GUIDELINES FOR ALLOCATION OF SCARCE MEDICAL RESOURCES

Version 1.0

April 5, 2020

Important Message to Readers

This document was created to provide a resource to hospitals as they navigate difficult decisions related to patient surge situations and the allocation of scarce medical resources. It is provided as guidance, not as an official state plan for how scarce resources should be allocated. This document was prepared as an "all-hazards" guidance document but is certainly applicable in response to pandemics.

Some hospitals and health systems have undertaken comprehensive processes to develop their own plans, some of which may vary from the approaches considered in this document. Other hospitals are not as far along in their development of these plans and will find this document useful to furthering their work on these challenging resource allocation issues.

This document is not intended to substitute for any plans that are developed locally or regionally. Some regions are engaging in regional discussions regarding allocating scarce resources, and that collaboration is encouraged to continue. Each hospital is encouraged to collaborate with other hospitals in your region to develop plans to allocate resources regionally. At the same time, this document clearly recognizes and preserves the importance of clinical decision-making within the hospital facility and encourages the use of teamwork to navigate these complex decisions as the situation requires.

This document was created based on input from a committee of physicians, ethicists, and other emergency preparedness experts that occurred over a period of years but has not been adopted as an official state plan. It has also been informed by the Institute of Medicine's report entitled *Guidance for establishing crisis standards of care for use in disaster situations: A letter report* (2009), as well as a review of other similar documents created by other states, and numerous other reports of subject-matter experts.

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INTRODUCTION

The primary objective for comprehensive scarce medical resource management is to maintain the usual, or functionally equivalent, standard of patient care during a medical surge event. The cornerstone of these planning efforts is the ability of facilities to anticipate, mitigate and respond to imbalances between resource availability and demand for services.

An organizational structure, in the form of a multi-disciplinary team of clinical and operation subject matter experts/decision-makers, proactively convened and sanctioned at the highest level of hospital administration, is crucial for effective scarce resource management and policy formulation. Although hospitals have been involved in surge capacity planning for years, this body of work by necessity, has evolved over the recent past due to the nature of and citizen-response to sudden, often catastrophic, events occurring across the world; and the types and numbers of trauma-based causalities imposed by them on individual hospitals. This current reality requires facilities to take a second look at their surge processes and resource management strategies.

It is important that proactive discussions within an organization include not only alternative strategies for resource allocation and consumption, but equally important, facility-specific indicators that predict change in demand or resource availability and discrete, well-defined triggers that may assist decision-makers in anticipating the provisions required for appropriate patient care needs where resources may not be readily available. Identifying these response tactics, in isolation, will not effectively contribute to a systematic, data-driven allocation response in medical surge events, therefore it is important to have a team of decision makers pre-identified for a scarce resource management program.

PURPOSE

The intent of this document is two-fold: (1) To provide strategic guidance for individual hospitals to develop a scarce resource management program in their facilities and; (2) To assist hospitals in building organizational resilience by strengthening their ability to provide the usual and/or functionally equivalent level of patient care in surge events, large or small.

Recommendations are meant to be adaptable for all facilities based on their individual capability and capacity.

SCOPE

Although this document focuses primarily on acute care organizations, it is important to note that the duty to plan for surge events does not rest solely with hospitals. Long-term care facilities, free-standings Emergency Departments (EDs), community-based health clinics, home health and hospice agencies, outpatient medical and surgical facilities and primary care physicians should also have plans that prepare for staff shortages, adaption of space for surge response or mitigation, conservation of resources and continuity of operations in the event of a situation of scarcity in their facility or the community. Non acute care facility planners may benefit by modifying strategies contained within this document for their specific organizational resource management objectives.

PLANNING ASSUMPTIONS

- A process for communication, coordination and information-sharing during surge events has been developed and exercised at the regional level.
- Exercises are conducted to stress hospital resources to a facility-level crisis.
- Carefully crafted mutual aid agreements and/or memorandums of understanding (MOU) have been fully executed among facilities and suppliers and reviewed annually.
- Hospitals have updated surge plans that reflect the evolution of surge capacity concepts, evidence-based research and current risk analysis. Plans are based on measurable decision-making tools and criteria.
- Initiation of contingency and facility-level crisis care lies within the purview of individual hospitals.

FUNDAMENTALS OF SCARCE RESOURCE ALLOCATION

1. Establish an organization resource management team dedicated to allocation of scarce medical resource (ASMR) planning and disaster risk management during surge events. Members should be subject matter experts and decision makers from different areas of the hospital (administrative, clinically, logistics, etc.)
2. Complete an Outcomes-Based Hazard Vulnerability Analysis.
3. Utilize a Continuum of Care Model (conventional, contingency, facility-crisis care).
4. Establish facility-level indicators and trigger points to pre-define resource thresholds.
5. Establish reciprocal obligations for staff and providers.

