Topic Area Collection: Hospital Surge Capacity and Immediate Bed Availability

Hospitals and healthcare coalitions are faced with challenges that multiply after natural or human-caused events or disasters. Surge planning—and immediate bed availability in particular—are critical components of every healthcare facility’s emergency plan and response ability. These resources highlight recent case studies, lessons learned, tools, and promising practices for planning and improving capabilities for a surge event.

Each resource in this Topic Collection is placed into one or more of the following categories (click on the category name to be taken directly to that set of resources). Resources marked with an asterisk (*) appear in more than one category. This Topic Collection was updated in November 2016.

Must Reads
Capabilities
Immediate Bed Availability
Lessons Learned
Pediatric
Pediatric, Webinar/Training
Plans, Tools, and Templates
Resource Allocation
Rural/ Frontier
Surge/Mass Care Response
Surge Planning
Agencies and Organizations

Must Reads


The authors wrote this guide as a companion piece to the MSCC handbook, providing tips for developing, implementing, and maintaining effective Healthcare Coalitions.


The recommendations contained in this document can help medical professionals develop tailored responses to mass casualty events involving pediatric patients.

This toolkit can help neonatal and pediatric medical care professionals build and sustain related disaster preparedness programs.


The authors synthesized comments from a series of expert panel meetings on identifying innovative strategies hospitals could adopt to address terrorism-related surge issues.


The authors list 22 suggestions specific to surge capacity and mass critical care under the following topics: stockpiling of equipment, supplies, and pharmaceuticals; staff preparation and organization; patient flow and distribution; deployable critical care services; and using transportation assets to support surge response.


Chapter 7 of the framework, Hospitals and Acute Care Facilities, provides a high level of detail related to implementing surge strategies, including immediate bed availability.


The authors examined the effect of reverse triage (early patient discharge) on inpatient bed surge capacity and found that surge capacity may be greater than previously thought.


The focus of this report is on immediate bed availability in rural healthcare settings. The authors conducted a literature review and synthesized data collected during interviews with representatives in four areas: Mississippi, Southwest Utah, Virginia, and Southeast Texas.
According to the authors, the “art” of surge includes decisions, authority, and responsibility, and the “science” includes numbers and benchmarks. The authors share surge strategies used by the U.S. military and Israel that can be replicated by other healthcare systems.

The authors share the results of a literature review that included surge capacity, and conclude that more work needs to be done in the area of generating strong frameworks and data collection methods.

**Capabilities**


The speakers in this webcast share strategies for addressing obstacles associated with pediatric surge.


The author shares his hospital’s experiences preparing for, responding to, and recovering from Hurricane Katrina. He shares lessons learned regarding anticipating patient surge, relocating critical patients, and interagency communications.


This handbook provides an overview of the Medical Surge Capacity and Capability (MSCC) Management System and describes how the model can be applied and integrated across six “tiers of response.”


The authors wrote this guide as a companion piece to the MSCC handbook, providing tips for developing, implementing, and maintaining effective Healthcare Coalitions.

The authors surveyed United Kingdom Primary Care Trust Hospitals over a period of time to determine the number of beds they could “free up” in the event of a major incident.


This infographic includes general statistics and depicts how emergency medical services effectively distributed patients after the Boston Marathon bombing.


The Dallas Convention Center Medical Unit was established just after Hurricane Katrina, and the authors explain how the medical surge capacity provided by this unit absorbed patient volume while also minimizing impact on routine operations.


The authors used a new rapid screening process to manage patient surge associated with the 2009 H1N1 pandemic and found that it—along with a slight increase in staffing—improved patient flow and had no effect on emergency room return rates within two or seven days.


The focus of this report is on immediate bed availability in rural healthcare settings. The authors conducted a literature review and synthesized data collected during interviews with representatives in four areas: Mississippi, Southwest Utah, Virginia, and Southeast Texas.

The article details a real-life reverse triage situation where a full hospital freed up 56 beds (16% of capacity) to treat casualties suffering from blast injuries.


The authors examined the impact of delaying hospital procedures on immediate bed availability.


According to the authors, the “art” of surge includes decisions, authority, and responsibility, and the “science” includes numbers and benchmarks. The authors share surge strategies used by the U.S. military and Israel that can be replicated by other healthcare systems.


