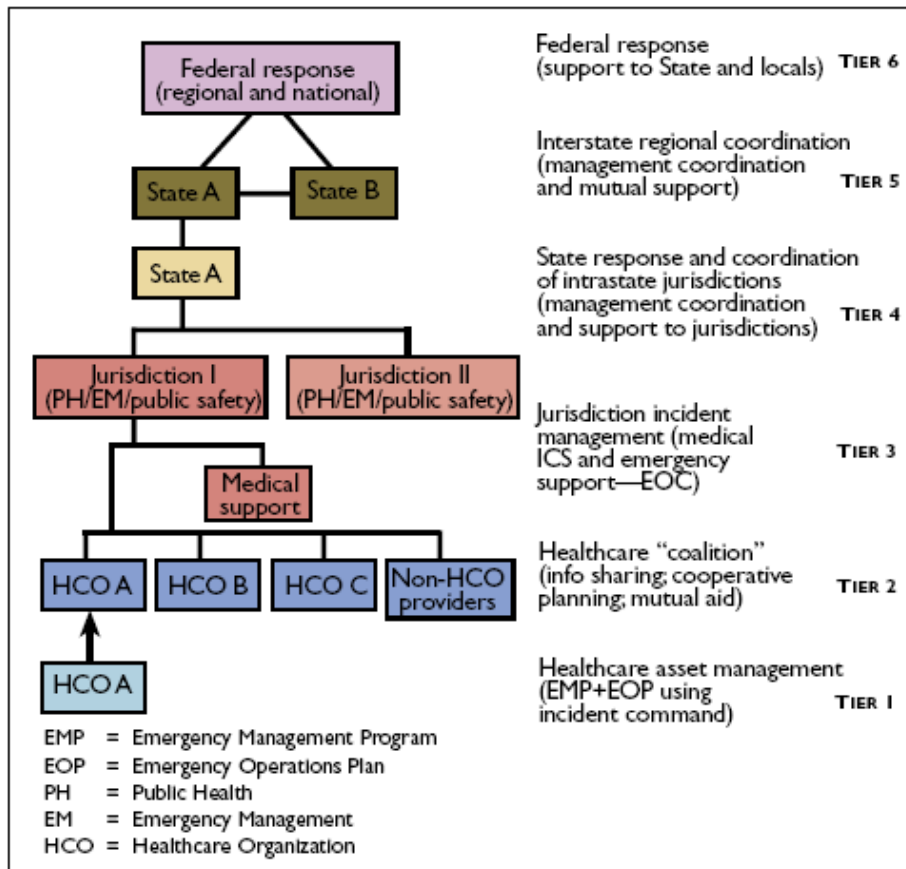


Figure 4. MSCC Management Organization Strategy (From Barbera and MacIntyre 2007)

The Medical Surge Capacity and Capability (MSCC) strategy (Figure 4) shows the various levels of disaster medical management. The tiers show individual healthcare organizations or assets and the integration with a coalition, region, state, and federal agencies. Each tier builds upon the other as resources—as each tier is expended, resource requests move to the next tier. The 2013 DHS initiatives are emphasizing whole community involvement and public-private collaboration for planning and response.

Articulation of resources among local, state, and federal levels are key to having what is needed at the right time and the right place to treat patients in the medical surge. The *Preparedness: Federal Medical Response Programs and the Health Workforce* study identify gaps in Federal response and for coordination with local communities (Cooksey 2004). Collaboration across all levels is essential to lessen the response times, improve staffing plans, best utilize space, and acquire the most appropriate medical caches to do the best care for the most disaster survivors.

The FEMA is not waiting for state and local government failure before intervening; however, with limited federal funding, resources are becoming scarcer and the eligibility threshold for disaster support is increasing. Federal agencies have worked together and independently to achieve a level of response to provide direct patient care using resources and personnel from the various levels of government. It becomes complicated when a community or a state has the expectation that the Federal government will intervene in a timely manner. Deployment of federal resources can take days before reaching the requestor, and longer to become operational. If simultaneous disasters occur, the response time may be increased. This gap between request for resources and them becoming operational requires communities to plan for the worst case scenario upward of 72 hours or more. Leaders from the medical and health sectors need to become familiar with the two medical response systems (NDMS and MMRS) within their local area. At the national level, health care leaders need to identify a process to work with the Department of Homeland Security and the Department of Health and Human Services on the emergency preparedness and response mission and the strategy being pursued by these departments and other federal agencies (Cooksey 2004).