FIVE KEY ELEMENTS

The Institute of Medicine standards of care committee 2009 letter report described the framework and foundational elements for the development and implementation of CSC. The committee's vision for this original framework was based on fairness (i.e., standards are evidence based and recognized as fair by all they affect); equitable processes for decision making and implementation (i.e., transparency, consistency, proportionality, and accountability); community and provider engagement, education, and communication through formalized processes; and the rule of law (i.e., the authority to take necessary and appropriate response actions and an environment that facilitates the implementation of response actions through appropriate laws and regulations). Based on this vision, the committee, in its letter report, recommended the five key elements for CSC protocol development shown in Table 1: Five Key Elements of Crisis Standards of Care Protocols and Associated Components from the 2009 Letter Report and described in the following subsections.

TABLE 1: Five Key Elements of Crisis Standards of Care Protocols and Associated Components from the Institute of Medicine 2009 Letter Report.	
Key Elements of Crisis Standards of Care Protocols	Components
Ethical considerations	• Fairness • Duty to care • Duty to steward resources • Transparency • Consistency • Proportionality • Accountability
Community and Provider Engagement, Education and Communication	• Community stakeholder identification with delineation of roles and involvement with attention to vulnerable populations • Community trust and assurance of fairness and transparency in processes developed • Community cultural values and boundaries • Continuum of community education and trust building • Crisis risk communication strategies and situational awareness • Continuum of resilience building and mental health triage • Palliative care education for stakeholders

Legal Authority and Environment	• Medical and legal standards of care
	• Scope of practice for health care professionals
	• Mutual-aid agreements to facilitate resource allocation
	• Federal, state and local declarations of
	  ○ Emergency
	  ○ Disaster
	  ○ Public health emergency
	• Special emergency protections (e.g., PREP Act, Section 1135 waivers of sanctions under EMTALA (Emergency Medical Treatment and Active Labor Act) and HIPAA (Health Insurance Portability and Accountability Act).
	• Licensing and credentialing
	• Medical malpractice
	• Liability risks (civil, criminal, Constitutional)
	• Statutory, regulatory, and common-law liability protections

TABLE 1: Five Key Elements of Crisis Standards of Care Protocols and Associated Components from the Institute of Medicine 2009 Letter Report.	
Key Elements of Crisis Standards of Care Protocols	Components

Indicators and Triggers	Indicators for assessment and potential management:
	• Situational awareness (local/regional, state, national)
	• Incident specific
	  o Illness and injury—incidence and severity
	  o Disruption of social and community functioning
	  o Resource availability
	Triggers for action:
	• Critical infrastructure disruption
	• Failure of "contingency" surge capacity (resource-sparing strategies overwhelmed)
	  o Human resource/staffing availability
	  o Material resource availability
	  o Patient care space availability

Clinical Process and Operations	Local/regional and state government processes to include: • State-level "disaster medical advisory committee" and local "clinical care committees" and "triage teams" • Resource-sparing strategies • Incident management (National Incident Management System [NIMS]/Hospital Incident Command Structure [HICS]) principles • Intrastate and interstate regional consistencies in the application of crisis standards of care • Coordination of resource management • Specific attention to vulnerable populations and those with medical special needs • Communications strategies of the health system, including public health, emergency medical services, long-term care, primary care, and home care Clinical operations based on crisis surge response plan: • Decision support tool to triage life-sustaining interventions • Palliative care principles • Mental health needs and promotion of resilience
SOURCE: IOM, 2009, pp. 21-23.	

Ethical Considerations

Health care professionals must adhere to ethical norms even in conditions of overwhelming scarcity that limit practitioner and patient choices. As a starting point for CSC planning deliberations, ethical values should include the concept of fairness, together with professional duties to care for patients and steward resources. The CSC development process should be guided by key ethical values, including transparency, consistency, proportionality and accountability.

The US Department of Health and Human Services Office of Civil Rights (OCR) enforces the Americans with Disabilities Act, Section 504 of the Rehabilitation Act, the Age Discrimination Act, and Section 1557 of the Affordable Care Act which prohibits discrimination in HHS funded health programs or activities. As such, persons with disabilities should not be denied medical care on the basis of stereotypes, quality of life, or judgments about a person's relative "worth" based on the presence or absence of disabilities or age. Decisions by covered entities concerning whether an individual is a candidate for treatment should be guided by an individualized assessment of the patient and his or her circumstances, based on the best available objective medical evidence.

Ethical Considerations for Triage

Providers likely to perform triage should understand their facility's ethical and procedural grounding; otherwise they may make implicit value judgments that do not reflect institutional and community values.