The authors provide an overview of hospital surge during influenza season and used CDC’s FluSurge program to approximate the number of patients that could be hospitalized per state in a pandemic influenza scenario.


During this national call, speakers shared information about medical surge and how hospital staff can use immediate bed availability to operationalize Capability 10.


These capabilities can help the healthcare delivery system, including healthcare coalitions, hospitals, and emergency medical services (EMS), better understand their roles in preparing for and responding to emergencies that impact the public’s health.

**Immediate Bed Availability**

The authors complemented a literature review with mathematical modeling to illustrate the importance of quantitatively benchmarking various components of hospital bed surge capacity.


The authors provide an overview of the Hospital Available Beds for Emergencies and Disasters (HAvBED) reporting system, with chapters dedicated to definitions and data elements, data entry, HAvBED and the National Incident Management System, and recommendations for facilities interested in implementing the system.


The authors synthesized comments from a series of expert panel meetings on identifying innovative strategies hospitals could adopt to address terrorism-related surge issues.


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 Lessons Learned


This article discusses how using an all-hazards approach to bioterrorism response planning helped to prepare hospitals in the Raleigh/Durham, NC area to care for casualties from a plant explosion in June 2009. The rescue, response, and resuscitation of survivors by first responders and first receivers, as well as efforts to develop burn surge, are described.
The speakers in this webinar share information related to the challenges faced by health systems in response to surge events, as well as coordination efforts and strategies implemented by local health departments and healthcare coalitions to achieve surge capability for health and medical services.


The authors examined the effect of a newly-developed regional healthcare coalition (in south Central Pennsylvania) on six surge capacity-related objectives. In a two-year period, the healthcare coalition improved areas under all objectives.


Staff from two hospitals in California share their experiences related to a sustained (mainly) outpatient medical surge of 15,000 patients over a two week period associated with a petrochemical explosion. The authors emphasize the non-traditional nature of the surge response (outpatient versus inpatient) and highlight strategies to enhance staffing from community partners, receiving needed equipment for patient treatment, security concerns and medical records challenges.

Pediatric


The recommendations contained in this document can help medical professionals develop tailored responses to mass casualty events involving pediatric patients.

The author stresses the importance of community hospitals in planning for and managing pediatric surge.


The authors examine the capacity of New York City hospitals to accommodate a large pediatric surge and find that while altering standards of care could help address the increase in demand, intensive care unit capacity would not be sufficient in the event of larger-scale disasters.


This primer provides planning guidance for healthcare facilities that do not typically provide pediatric inpatient or pediatric trauma services. The website provides links to additional pediatric surge resources.


The authors examined data from 34 U.S. children’s hospitals during the 2009 H1N1 pandemic and found that during the fall, occupancy was actually 6% lower than it was during the same period of the previous seasonal influenza period (95% and 101% respectively). Using this data, they built five models to project occupancy and better understand the impact a more virulent pandemic could have on a facility.

**Pediatric, Webinar/Training**


The speakers in this webcast share strategies for addressing obstacles associated with pediatric surge.

Rady Children's Hospital, San Diego. (2011). *Pediatric Surge Planning: Train the Trainer.*

This online course provides an in-depth overview of the special considerations associated with pediatric surge planning. The authors describe hospital incident command system activation, specific tools and actions linked to pediatric surge, and provide tips for developing a surge plan.
**Plans, Tools, and Templates**

Alachua County Health Department (Florida). (2012). *ESF 8 Annex Example*. (Login required.) National Association of County & City Health Officials.

The Medical Surge Capacity Annex shows how Alachua County outlines roles and responsibilities in the event of a natural or human-caused incident.


Table 1 in this article illustrates a comparison of crowding scales by calculation and outcome, and includes a notes section.


Neonatal and pediatric medical care professionals can use this toolkit to build and sustain related surge plans.


The report and associated tools can help emergency planners and other stakeholders select, staff, and stock Disaster Alternate Care Facilities.


This checklist is rooted in the “whole community approach” and provides step-by-step guidance for those planning for significant increases in demand as a result of a critical incident.


The authors provide a framework and checklist for initial surge actions and areas of attention for a hospital in the first hour after a mass casualty incident.

This primer provides planning guidance for healthcare facilities that do not typically provide pediatric inpatient or pediatric trauma services. The website provides links to additional pediatric surge resources.