Healthcare systems must think differently from daily business of delivering healthcare services. It requires agreements like EMAC and IMAC with healthcare systems or coalitions and among and between healthcare agencies and stakeholders to reach across geographic boundaries, and healthcare facility philosophies to get the most benefit from a coordinated system for disaster management. Integration with federal initiatives has happened in California and Florida at various levels. State teams act as a link between the local and federal levels or may act to support local response without the

need for a federal response. Embedded in each state, are six DMAT teams, the MRC with 20,000 in California and 18,000 in Florida, Citizen Corp, and the MMRS. These teams have been instrumental in medical surge management in each state and can act as a resource to other states.

Federal funding has been directed toward the development of State Medical Response teams which are similar to Federal DMATs and can usually respond more quickly to augment local needs. State disaster response however does not simply plug into a community or into the federal system without planning. A comparison of California and Florida identifies how both states have dedicated resources and organized capabilities through planning. Perhaps because of their experience with disaster response, both states identify options for articulation with local communities and with federal response resources. This is especially obvious with DMATs, a federal asset interfacing with a state medical response teams. Both state and federal teams provide trained and credential medical personnel that can arrive and begin to care for disaster survivors. California and Florida have resources to manage disaster medical surge and have teams in place that can integrate with local medical professionals or with federal teams. These states have embedded partnerships within the healthcare community some formally developed into healthcare coalitions to provide alternatives at the local and often regional levels for filling gaps with medical caches and medical response team through MOUs that can redirect assets that will best manage the complexity of the situation.

Comparisons of medical surge management in California and Florida are similar. The states have built a framework with guidance and legislation within Public Health and Emergency Management sectors for coordinated response to disasters. California and Florida have experience responding to natural disasters and have had incidents causing medical surge. These experiences have required assistance from other states through EMAC, the federal government through NDMS, and the military through the National Guard. Disasters and simulations during exercises allow the states to assess response and make improvements that streamline policies and procedures for medical surge management.

Decompressing hospitals, or redirecting surge away from a hospital to increase clinical space, requires a robust patient movement plan to be effective in the early stages of a disaster. California and Florida have identified government authorized alternate care sites. In both states the process for establishing alternate care sites for the management of medical surge has worked. There is a heavy reliance on local community support from healthcare facilities to manage medical surge and to continue to build public-private partnerships may make more resources available.

California and Florida have made efforts toward redirecting patients away from overwhelmed hospitals or from the scene of an incident by establishing Ambulance Strike Teams to move patients within the healthcare system or to non-impacted medical facilities. A plan for mobilizing 50 ambulances within 10 minutes after a blast with at least 75% arriving at the staging area within one hour and the remainder within 90 minutes is suggested in the HHS CDC document, *In a Moment's Notice: Surge Capacity for Terrorist Bombings* (Health and Human Services, Centers for Disease Control and Prevention 2007).

The AST policies and procedures are similar in California and in Florida. The ambulance strike team concept for moving patients does have some challenges with integration into the impacted area. Literature discusses problems with communications, command and control of ambulance tasking and strikes teams becoming separated and working on different missions. This is a topic for another researcher. In previous disasters, Florida and California have received support from the military with ground and air patient movement assets in addition to on the ground assistance by military medical teams. The strong presence of military bases and Veterans Administration healthcare facilities within Florida and California can lead to efficient planning and response.

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V. CONCLUSIONS AND RECOMMENDATIONS

Ultimately, effective surge response requires all stakeholders to accept new responsibilities, behave differently than they may have been trained, and cooperate with each other in unprecedented ways. (California Department of Public Health 2008 14)

This thesis asks the following three questions to determine what individual resources, or those in coordination, can best manage or minimize the impact of medical surge that overwhelms a healthcare system during a disaster. Federal resources and those within the States of California and Florida support this inquiry. The results of the comparative analysis were used to answer the questions for federal and state resources and the use of alternate care sites to manage medical surge.

A. CONCLUSIONS

1. **What are the alternatives for the management of medical surge during a disaster?**

The management of medical surge may begin with a single healthcare facility and can move to collaborating and coordinating within the whole community and with continued escalation can involve state and federal resources. California and Florida have identified alternatives at the state level to manage medical surge through the use of alternate care sites. Each state has plans and guidance for how to access federal resources, teams, equipment and supplies, patient evacuation and movement. Although existent, it is less coordinated from the state level to local levels. The challenge may be due to much of healthcare is in the private sector. Without private sector support for public plans, it becomes a more silo approach. Federal agencies are using grant guidance to encourage the development of healthcare coalitions to bring community partners together to coordinate resources (U.S. Department of Health and Human Services, ASPR, CDC 2012).