In many cases, allocation decisions do not critically impact survivability (e.g., the use of certain medications, appropriateness for discharge, diagnostic testing). In other cases, access to a life-saving intervention, such as mechanical ventilation or ECMO (Extracorporeal Membrane Oxygenation), may not be available to all patients who need it. These allocation decisions are extremely challenging, and require careful consideration, strong ethical foundations, and thoughtful transition to palliative care.

One problem that can be anticipated in a catastrophic disaster situation (such as a pandemic influenza) is having more people who require care than available resources to provide that care. Resources for the delivery of health care may be depleted and the resupply may be either slow or nonexistent. The provision of palliative care in the context of a disaster with scarce resources can be considered a moral imperative of a humane society.

Ethical Considerations for Allocations

Any ethically acceptable allocation system should adhere to the components to ethical considerations depicted in Table 1: Five Key Elements of Crisis Standards of Care Protocols including, most important, the principle of fairness. Generally, an allocation system will be more likely to pass the test of fairness if it reflects the additional principles of transparency, consistency, proportionality, and accountability. The ethics framework's greatest potential for impact is during the development of CSC plans. The RPAT (Resource Planning and Allocation Team) is responsible for ensuring that CSC plans incorporate such ethical principles that benefit the process best when they themselves are well versed in the specific issues affecting and affected by CSC plans and their implementation. It is also important to recognize how those issues expand upon and differ from ethical issues associated with routine medical

practice. To ensure that the issues entailed in the process are resolved in a way that reflects community values, facilities may choose to engage the community in a dialog to help establish the standards that will be applied. Professionals have special training that helps them determine how best to achieve certain goals however they must factor in the values of their community members. An example of this is whether age is an appropriate factor in determining access to scarce health care resources. For instance, not all cultural groups value the young; some groups prize their elders and would not agree with giving younger patients priority.

Community and Provider Engagement, Education and Communication

Meaningful, integrated, and ongoing engagement of CSC stakeholders (e.g., the public, at-risk populations, health care providers) is critical for effective CSC planning and implementation. State and local governments involved in CSC planning should ensure that strong public engagement occurs and that it promotes trust and transparency in the process, delineates roles and responsibilities and gives particular attention to the needs of at-risk populations and those with special medical needs. Active engagement should contribute, as appropriate, to developing and refining CSC protocols, developing communication and educational messages/tools for the public and health care practitioners, developing and implementing strategies for community resilience and improving future CSC responses.

Legal Authority and Environment

Establishing and implementing CSC plans requires careful consideration of the substantial legal challenges involved, including potential liability. Among the legal topics identified as requiring assessment and potential resolution during the course of CSC planning efforts are emergency declarations (local, state, federal), medical versus legal standards of care, mutual-aid agreements, liability risks (including medical malpractice), liability protections (e.g., Public Readiness and Emergency Preparedness [PREP] Act) during emergencies, licensing and credentialing, regulation of Emergency Medical Services (EMS) and health care facilities and health care practitioners' scopes of practice.

Indicators and Triggers

For the assessment and potential management of CSC incidents, CSC planning efforts should include identifying specific indicators, including those based on situational awareness (e.g., hospital bed availability, ventilator availability, EMS call volume, divert status) and on factors specific to the incident (e.g., incidence and severity of illness or injury; disruption of social and community functioning; availability of resources, such as vaccines and oxygen). Planning efforts should also include establishing triggers for action (e.g., disruption of critical infrastructure, failure of surge capacity strategies).

Clinical Process and Operations

CSC plans should acknowledge the continuum of clinical capacity (i.e., conventional, contingency, crisis) during a disaster and should also establish local, regional and state government clinical processes and operations—including the state disaster medical advisory committee, regional disaster medical advisory committees, and local clinical care committees and triage teams—that implement incident command system principles, resource-sparing strategies, and communication strategies. In addition, CSC plans should ensure that intra- and interstate plans for CSC implementation are consistent, but not necessarily identical; that resource management is coordinated; that specific attention is given to protecting the interests of at-risk populations and those with special medical needs; and that coordination occurs across all levels and elements of the health care system (e.g., EMS, public health, primary care, home care, long-term care).

Goals for the Facility's Resource Planning and Allocation Team

- Coordinate and provide oversight for the entirety of the facility scarce resource allocation program for medical surge events;
- Mitigate deterioration of patient care standards by the pre-determination of organization resource conservation/consumption measures and alternative strategies;
- Plan strategies to direct limited resources towards the highest relative risk outcomes(s) to inform decision;
- Provide data-supported technical and clinical expertise to the Hospital Incident Command;
- Serve as the mechanism for development of applicable all-hazard clinical and logistical policies and processes related to scarce resource management and allocation to augment facility preparedness;
- Maintain on-going situational awareness for actual and/or emerging resource-intensive threats;
- Evaluate effectiveness of established policies, processes and protocols in response to potential threats and/or post-surge event outcomes evaluations;
- Protect the facilities ethical framework through the establishment of consistent procedural protections;
- Ensure preparedness exercises adequately stress the organization's resource thresholds; and,
- Establish and sustain a strong ethical foundation for decision-making and established scarce resource management structure, processes and protocols.