The authors summarize the main components of Utah’s medical surge plan and provide information on immediate bed availability, plan activation and response, and communications.


Users can request actual plans via email on this website. They can also use this toolkit, which provides links to templates and other surge tools, to help determine their surge planning, staffing, and supply needs.


This collection of PDF documents outlines Pennsylvania’s strategy for mass response, and includes information on alternate care sites and the delivery of healthcare with scarce resources.

Richmond City Health District (Virginia). (2012). Health and Medical Surge Plan. (Login required.) National Association of County & City Health Officials.

This plan can be used as an example by those looking to plan for post-disaster public health and medical surge response.


The creators of this toolkit include information on providing medical surge capacity, tracking patients, and establishing alternate care sites. Each section of this toolkit is available in Microsoft Word and PDF format, allowing users to tailor it to their requirements. Users can download the files or order a CD-ROM containing the templates from the National Association of County and City Health Officials.


This plan can serve as an example for local health departments interested in establishing region-wide preparedness for a mass casualty or surge event.
Focused on pandemic influenza, this plan includes several modeling tools and appendices on surge response, surge measures for healthcare facilities, implementing and monitoring surge response, and recovering from surge.


This tool can be used by hospital emergency planners, administrators, and other personnel to both assess and enhance their facility’s surge plans. It includes evaluation tools specific to emergency department triage and hospital incident command.


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Resource Allocation


The authors convened an expert consensus panel representing health providers, administrators, emergency planners, and specialists, and asked them to review four disaster scenarios and prioritize 132 hospital resources. The number of hospital resources considered to be critical varied by scenario: 58 for the pandemic influenza scenario, 51 for radiation exposure, 41 for explosives, and 35 for nerve gas scenario.


The authors surveyed United Kingdom Primary Care Trust Hospitals over a period of time to determine the number of beds they could “free up” in the event of a major incident.


The authors asked 32 experts in the UK who had clinical experience with mass casualty
incidents (MCI) to rank medical items necessary to treat 100 patients at the scene of a MCI. The experts achieved consensus on 134 items (54%); findings can be used to support MCI resource allocation planning.


The authors highlight the roles physicians can play during surge events (e.g., assisting with reverse triage and patient flow).


Non-respiratory therapy staff can be trained to augment staff and help patients in respiratory failure after a critical incident.


The authors explore the use of closed facilities to provide extra capacity in the aftermath of a critical incident, focusing on facility structure, equipment and supplies, staffing considerations, patient transport, security, and patient information.


The authors examined the effect of reverse triage (early patient discharge) on inpatient bed surge capacity and found that surge capacity may be greater than previously thought.


This article focuses on intensive care unit surge and lists recommended standard operating procedures for staff assigned with managing patient flow.


The article details a real-life reverse triage situation where a full hospital freed up 56 beds (16% of capacity) to treat casualties suffering from blast injuries.

The authors examined the impact of delaying hospital procedures on immediate bed availability.


Using data from “established databases and published reports,” the authors examined both the baseline capacity of U.S. healthcare facilities and the length of time it took for external facilities to provide assistance after a no-notice critical incident. They concluded that communities should plan to maintain their provision of medical services without assistance for at least 24, and as much as 96 hours, after such an incident.


According to the authors, the “art” of surge includes decisions, authority, and responsibility, and the “science” includes numbers and benchmarks. The authors share surge strategies used by the military and Israel that can be replicated by other healthcare systems.

Rural/ Frontier


This 90-minute webinar reviews the unique challenges of building and operating healthcare coalitions in rural settings. Speakers discuss policy and partnership lessons learned from a disaster in Arkansas; bed surge and mass fatality support and coordination best practices from a Greyhound bus disaster in Pennsylvania; Community Assessment Tool (CAT) implementation in Nebraska; and rural healthcare coalition development strategies used in Missouri.


The focus of this report is on immediate bed availability in rural healthcare settings. The authors conducted a literature review and synthesized data collected during interviews with representatives in four areas: Mississippi, Southwest Utah, Virginia, and Southeast Texas.
Surge/Mass Care Response


The authors conducted a retrospective study of administrative hospital claims in a state that experienced a mass casualty incident involving more than 200 casualties. They found that--when adjusted for severity of illness--both casualty and non-casualty patients had significantly longer lengths of stay and higher charges than traditional patients during non-surge periods.