Management of resources is a community responsibility as medical surge begins at the local level and becomes unmanageable for a single medical facility. One alternative for increasing the capacity and capability for providing patient care is to redirect non-

critical disaster survivors to an alternate care site located on hospital property or in the community. To redirect non-critical patients to an ACS, can leave hospital resources for the more critical patients arriving to the hospital. To match the criticality of patients with the sufficiency of care can maximize resources and provide the highest level of definitive care.

To determine the capability for a community to surge, it becomes important to assess the amount and type of resources available. To adequately evaluate the whole community from the perspective of resources requires the involvement and input by a variety of healthcare agencies, non-governmental organizations, public and private organizations and local, state and federal responders. To bring the stakeholders together can become challenging. One model being used in California and in Florida is to develop Disaster Healthcare Coalitions. The use of coalitions provides for effective planning and for the assessment of resources at the local level. Plans are written for the community rather than specific to individual organizations and facilities.

State and the federal resources may be delayed so it becomes necessary for self-sufficiency in the initial hours. If not managed, surge may overwhelm staff, resources, and space. Essentially, the facility becomes unable to provide medical care. Preplanning of ACS sites and a strategy for the deployment of medical resources and staff can save valuable time, making those decisions in the midst of a disaster. Alternate care locations can be established close to an incident or close to the hospital.

2. How can alternate care sites improve the capacity and/or capability of a healthcare system during a disaster?

An ACS can improve capacity by redirecting the less injured away from the hospital or outside the traditional healthcare system. The less injured and those that self-evacuate the scene can be redirected to an ACS to receive services like wound care, mental health services and less complex injury management. The movement of medical surge can improve capability as the most critical are cared for at the hospital and the less injured receive care at an ACS. The mixture of patients in one location can cause delays in patient throughput and increase time to receive care.

Redirection of patients can be facilitated by EMS at triage points close to the scene or at the hospital campus away from the emergency department. If EMS is required by protocols or legislative mandate to transport patients only to emergency departments this increases the number of patients waiting for care and increases surge. An alternative for hospitals is to triage patients brought by EMS and redirect the less injured to an alternate site. This redirection can increase the emergency department's capacity by leaving available beds or surge beds inside the hospital.

Once the demand for resources exceeds the supply a higher potential exists for poor patient outcomes including death and disability. Moving the less critical to an ACS expands the capacity and capability of the entire healthcare system. The ACS system can provide care and facilitate a more rapid discharge of the less injured alleviating the need for costly bed space. The ACS concept needs to be rapidly deployable to ensure the greatest benefit. There may be times when disasters are so large and complex (catastrophic) that it is like a tsunami of people seeking care. At those times, an ACS or more than one can do the best for the most by accurately triaging and providing sufficient care to patients.

The use of an ACS takes significant support of the healthcare system and community partners. It requires a collaborative and coordinated effort toward making resources available. Staff from one local facility can move to another local facility to support surge under an agreement. The use of MOU agreements for staff and supplies can provide for a more timely response especially as surge expands at one hospital leaving less resources to provide patient care. The availability of mobile caches of equipment and supplies and medical response teams becomes essential to creating an ACS. The use of an Alternate Care Site is less about the physical plant for where the care takes place and more about the teams and supplies in the overall system that can do the most good within the available healthcare system.

3. Would using an alternate care site for medical surge challenge community and healthcare system policies, procedures, practices, and regulations?

Communities and healthcare systems adopting the ACS concept may be challenged when trying to collaborate for resources to effectively and efficiently manage

medical surge. There are many regulations and mandates required for licensed facilities and professionals when providing medical care to patients. These include EMTALA, JCAHO, professional practice acts, EMS standards, and policies specific to the delivery of healthcare services. In a disaster, some of these policies are relaxed when an emergency declaration is issued however medical facilities are reluctant to work outside these policies. The use of an ACS must address the issues of EMS requirements for transporting patients to the closest most appropriate hospitals, the requirement by EMTALA under 42 CFR 413.65: A person who presents anywhere on the hospital campus (250-yard zone) and requests emergency services, or who would appear to a reasonably prudent person to be in need of medical attention, must be handled under EMTALA (Government Accountability Office 2008). As ACS protocols are being developed, hospitals must look toward the use of an HHS waiver under Section 1135 of the Social Security Act, which allows for care to be done for the greatest good for the greatest number with a focus of providing care with existing capacity (Center for Bio-Security of UPMC 2009). Healthcare as a business, risks financial loss for being liable for untoward outcomes while caring for patients. The use of a waiver may provide liability protection for hospitals and the medical professionals providing care.