PART ONE – STEPS FOR IMPLEMENTATION OF SCARCE RESOURCES MANAGEMENT PROGRAM

I. OBTAIN C-SUITE ENDORSEMENT OF THE SCARCE RESOURCE BUSINESS MODEL

Buy-in from the top of an organization, including chief executive officer, financial officer, operating officer, information officer, medical officer, nursing officer, etc. for creating a scarce resource management program is essential for a sustainable and effective resource planning and allocation process during medical surge events. It is crucial that administrators understand how this business model may help an organization mitigate the negative impacts on quality of care, patient satisfaction and provider safety, as well as resource, revenue and reputation of the facility.

Additional benefits of a resource management program include the ability to:

1. Effectively meet the provisions of accrediting bodies, as well as conditions of participation for Medicare and Medicaid programs;
2. Translate collaborative and proactive comprehensive resource management efforts into quantifiable community benefits for nonprofit organizations;
3. Mitigate potential provider error(s) often associated with times of high stress and chaos by pre-determining measurable indicators and triggers for movement along a stand of care continuum; and,
4. Stay abreast of the changing external environment and associated risk.

II. ESTABLISH A DEDICATED RESOURCE PLANNING AND ALLOCATION TEAM

In order to accomplish the goals, set forth in this document, it is essential that every facility, regardless of location or size, establish an interdisciplinary team of clinical and technical subject matter experts referred to here as the **Resource Planning and Allocation Team (RPAT).**

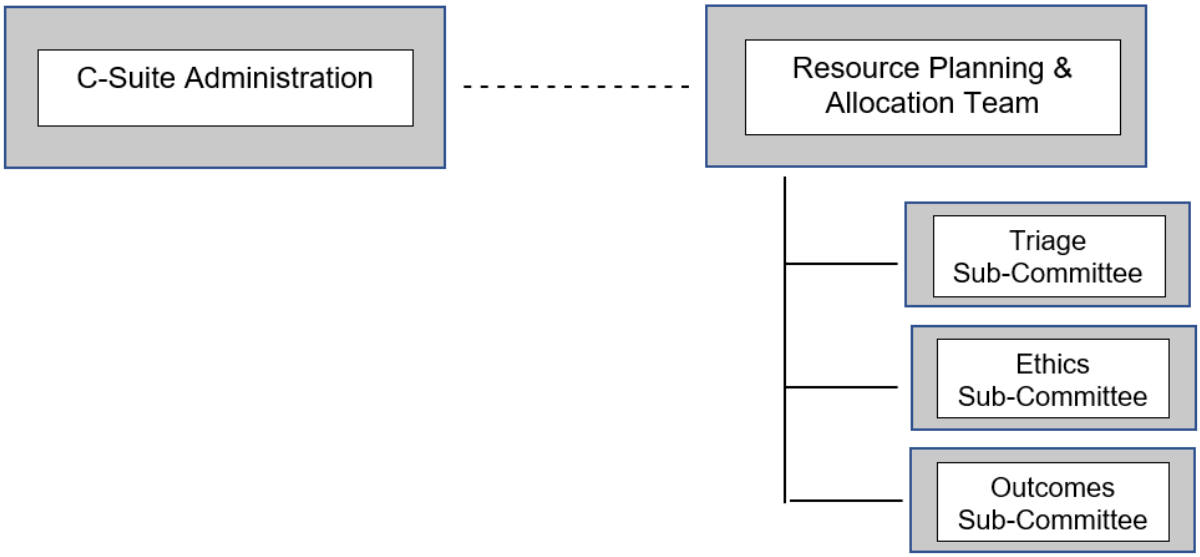
The primary role of the RPAT is to pre-determine strategies, policies and processes for the judicious and ethical consumption and allocation of medical resources when demand for services put stress on the organization to provide the usual level of patient care. This team is dedicated to promoting data-driven decision-making prior, to during and after surge events.

Creation/re-configuring of a dedicated team is crucial in developing an effective and comprehensive resource management program within any organization. It is intended for this team to function as an expanded emergency preparedness team with responsibility and authority from the top of the organization. Team members must be drawn from operational decision-makers responsible for direct patient-care disciplines and clinical service lines within the facility and serving in conjunction with emergency management and non-clinical operations' directors, physicians and administration. Hospital systems may choose to assemble a corporate RPAT that includes representation from all components of the Hospital system.