This document includes information to help planners enhance and/or develop a community's (not hospital-specific) medical surge plans. It is organized into chapters (e.g., Building Planning Teams and Coalitions; Models of Healthcare Delivery; Alternate Care Systems; Essential Healthcare Services; and Crisis Standards of Care). The chapter on coalitions defines roles and responsibilities for planning teams and coalitions, and the steps necessary to determine a community's healthcare needs.


The authors surveyed United Kingdom Primary Care Trust Hospitals over a period of time to determine the number of beds they could “free up” in the event of a major incident.


The authors sought a more accurate way to determine hospital bed surge capacity by using physician and nurse manager assessments (instead of traditional cross-sectional hospital census data).


The authors list 22 suggestions specific to surge capacity and mass critical care under the following topics: stockpiling of equipment, supplies, and pharmaceuticals; staff preparation and organization; patient flow and distribution; deployable critical care services; and using transportation assets to support surge response.

Data from patients admitted to six Level 1 Trauma Centers in Israel just after a mass casualty incident allowed the authors to develop related guidelines for hospitals to activate in the event of similar events.


The authors used a new rapid screening process to manage patient surge associated with the 2009 H1N1 pandemic and found that it—along with a slight increase in staffing—improved patient flow and had no effect on emergency room return rates within two or seven days.


This checklist is rooted in the “whole community approach” and aims to help the healthcare community prepare for significant increases in demand as a result of a critical incident.


The authors highlight the roles physicians can play during surge events (e.g., assisting with reverse triage and patient flow).


Non-respiratory therapy staff can be trained to augment staff and help patients in respiratory failure after a critical incident.


The authors provide a framework and checklist for initial surge actions and areas of attention for a hospital in the first hour after a mass casualty incident.
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The focus of this report is on immediate bed availability in rural healthcare settings. The authors conducted a literature review and synthesized data collected during interviews with representatives in four areas: Mississippi, Southwest Utah, Virginia, and Southeast Texas.

This toolkit provides links to templates and other surge tools that can help hospital staff determine their surge planning, staffing, and supply needs.

The goal of this guide is to help community and hospital planners meet patient demand when it outweighs supply. The authors also dedicate a chapter to the use of alternative care sites.

This article focuses on intensive care unit surge and lists recommended standard operating procedures for staff assigned with managing patient flow.

The authors share information on standards of care, tools and resources, and case studies of how hospitals have planned for mass casualty events.

The article details a real-life reverse triage situation where a full hospital freed up 56 beds (16% of capacity) to treat casualties suffering from blast injuries.


The authors examined the impact of delaying hospital procedures on immediate bed availability.


Using data from “established databases and published reports,” the authors examined both the baseline capacity of U.S. healthcare facilities and the length of time it took for external facilities to provide assistance after a no-notice critical incident. They concluded that communities should plan to maintain their provision of medical services without assistance for at least 24, and as much as 96 hours, after such an incident.


According to the authors, the “art” of surge includes decisions, authority, and responsibility, and the “science” includes numbers and benchmarks. The authors share surge strategies used by the U.S. military and Israel that can be replicated by other healthcare systems.


The speakers in this webinar share information related to the challenges faced by health systems in response to surge events, as well as coordination efforts and strategies implemented by local health departments and healthcare coalitions to achieve surge capability for health and medical services.

**Surge Planning**

This handbook provides an overview of the Medical Surge Capacity and Capability (MSCC) Management System and describes how the model can be applied and integrated across six “tiers of response.”


Together with a variety of stakeholders, the California Department of Public Health developed standards for healthcare facilities and communities to implement during surge events.


This toolkit can help neonatal and pediatric medical care professionals build and sustain related disaster preparedness programs.


This document includes information to help planners enhance and/or develop a community's (not hospital-specific) medical surge plans. It is organized into chapters (e.g., Building Planning Teams and Coalitions; Models of Healthcare Delivery; Alternate Care Systems; Essential Healthcare Services; and Crisis Standards of Care). The chapter on coalitions defines roles and responsibilities for planning teams and coalitions, and the steps necessary to determine a community's healthcare needs.


In this article, the authors provide a summary of the threat of major disasters and an overview of mass critical management to help intensive care unit directors prepare their teams for similar events.