Professional practice acts, for healthcare workers including nurses and physicians, are required to provide a specific standard of care to patients when planning for ACS implementation. In a disaster, caring for many patients versus single patients may compromise specific patient ratios outlined in medical practice acts. Current healthcare systems would benefit from rapidly credentialing and integrating public health and medical personnel into the system, so direct patient care services can be provided during surge. The lack of national standards for the deployment and use of public health and medical emergency response personnel and the use of spontaneous volunteer health practitioners may become problematic unless credentialing systems are in place. This may become especially challenging when medical professionals respond across geographic boundaries (U.S. Department of Health and Human Services 2006).

The culmination of the literature and analysis of federal and state plans and assets, has led to the following conclusions.

B. POSITIVE RESULTS

States refers to Florida and California. Federal refers to different agencies that provide support to the states.

- Federal agencies have responded with guidance that supports unified management of disasters that cause mass casualties and ultimately medical surge (HSPDs, NRP, UTL, and TCL).
- Federal funding is available to support the purchase of medical equipment and supplies (ASPR, CDC, HSPG, and HHP).
- Federal support exists for training and exercises (NIMS, HSEEP).
- Federal agencies have funded teams (DMAT, MRC) across the nation to respond to disasters and augment or develop medical infrastructure for disaster impacted communities (NDMS, MMRS).
- Federal agencies are improving coordination with states through the FEMA regional concept (FEMA).
- States have utilized federal funding opportunities to support development of statewide strategies and healthcare coalitions for disaster response (ASPR, CDC).
- States have made efforts toward collaboration across geographical lines (EMAC).
- States have plans in place for alternate care sites and methods for treating large numbers of disaster survivors (ACS plans, State response teams, caches).
- States have identified response teams to be available to deploy to for medical surge disasters (State Medical Response Teams).

C. CHALLENGES

- All disasters are local and may exceed 72-hours, making it necessary for communities and healthcare systems to be self-sufficient for a period of time before federal assistance is available.
- Disaster survivors arrive at hospitals in the first minutes with a peak in the first hour and continue over six hours straining resources and staff.
- EMS may take longer on scene to triage, package and transport more critical patients.

- Ambulances lack the capacity to transport large numbers leaving a gap for moving patients without additional ambulance support.
- EMS may follow existing protocols and bring survivors to the closest hospital and may not have the authority or option to vary transport protocols to include transportation to an ACS.
- Healthcare systems and hospitals are often private businesses, and are not required to work with the government toward medical surge preparedness in the community.
- Healthcare facilities may be reluctant to enter into agreements with competing facilities for disaster response.
- Communities may have difficulty bringing stakeholders together to develop one whole community plan for medical surge management.
- States have addressed aspects of the federal guidance; however, many are not have the coordination with local communities.
- Locally, healthcare disaster preparedness is often placed on the largest healthcare facility in a particular community.
- Disaster healthcare is costly and reimbursement is not always an option when providing medical surge care.

D. RECOMMENDATIONS

The idea that all disasters are local becomes a challenge when an incident causing multiple casualties impacts a community. The most common gap to emerge in this research was the lack of a clear coordinated strategy at the local level for managing medical surge. The federal funding and guidance has helped states to develop plans however it is less apparent that there is a consistent method in local communities to prepare for and respond to medical surge. The healthcare infrastructure must be responsive to deliver care for those that self-evacuate and those that arrive by ambulance. The challenge is to have plans in place, to exercise the plans and make adjustments to accommodate a variety of disaster casualties. It requires a collaboration of healthcare facilities with other stakeholders to develop community support for sharing resources and establishing ACS.

Federal and state governments have provided guidance and funding to support the management of disaster medical surge; however on the whole, these are insufficient and have failed to scale in proportion to the demands placed on local communities. It is necessary to do more. Healthcare is expensive. The costs exponentially increase during disaster care. A mechanism should be in place to make communities accountable to receive funds and provide guidance that will allow communities to articulate with states and then the federal response mechanisms. This articulation among and between the levels will lessen the burden on each level while providing care. It is no longer sufficient for disaster surge management to be the burden of the local healthcare system. Rather a collaborative system of response must be in place to coordinate care.