Suggested RPAT Model

1. It is important that the RPAT is sanctioned by and charged with sufficient authority by the facility or system [C-Suite] and held accountable for accomplishing the goals identified in the body of this guidance. To ensure the highest degree of communication and coordination, it is recommended that the RPAT to be co-chaired by a C-Suite administrator and the person charged with ultimate responsibility for the facility preparedness standards.
2. The RPAT should additionally structure three sub-committee groups: (1) Triage, (2) Ethics and (3) Outcomes to specifically address their topic areas.
3. The organizational structure for the RPAT, depicted in Graphic 1: Organizational Structure, is recommended as a best practice model for acute care organizations. The structure should be scaled to a facility's capacity and capabilities. There should be a well-defined, written reporting mechanism to administration regarding activities of the team.

Graphic 1: Organizational Structure



RPAT Composition

1. Membership of the RPAT and its sub-committees will vary depending on the size of the organization, the type and duration of an incident and the scope of the incident-specific challenges. *It is critical that all members have decision-making authority within their department(s) and/or service line(s).*
2. While it is recognized that not all hospitals will have access to all areas of expertise or numbers of staff to support multiple teams as indicated in the model, ALL major responsibilities outlined in these guidelines should be assumed by the RPAT.
3. The RPAT should develop written role descriptions and responsibilities for team members/sub-committees related to conventional, contingency and facility-level crisis surge events.
4. Recommended composition of the RPAT can be found in Table 2: RPAT Team Composition *on the following page.*

Table 2: RPAT Team Composition

Direct Patient Care	**Clinical & Logistical Operations**
• Clinical Administration such as Chief Nursing Officer or Chief Medical Officer **(Co-Chair)** • Physician Representation (critical care, ED, trauma and/or if applicable, pediatrics) • Nursing Manager(s) (i.e. ED and critical care) • Pharmacy • Respiratory therapy • Laboratory • Infection Prevention and Control/Infectious Diseases • Radiology • Surgical Services • Hospice and/or Palliative Care	• Emergency Management Administrator **(Co-Chair)** • Ethics • Finance • Quality/Risk Management • Human Resources • Facilities and/or Materials Management • Ad hoc members with decision-making authority over resource allocation and/or operational strategies for non-clinical and/or ancillary departments (i.e. admitting billing, dietary, security, performance improvement, etc.)

RPAT Composition – Sub-Committee Responsibilities

(1) Triage, (2) Ethics and (3) Outcomes

Triage Team

The TT may be a sub-group within the RPAT in smaller facilities or an ad hoc team(s) in larger organizations.

1. Suggested Composition	• Representatives from the medical staff, nursing and ethics
2. Responsibilities	• Collect scoring data according to established triage protocols specific to the disaster • Calculate triage scores; ensure accuracy and timeliness of data • Identify patients who qualify or no longer qualify for scarce lifesaving resources and present to IC for allocation decisions • Maintain appropriate log(s) of triage decisions and rationale

Triage decisions are often involved in CSC. The impact of triage on the primary goal of CSC is to provide the best outcomes for the largest number of patients. This will be dependent on the number of patients

presenting, the duration for which they use specific resources, and their outcomes relative to other patients. The organizational structure proposed in these guidelines reinforces that bedside clinicians should not be responsible for decisions to deny or remove potentially life-saving resources during a disaster.

Three basic types of Triage:

Primary triage—performed at first assessment and prior to any interventions (e.g., triage upon entry to the emergency department or by EMS providers at a disaster scene)

Secondary triage—performed after additional assessments and initial interventions (e.g., triage performed by surgery staff after administration of intravenous fluids and an initial CT scan)

Primary and secondary triage are taught and preformed routinely in high-volume situations or in a mass causality. In the early stages of an incident, primary and secondary triage are generally reactive as providers are making resource allocation decisions individually and without structured guidelines. Decisions during this reactive phase rely on the best clinical judgment of providers based on their knowledge of the incident and patients' conditions (usually trauma, burns, or chemical exposures). Triage decisions are influenced by rapidly changing patient volumes and often reflect the prior experience of the provider (e.g., previous military or mass casualty training). Experienced triage officers can potentially limit overtriage (which would commit more resources than necessary) and undertriage (which would risk a viable patient's dying)

Reactive triage is unavoidable in the early stages of an incident but should be limited to the time prior to situational awareness, and proactive strategies should be instituted as soon as possible, with a consistent process for decisions that are as evidence based as possible.

Tertiary triage—performed after or during the provision of definitive diagnostics and medical care (e.g., triage performed by critical care staff after intubation and mechanical ventilation with assessment of physiologic variables)

Tertiary triage is seldom practiced but involves a decision about whether to initiate or continue certain therapies on the basis of a relatively complete knowledge of the patient's diagnosis and prognosis to maximize the use of available resources to save more patients.