The authors provide an overview of system dynamic modeling and how it can be used to predict epidemics (when used in conjunction with surveillance systems, sentinel data, and other tools). The authors suggest a way to synthesize the concepts and highlight future work that can help with resource allocation in surge events.

According to the author, surge capacity estimates should include daily variation in patient volume and within-year variation in bed supply; relying simply on the latter may provide inaccurate estimates.


The report and associated tools can help emergency planners and other stakeholders select, staff, and stock Disaster Alternate Care Facilities.


This article highlights consensus statements gathered from literature and expert opinion and classified under eight themes. The authors emphasize the importance of system-level surge planning, robust communication systems, realistic exercises, and support from the federal government.


The author summarizes one state’s planning activities surrounding pandemic influenza. Each healthcare facility had to address four objectives, including increasing bed availability.


The authors used a new rapid screening process to manage patient surge associated with the 2009 H1N1 pandemic and found that it—along with a slight increase in staffing—improved patient flow and had no effect on emergency room return rates within two or seven days.


This checklist is rooted in the “whole community approach” and aims to help the healthcare community prepare for significant increases in demand as a result of a critical incident.

The authors highlight the roles physicians can play during surge events (e.g., assisting with reverse triage and patient flow).


In this article, the authors suggest using a three-level surge capacity taxonomy (conventional capacity, contingency capacity, and crisis capacity) to bolster hospital surge planning.


Ten suggestions associated with the principles of surge capacity and immediate bed availability are summarized by the authors, who also stress the importance of scenario-based planning and the development of disaster-related management and patient data forms.


The authors provide a framework and checklist for initial surge actions and areas of attention for a hospital in the first hour after a mass casualty incident.


Chapter 7 of the framework, Hospitals and Acute Care Facilities, provides a high level of detail related to implementing surge strategies, including immediate bed availability.


The authors developed the Trauma Surge Index and used it with an established definition of mass casualty events to examine recent hospital surges. They found that patients admitted during high-surge period had higher mortality than those admitted during low-surge periods.

The authors provide an overview of planning for and operating surge hospitals followed by five case studies of surge hospitals that were stood up after Hurricane Katrina.


The difference between daily and disaster surge is highlighted by the authors who also provide an overview of the essential components of surge capacity and related planning tips.


The authors examined differences in patient boarding times in U.S. areas at risk for public health emergencies. They found that 86% of at-risk hospital referral regions had high boarding times (suggesting greater vulnerability), though it is important to note the limitations associated with drawing conclusions solely based on daily capacity.


This literature review of more than 60 articles related to surge metrics found that while disaster simulation studies have advanced the study of disaster surge, use of reverse triage approaches and altered standards of care, as well as Internet-based tools such as Google Flu Trends, have also proven effective. The authors note that more work needs to be done regarding standardizing research methodologies and outcomes and validating disaster surge metrics.


The authors summarize the main components of Utah’s medical surge plan and provide information on immediate bed availability, plan activation and response, and communications.

This toolkit provides links to templates and other surge tools that can help hospital staff determine their surge planning, staffing, and supply needs.


This article focuses on intensive care unit surge and lists recommended standard operating procedures for staff assigned with managing patient flow.


During this national call, speakers shared information about medical surge and how hospital staff can use immediate bed availability to operationalize Capability 10.


The speakers in this webinar share information related to the challenges faced by health systems in response to surge events, as well as coordination efforts and strategies implemented by local health departments and healthcare coalitions to achieve surge capability for health and medical services.


The authors share the results of a literature review that included surge capacity, and conclude that more work needs to be done in the area of generating strong frameworks and data collection methods.

**Agencies and Organizations**

U.S. Department of Health and Human Services, Office of the Assistant Secretary for Preparedness and Response, Hospital Preparedness Program: [Guidance, Reports and Research](#).

U.S. Department of Health and Human Services, Office of the Assistant Secretary for Preparedness and Response, Crisis Standards of Care Communities of Interest: [Immediate Bed Availability](#).
This ASPR TRACIE Topic Collection was comprehensively reviewed in April 2015 by John Hick, MD, HHS ASPR and Hennepin County Medical Center.

Additional assistance provided by Alicia Livinski, Biomedical Librarian, HHS National Institutes of Health and Anthony McIntyre, MD, George Washington University.