In the initial hours following a disaster causing mass casualties, Emergency Medical Services responds to the scene. In the initial phases, EMS will triage, provide immediate care, package the patient and transport to the nearest medical facility. The time it takes for EMS to perform their tasks on scene, allows self-evacuees to surge the Emergency Department. Once a surge occurs, limited resources including a lack of capacity and capability ensues. It is essential for hospitals to articulate to the healthcare community that this could compromise patient care and lead to increased death and disability. Public information and education of disaster expectations may be helpful. EMS has an additional role with the AST which can move patients and assist to decompress a hospital, transfer patients to un-impacted facilities, and provide staffing at an ACS.

Communities must work together in a multidisciplinary manner to manage disaster medical surge. This requires bringing together healthcare agencies, law enforcement, EMS, emergency management, NGOs, religious and community organizations together to form a disaster healthcare coalition to determine the following:

- 1. EMS Response**

Consideration for changing EMS transport operations when faced with disasters is necessary. It is essential that local and state protocols and laws include a mechanism to allow for the transport of less critical patients to facilities, including alternate care sites

that can provide sufficient care. EMS agencies can be instrumental in redirecting non-critical patients that would cause hospital surge to alternate sites away from hospital emergency departments. This redirection would be based upon field triage allowing for the movement of the most critical to the hospitals and the less injured or ill to alternate care sites.

2. Capacity of Healthcare Systems

Each community should assess the total number of beds in the clinical space within the healthcare system. This number is the capacity or the number of patients that can occupy a bed. In addition, the surge capacity should be assessed. This is determined by expanding into non-clinical space that can be converted into clinical space to accommodate disaster patients. This number of increased beds can be utilized to predict surge capacity. It is difficult to determine how many disaster survivors will arrive so it becomes necessary to have plans to expand capacity to manage surge.

Attention toward developing mutual aid or memoranda of agreements will allow other healthcare facilities to provide surge space. When faced with disaster medical surge, hospitals must have the ability to redirect the less injured to alternate locations for care which may be other medical facilities with space. Alternate care sites with predetermined deployment strategies, strengthens a community's ability to understand surge capacity within a locale.

3. Capability of Healthcare Systems

The capacity must be partnered with knowing the capability of the healthcare system. The capability includes the baseline level of daily services provided in a community, region or state during non-disaster times. The number and level of trauma centers is a consideration. Availability of rehabilitation, behavioral health services, public health services and other healthcare provider services in a healthcare system is part of the capacity. This includes level, credentials, and type and number of staff, and the supplies and equipment that can provide care for disaster survivors.

In a disaster, expanding staff to provide care can be accomplished by recall or by moving to 12-hour rotations, called alpha and bravo shifts. This shift configuration has historically been done during disasters with financial burden to the facility for the overtime. Recall may not be effective if the recalled staff are personally impacted by the disaster or are unable get to work due to failure of transportation infrastructure. Alternative staffing can come from other patient care areas or by using licensed medical staff from non- patient care areas like administration. Credentialed medical volunteers like those members of medical response teams or MRC also become a staffing option during a disaster. DMAT and MRC volunteers are credentialed prior to deployment and can become an asset in surge.

Staff capability for spontaneous medical volunteers or those from other healthcare systems requires a process for credentialing. Healthcare agencies and systems would benefit from having a predetermined process that would quickly identify, credential, and assign staff to areas of expertise to maximize utilization.

Capability includes medical resources, supplies, equipment and pharmaceuticals. An inventory of a communities resources is part of planning for a disaster. Just in time ordering has created a challenge for healthcare systems to have residual stock of supplies. Vendor management may include a clause in the contract that will support a facility during a disaster. This can become a challenge if the same vendor is utilized by many of the impacted facilities, and potentially creates a medical supply shortage.

4. Challenges to Surge Management

It is prudent to recognize that other considerations to surge management might be explored in future research. Topics to explore include how to alter medical care standards and protocols, and clearly define sufficiency of care when faced with surge from a disaster. The model must evolve from a focus on single patient care to one which is dynamic and scalable. This new model may in fact minimize or substitute heretofore standard practices such as early diagnostics to provide, a higher level of care while doing the best for the most disaster survivors.