Ethics

1. Suggested Composition	• Representatives from the major medical departments; • Other clinical departments, such as nursing, social work, and allied health • Pastoral care, hospital administration, and the community.
2. Responsibilities	• To promote the rights of patients; • To promote shared decision making between patients (or their surrogates if decisionally incapacitated) and their clinicians;

	• To promote fair policies and procedures that maximize the likelihood of achieving good, patient-centered outcomes; and • To enhance the ethical environment for health care professionals in health care institutions.

Components to Ethical Considerations depicted in Table 1: Five Key Elements of Crisis Standards of Care Protocols, *should support ethical behavior at every level of disaster response.*

Outcomes

In a disaster situation involving CSC decisions, there is an obligation to measure affected patients' outcomes and adjust protocols accordingly (Toltzis, 2015). It is also vitally important to collect data to improve planning and processes for future disasters. Prognosis in disaster situations is rarely well-defined. Reassessment of patients who do not receive intervention is an important part of the ongoing triage process.

1. Suggested Composition	• Ethics, quality management and/or patient safety • Reports findings to the RPAT for further analysis and possible protocol adaptation
2. Responsibilities	• Scrutinize patients' clinical and ethical outcomes to ensure triage protocols are in fact saving more lives • Oversee that the organization is honoring its premise to provide comfort care to patients denied potentially life-saving care.

III. COMPLETE AN OUTCOMES-BASED VULNERABILITY ANALYSIS

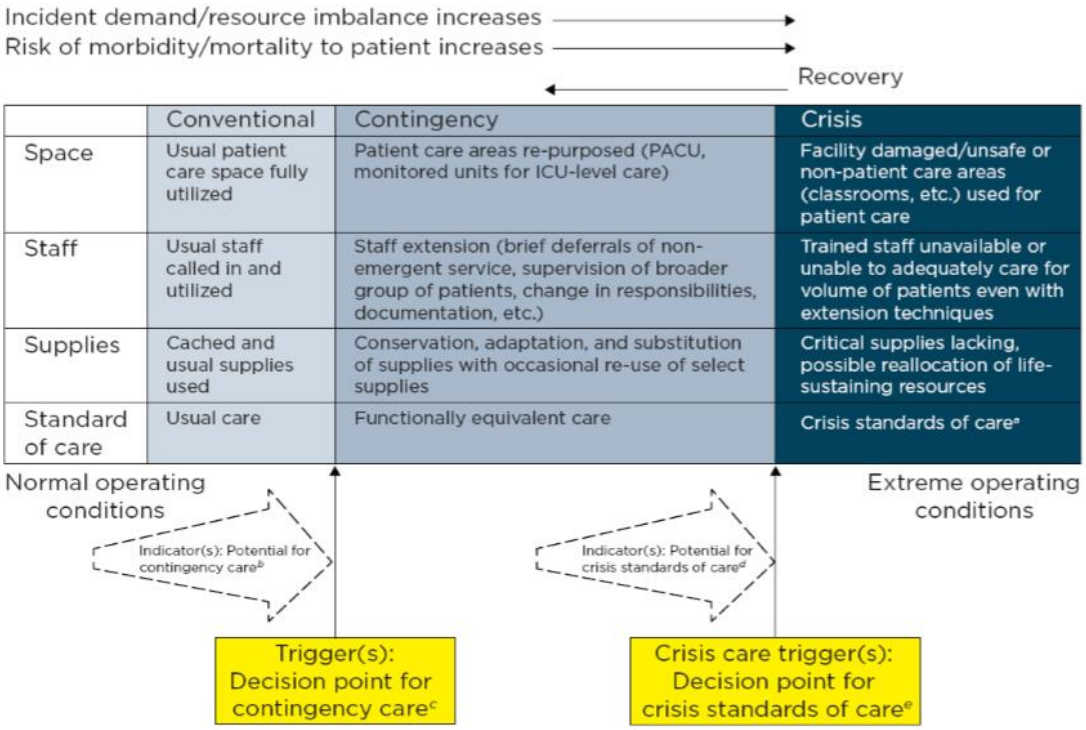
In order to best accommodate the business model established by these guidelines, it is recommended that each organization complete an outcomes-based vulnerability analysis (OVA). (Refer to Appendix D: Facility Outcomes Vulnerability Analysis).

Many of the Hazard Vulnerability Analysis (HVA) tools used by organizations serve to identify and plan against high risk events. Conducting a stand-alone OVA or extrapolating data from the usual method used into an OVA matrix affords an organization the opportunity to prioritize planning in relation to high risk outcomes (including financial risk to the organization), thus directing planning efforts to specific, actionable processes that address an assortment of possible scenarios, in a more comprehensive and cost-efficient manner.

