Disaster Medicine and Public Health Preparedness

www.cambridge.org/dmp

Responder Tools

Cite this article: Thomasian NM, Madad S, Hick JL, Ranney ML, Biddinger PD (2021) Hospital Surge Preparedness and Response Index. *Disaster Med Public Health Prep* **15**: 398–401 doi: https://doi.org/10.1017/dmp.2021.190.

Keywords:
The 4 "S" domains; domains of hospital service capacity; staffing; supplies; space; systems

Corresponding author:
Syra Madad,
Email: syra_madad@hks.harvard.edu.

Hospital Surge Preparedness and Response Index

Nicole M. Thomasian BS[1,2], Syra Madad DHSc, MSc, MCP[1,3], John L. Hick MD[4], Megan L. Ranney MD, MPH, FACEP[2,5,6] and Paul D. Biddinger MD, FACEP[7,8,9]

[1]Belfer Center for Science and International Affairs, Harvard Kennedy School of Government, Cambridge, MA, USA; [2]Warren Alpert Medical School, Brown University, Providence, RI, USA; [3]System-Wide Special Pathogens Program, New York City Health + Hospitals, New York, NY, USA; [4]Department of Emergency Medicine, Hennepin Healthcare, University of Minnesota, Minneapolis, MN, USA; [5]Brown-Lifespan Center for Digital Health, Brown University, Providence, RI, USA; [6]Brown University School of Public Health, Brown University, Providence, RI, USA; [7]Harvard TH Chan School of Public Health, Boston, MA, USA; [8]Department of Emergency Medicine, Massachusetts General Hospital, Boston, MA, USA and [9]Harvard Medical School, Boston, MA, USA

Abstract

The Hospital Surge Preparedness and Response Index is an all-hazards template developed by a group of emergency management and disaster medicine experts from the United States. The objective of the Hospital Surge Preparedness and Response Index is to improve planning by linking action items to institutional triggers across the surge capacity continuum. This responder tool is a non-exhaustive, high-level template: administrators should tailor these elements to their individual institutional protocols and constraints for optimal efficiency. The Hospital Surge Preparedness and Response Index can be used to provide administrators with a snapshot of their facility's current service capacity in order to promote efficiency and situational awareness both internally and among regional partners.

A medical surge occurs when patient volumes and/or clinical needs exceed the limits of hospital service capacity. This can occur at any time for a multitude of hazards from mass casualty incidents to infectious disease outbreaks. A surge can be brief or protracted – spanning from days to weeks or weeks to months – and can involve 1 or all of the 4 "S" domains of hospital service capacity: staffing, supplies, space, and systems.

A medical surge's impact on health care delivery can occur across a continuum, ranging from conventional to contingency to crisis operations (see *Keywords*). Based on the premise that "ready or not" incidents will occur and patients will present, hospitals must have plans and processes established to be able to care for those patients.

The Hospital Surge Preparedness and Response Index is an all-hazards template developed by a group of emergency management and disaster medicine experts from the United States (Figure 1). Multiple working group plenary sessions were convened between November 2020 and April 2021, with a consensus on the index items derived via a modified Delphi process. While the US experience may differ from those of other nations in terms of logistical detail, the key principles in disaster preparedness and response are generally well conserved. It should be noted, however, that in areas with developing infrastructure, the ability to coordinate information and to consistently access supply chains may be limited. Further, political capacity to induce change will vary across local/regional/national jurisdictions. These bureaucratic constraints can impact the development of disaster-related policy measures and governmental roles, both of which can in turn affect the ability of hospitals and health care systems to effectively manage a surge.

The Hospital Surge Preparedness and Response Index can improve planning by linking action items to institutional triggers across the surge capacity continuum. This responder tool is a non-exhaustive, high-level template: administrators should tailor these elements to their individual institutional protocols and constraints for optimal efficiency. We acknowledge that, in practice, the trigger points described herein are not inherently linked (see Figure 1). Indeed, they may often be in flux so that an activation of one surge domain does not necessarily imply an activation in other domains. There are also aspects within the index that may apply to all surge domains (eg, active palliative care, load-balancing). An appropriate, phased response is not only contingent upon effective disaster planning, but also on staunch incident command. The above limitations notwithstanding, the Hospital Surge Preparedness and Response Index can be used to provide administrators with a snapshot of their facility's current service capacity in order to promote efficiency and situational awareness both internally and among regional partners. See service capacity descriptions below.