During a disaster when the demand for medical supplies, equipment, and pharmaceuticals exceeds the supply rationing may be instituted. When rationing, the decision-making process by medical professionals becomes an ethical dilemma. The healthcare professional may be required to determine who lives and who dies given the resources. This is an issue that is not often faced when caring for one patient at a time. In a disaster scenario, healthcare professionals will find themselves making difficult decisions that may not be comfortable, or have not been exposed to such in medical training or for ethical decision making.

To predict the number and the types of medical professionals required to adequately staff for medical surge may be explored by retrospective research. To manage a disaster, some facilities activate a full staff recall. This process impacts the length of time for healthcare system recovery because of the inability to backfill tired staff. There is a financial impact for loss of revenue during response to and recovering from a disaster causing medical surge. Human resource costs for overtime and backfill is significant and takes time to financially recover. These and other topics should be considered when caring for disaster medical surge survivors, though are not included in this thesis.

5. Alternate Care Site

An ACS can be a fixed location or a mobile complement which can expand capacity. It can be set up at or near the epicenter of the disaster or can be at a location near the hospital where many disaster survivors will self-evacuate. Although states have successfully implemented ACS unless it is rapidly deployable it is not effective for the initial phase of surge. Therefore, establishment of an ACS to lessen medical disaster surge must include partnerships of healthcare provider stakeholders and by supporting agencies like emergency management, law enforcement and public health. The development of a disaster healthcare coalition that can develop plans, have an inventory of medical supplies and equipment, and include staffing matrixes, can be an asset to response efforts. Agreements by a coalition could address credentialing, deployment and utilization of an Alternate Care Site. An ACS can lessen surge by having the less injured referred or transported by EMS. If a community lacks a hospital, an ACS can also

prevent long transport times for movement of disaster survivors. Basic care without displacement from the community is an advantage of using an ACS. This also can include the use of the MRC or DMAT as staffing. In a disaster medical surge, ESF-8 would be lead for determining where to access staff. Similarly, supplies can also be redirected or caches can be accessed to provide care. If facilities are unable to accommodate capacity, an alternate care site model can be developed where facilities in the coalition can move staff to the alternate site and add to whole community capabilities.

Simply put, an alternate care site is not always a specific location or a tent erected in a parking lot. It is a concept to expand the healthcare system to manage medical surge following a disaster. It is a concept that can include pre-planned locations or a process to divert disaster survivors to another location that can provide minimal care, while lessening the surge on the entire system. An alternate care site can be existing healthcare facilities that are not typically used for acute care. The alternate care site concept is one that requires staff, stuff, space, and a system to achieve its goals of expanding care to an increased number. The success of an ACS is predicated on working together at local, state, and federal levels to ensure its capacity and capability.

6. Disaster Healthcare Coalitions

A coalition can determine the needs of the community based upon the current capacity and capability. A coalition is instrumental for the development of a plan to manage disaster medical surge in the immediate hours following a disaster. A coalition authored plan can work to identify disaster survivor movement from the hospital where most self-evacuate and redirect to other coalition member healthcare facilities. The idea of acute care or management of disaster survivors may be different than the facilities daily mission. It entails collaboration, cooperation and communication between and among the members from public and private sectors and from organizations that can support the mission. An analogy may be drawn by a bulls-eye, where emergent patients are in the center and as the surge builds and patients are referred out to the other circles or

to other facilities on the bulls-eye. This process will allow the coalition members to seek a place within the circles where they can provide support and services. Collectively, the bulls-eye is how a community can manage surge.

E. CONCLUSION

The management of medical surge is complex, requiring dedicated resources from federal, state, and local government levels. The resources must include medical response teams, supplies, and equipment, surge space, and plans to operationalize medical surge mitigation strategies in a timely manner. The use of ACSs may allow the disaster survivors that are less injured to receive care while leaving critical space at the hospital for the most injured. The use of state and federal resources to augment a local healthcare system during medical surge is difficult and often lacks clear articulation between the levels. This delay in resources arriving to an impacted disaster area leaves local governments having to be self-sufficient. States that have resources do not have the same plans to use those resources. The federal government provides guidance, frameworks, and documents that help with planning; however, lacks the true infrastructure to manage medical surge.

Our national preparedness is the shared responsibility of all levels of government, the private and non-profit sectors, and individual citizens (Obama PPD-8 2011).

All disasters are local, and require the commitment of many partners within and outside the healthcare community. The forum for community collaboration and coordination is being done through disaster healthcare coalitions. The coalition model can allow members to work together to identify resources for utilizing an alternate care site. The use of an ACS can mitigate medical surge during disasters with involvement by the whole community.

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