IV. UTILIZE THE CONTINUUM OF CARE MODEL

Graphic 2 (below) illustrates the continuum of care, from conventional care, transitioning to contingency care and finally crisis care. During conventional care, customary routine services are provided with no issues (e.g. use of available inpatient beds). During contingency care, care provided is functionally equivalent to routine care but equipment, medications, and even staff may be used for a different purpose or in a different manner than typical daily use (e.g. substituting one antibiotic for another that covers the same classification). The demands of most incidents can be met with conventional and contingency care. Crisis care falls at the far end of the spectrum when resources are scarce and the focus changes from delivering individual patient care to delivering the best care for the patient population as a whole. This shift in focus, which may require adaptations and non-traditional provision of care, which while necessary to maximize the number of lives saved during a pervasive or catastrophic public health event, increases the risk to the individual patient of a worse outcome. A single resource (e.g. vaccine) or multiple resources (e.g. critical care beds and staffing) may be affected. Notably, emergencies are dynamic, and care moves back and forth along this continuum during an incident. The goal is to avoid the crisis state through good contingency planning and implementation, and to recover from the crisis state as soon as possible. For example, a hospital in a crisis after a local emergency can usually transfer patients and bring in resources within hours to get back to contingency or conventional status. In this example, a state response is not warranted. The activation of a state response is at the end of the continuum of care and is only utilized in an extreme prolonged event for a statewide response.

Graphic 2: During conventional care- Allocation of Specific Resources Along the Care Capacity Continuum



A situation Continuum of Care (COC) model, defined in *Box 1: Definitions of Situational COC*, should be used by all facilities as the basis for organization scarce resource planning and allocation management. Use of a uniform foundational structure promotes continuity of data reporting and inter-hospital and regional communication through the use of common terminology. This model also recognizes the fluidity of resource management during surge events and should be used as the basis for determining facility-related triggers and indicators.

The COC model does not adhere to an "all-in" requirement (i.e. some resources may remain consistent with daily practices while availability of others may require contingency or crisis strategies). Consequently, this paradigm is easily adaptable for fluctuations in daily surge, as well as medical surge events.

Table 7-1

Implications of the Care Capacity Continuum of Care

	Low Risk, Low Impact	Moderate Risk, Moderate Impact	High Risk, High Impact
Space	• Expand hours and use procedural spaces for out-of-hospital care (e.g., surgery and procedure center recovery areas) (Chung et al., 2011; Scarfone et al., 2011) • Use postanesthesia care areas for inpatient capacity	• Use operative spaces for inpatient care • Use alternative care sites to divert outpatients (e.g., "flu centers") (Cruz et al., 2010) or provide basic nonambulatory care (hospital overflow)	• Use cot-based care in flat space areas • Make major changes to admission criteria (e.g., no admission for cardiac rule-outs if no electrocardiogram [ECG] changes and normal troponin)
Staff	• Change documentation requirements • Delegate nonclinical duties (e.g., meal serving) to administrative or other staff	• Change staffing patterns, hours, or supervision • Change frequency of clinical assessment (e.g., vital signs based on clinical changes)	• Provide just-in-time training to staff allow them to provide lower-impact interventions and overall patient care (e.g., inhaler administration, change of burn dressing) so specialty staff can concentrate on higher-impact interventions (e.g., ventilator management, burn debridements)
Supplies	• Implement conservation strategies (e.g., restrict oxygen use to those that have hypoxia) • Recommend substitute medication classes where possible	• Adapt medications or supplies to the incident (e.g., use of BiPAP or selected anesthesia machines as ventilators) • Reuse otherwise disposable products that can easily be cleaned or disinfected (e.g., cervical collars, tourniquets)	• Reuse products that require high-level disinfection or sterilization (e.g., central lines, ventilator circuits) • Allocate resources to those who have the highest chance of survival based on an individual assessment of the patient and his or her circumstance, based on the best objective medical evidence. *

***Table 7.1 from the Institute of Medicine has been modified for Ohio to ensure the health and safety of Ohioans with disabilities.**

Box 1: Definitions of Situational Continuum of Care (adapted from Institute of Medicine Model)

Conventional: spaces, staff and supplies used are consistent with daily practices in the facility and are adequate to maintain the usual standard of care for that hospital during a surge in demand or acuity. Focus of care is on the individual patient.

Contingency: spaces, staff and/or supplies used are not consistent with daily practices in the facility but provide care that is functionally equivalent to usual patient care standards in that hospital. Focus remains on the individual patient.

Crisis: adapted spaces, staff and/or supplies are not adequate to provide conventional or functionally equivalent patient care within the facility. Alternative, transient measures are necessary to provide the best possible care to patients given the circumstances and resources available. Focus shifts from individual patient-centered care to population-centered outcomes.