CONDITION	CONVENTIONAL	CONTINGENCY	CRISIS
STAFFING	**Triggers:** • Can meet institution's routine staffing protocol	**Triggers:** • Cannot meet institution's routine staffing protocol but can provide staffing alternatives to meet patient medical needs	**Triggers:** • Cannot meet all patient medical needs with available staffing options
	Action Items: • Maintain usual staffing assignments • Use routine staffing to acuity (ratios vary by institution) • Isolate/quarantine any infected / exposed staff per public health recommendations • Familiarize staff with institutional protocol for disaster conditions	**Action Items:** • Determine shortage etiology (e.g.: staff illness/ injury versus patient volumes) • Cross-cover with staff of similar training • Adjust staff to ratios or acuity as needed (e.g.: staff:patient from 1:2 to 1:3) • Cross-train ambulatory, perioperative, and/or underutilized staff • Adjust admission criteria for specific units as needed to match trained staff to type of patients • Leverage any existing local, state, and national MOUs • Obtain contract staff	**Action Items:** • Use step-up staffing with staff that do not normally provide similar patient care to replace or supplement staffing shortages in critical roles; consider individual skillsets when making assignments • Use a tiered staffing model • Adjust staff to ratios or acuity as needed (e.g.: staff:patient from 1:2 to 1:8) • Begin structured onboarding of volunteers (e.g. volunteers with active practice similar credentials, retired similar credentials, student, non-similar credentials, etc.); consider temporary relaxation of state licensing rules
SPACE	**Triggers:** • Hospital operating at normal census • Patients to be admitted are at "X" % of ED bedspaces dependent on institution	**Triggers:** • Med/Surg occupancy exceeds institutional conventional capacity • ICU occupancy exceeds institutional conventional capacity • Patients to be admitted are at "X" % of ED bedspaces dependent on institution • Morgue at "X" % capacity contingent upon institution morgue surge plan	**Triggers:** • No inpatient bed assignment available for ventilated/ critical care level of care needs patients in the ED for "X" hours/days/weeks or for an extended period of time • Patients to be admitted are at "X" % of ED bedspaces dependent on institution • No morgue space available for deceased patients
	Action Items: • Use typical patient care area utilization • Review and drill plans for surge space creation • Develop remote patient monitoring systems, community paramedicine, home or mobile observation units, etc.	**Action Items:** • Reverse triage low-acuity patients for discharge to increase surge space • Create additional ICU care spaces (e.g.: using PACU, monitored units) • Reduce or eliminate non-emergency surgical cases that require inpatient resources per tiered case deferral model • Implement home monitoring / home hospitalization and virtual care for selected conditions • Prepare adjacent and alternate care/triage areas (hospital or community based) • Load balance patients across other hospitals / regionally • Develop alternate spaces for patients without access to housing such as those experiencing homeless & long-term care patients • Consider alternative morgue sites • Double current single rooms as safe from an infection / exposure perspective	**Action Items:** • Create on site space in non-patient care areas (e.g.: conference rooms, waiting areas, hallways, cafeterias) • Prepare facility adjacent and alternate care/ triage areas (community based) • Continue to expand critical care areas into monitored and other units • Continue to reduce non-emergency services to focus staff and space on acute care • Leverage adjacent and alternative care/triage areas • Load balance patients across other hospitals / regionally • Manage low-acuity patients that would typically receive hospital level care as outpatients and change criteria for admission to inpatient units as required • Perform active palliative care team outreach in the ED to ensure patients are placed in units consistent with their goals of care • Assure that patients are directed to the most appropriate unit for care based on their condition, including consultation with clinical providers (e.g. hospitalist/critical care)

Figure 1. Hospital Surge and Preparedness Index. Fields denoted by "X" refer to institution-specific parameters to-be-filled by administrators.

https://doi.org/10.1017/dmp.2021.190 Published online by Cambridge University Press

SUPPLIES	**Triggers:** • Supplies & equipment sufficient for meeting patient care needs	**Triggers:** • Ongoing or impending shortages negatively impact care but functional alternatives available	**Triggers:** • Shortages compromise ability to meet patient needs
	Action Items: • Leverage alternative supply chains • Create local and regional collaboratives for distribution of scarce resources where they are needed most • Collaborate with non-governmental entities and private corporations to develop new supply chains	**Action Items:** • Consistent with functionally equivalent care to assure adequate resources: » Conserve » Substitute » Adapt / Repurpose » Extend use » Limited re use / decontaminate • Consider alternatives to standard supplies (e.g., sewn gowns instead of disposable gowns; elastomeric masks instead of N95s) • Conserve standard supply & equipment utilization	**Action Items:** • Use more aggressive conservation, adaptation, substitution strategies » Re-use » Reallocate » Ration
SYSTEM	**Triggers:** • No operational/utilities failures, hazard incident, or infectious disease case(s) negatively impacting facility and/or regional standard of care • Infectious disease-related hospitalizations do not exceed institutional capacity or negatively impact hospital operations	**Triggers:** • Operational/utilities failures, hazard incident, or epidemiological disease does not directly threaten facility and/or regional standard of care (e.g. contaminated casualties from HAZMAT addressed by hospital decontamination capacity) • Can maintain hospital infection prevention and control when infectious disease-related hospitalizations exceed institutional capacity • Coalition coordination and information sharing • Neighboring hospitals requesting resource support due to incident impact • Contingency activation in any of the other three domains	**Triggers:** • Operational/utilities failures, hazard incident, or epidemiological disease burden directly threatens facility and/or regional standard of care and patient outcomes • Cannot maintain hospital infection prevention and control when infectious disease-related hospitalizations exceed institutional capacity
	Action Items: • Maintain routine standard of care • Use maximal utilization of existing capacity • Activate incident command team and consider command center activation based on incident • Determine surge plan for the anticipated impact • Evaluate IT/IS needs for surge • Develop flexible social media and digital health systems / applications at the population level for notification and symptom check that can be easily adapted in the event of a disaster	**Action Items:** • Maintain equivalent standard of care • Load balance to nearby hospital systems as needed • Share resources at the intra facility/systems level • Use regional / coalition information sharing including capacity/acuity/staffing information • Develop and circulate policies / guidance on care / conservation / adaptation strategies • Make consult team available for care decisions not covered by policy • Develop IS/IT training guides for contingency staffing and workforce and space • Develop a deferral plan for non-emergent surgeries or interventions (e.g.: heart valve replacement, oncologic surgeries) that minimizes adverse outcomes across both disaster-related and routine patients	**Action Items:** • Maintain best possible standard of care given resource constraints • Per local government guidance, load balance to internal and *external* hospital systems to balance staffing and space impacts • Publicly communicate and acknowledge crisis conditions (specific to resource deficit) at facility, coalition/region, public, political levels • Share resources at the intra and *inter* facility/systems level • Provide guidance on care rationing facility / region / state • Consult / triage team prepared to make care-limiting decisions as required and inform best practices for other rationing decisions

Figure 1. Continued.

Staffing: ability to provide needed care with the available medical personnel. Assessment of staffing need considers different levels of care, including: Intensive Care Unit, Emergency Department/Triage, Monitored/Intermediate care, Medical/Surgical (general floor) care, and so forth.

Space: physical area and infrastructure needed to provide care considering patient need, that is, airborne infection isolation (eg, negative pressure) rooms, oxygen, electrical, monitoring double/triple occupancy, alternative care sites/areas, security, and so forth.

Supplies and equipment: items needed to provide care (eg, personal protective equipment, ventilators, medications, dialysis machines, telemetry and pulse oximetry equipment, linen, medication pumps, disposables such as needles, IV supplies)

System: mechanisms for effective decision-making about resource utilization and coordination of actions at the facility/hospital level, as well as across health care systems to provide needed care. This often involves engagement with local and regional coalitions (eg, load balancing, sharing resources intra- and inter-facility/system, policy, information sharing).

https://doi.org/10.1017/dmp.2021.190 Published online by Cambridge University Press

Capacity Standards of Care Across the Surge Continuum

Conventional: no changes to routine clinical practices and standard of care

Contingency: moderate changes to 4 "S" domains needed to maintain functionally equivalent clinical practices and standard of care

Crisis: major changes to 4 "S" domains needed to provide the best care possible with the limited resources available with the recognition that these modifications may pose substantial risk(s) of adverse outcomes

Conflict(s) of interest. The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this paper.

Acknowledgements. We acknowledge the review and resources provided by the US Department of Health and Human Services, Office of the Assistant Secretaryfor Preparedness and Response, Technical Resources, Assistant Center, and Information Exchange (ASPR TRACIE).

https://doi.org/10.1017/dmp.2021.190 Published online by Cambridge University Press