V. ESTABLISH STRESS INDICATORS AND MEASURABLE TRIGGERS FOR CONVENTIONAL SURGE RESOURCE THRESHOLDS

Operational sustainability during periods of organizational stress can be best accomplished at the facility level by integrating preparedness activities into the fabric of daily operations versus planning exclusively for the most catastrophic events. The better prepared an organization is in advance, and the more alternative resource strategies are available to respond to day-to-day surge (conventional) events, the more effectively operations can withstand sudden or prolonged imbalances in supply and demand; and the longer a facility can provide the usual, or functionally equivalent, level of patient care under many different circumstances. The following information provides steps for defining facility-specific indicators and triggers.

Assess Key Response Capabilities of the Organization

- The RPAT is responsible for examining the capability of all hospital departments and service lines that provide resource support during surge events.
- The RPAT must also determine if current processes are adequate to respond to daily and contingency surge in high risk events; and/or if procurement/allocation processes need to be redefined or expanded.

Examples of key response capabilities include but are not limited to: surge capacity in the ED, Intensive Care Unit (ICU) and Operation Room (OR); secondary and tertiary triage and trauma team processes; through-put procedures (ed. Radiology and laboratory) and expedited ancillary procedures such as registration, discharge procedures, billing, modified documentation, activation of surge/disaster plan, etc.; regional coordination activities; etc.

Develop Indicators and Triggers Based on Facility Capabilities and Capacity

1. Each situational level on the continuum should have pre-defined indicators and triggers established at the facility-level to determine data-driven surge capacity tactics and resource thresholds. Over-seeing and/or completing this process in a comprehensive manner is the responsibility of RPAT. The RPAT should be involved in examining triggers that "stretch" the current perception of a facility's ability to manage daily and contingency surge levels.
2. Appendix A offers examples of a tiered approach to developing indicators and with discrete triggers for trauma, radiation and burns based on a hospital's established capability. Also included are references, suggestions for training and related competencies. These examples are not meant to be prescriptive but may be helpful as starting points for RPAT planning discussions around discrete resource thresholds as well as for regional planning and coordination.
3. Table 3: Indicators and Triggers *(below)* contains a graphic representation of how indicators and triggers inform the decision-making process of recourse management through continuum.

Indicator: A predictor or measure of change in demand for services and/or resource availability. It represents a facility-stressor that may forecast the potential for movement toward a different level of care.

Trigger: A decision point based on changes in the availability of resources that require adaptation to healthcare service delivery.

Table 3: Indicators and Triggers

Indicator	Trigger	Selected Strategies
Community cases (confirmed or ED/clinic volumes)	Sustained community-wide transmission	Institute enhanced infection control techniques, separate suspect cases from other patients, and augment patient flow in clinics and EDs
AIIR rooms	No AIIR rooms available	Convert to semi-private rooms if possible, cohort cases in unit with restricted access and adjusted airflow, and/or add in-room HEPA filtration units
Manufacturer/distributor information and facility supply chain	Supply/medication shortage	Implement PPE, medication, or supply conservation, adaptation, or other procedures according to items in shortage and impact
Unit staffing - needs versus available, staff absenteeism (ill or furloughed)	Unable to maintain usual staffing	Implement alternative staffing models, provide child care, housing, and other staff support, and consider limitation of elective or highly intensive treatments
Clinic and ED volume	Threshold for facility (wait time > X hours, volume > Y/24 hours)	Implement plans for triage and out of hospital care using tele-health resources, "fast track" services, and templated visits
Clinic requests for appointment, ED left without care percentage, wait times, admits boarding in ED	Significant delays in access to care due to demand	Repurpose specialty clinics to acute care, use of alternate care sites / systems for minor illness or non-ambulatory care depending on needs
ICU census, facility, and region	No available ICU beds	Regional ICU referral process, provide positive pressure ventilation on other units, suspend elective surgeries, and use other monitored areas (e.g., post anesthesia areas)

NOTE: It is usually most effective to determine the potential strategies and then whether there is an associated trigger point and a corresponding indicator. Strategies implemented should be proportional to the demand.

Abbreviations: AIIR = Airborne Infection Isolation Room; ECMO = extra-corporeal membrane oxygenation; ED = emergency department; HEPA = High Efficiency Particulate Air; ICU = intensive care unit; PPE = personal protective equipment.

Develop a Matrix of Facility-Specific Alternative Resource Strategies

1. The RPAT is responsible for providing advice and oversight for the development of department/service line strategies for use, conservation, adaptation, substitution and reuse of resources based on the facility and/or regional high-risk outcomes of surge events.
2. Rather than expensive resource stockpiling, facilities should plan for a variety of approved strategies that permit conservation, adaptation, substitution, and re-use for certain resources, based on the high-risk outcome analysis, the OVA, so that functionally equivalent care can be provided until the balance of supply and demand returns to conventional care. *Note: Re-use of a certain resource may be considered crisis care by some facilities.*
3. Scarcity of resources may involve human resources in a single department, an isolated medication or a certain therapy; or scarcity may affect multiple resource categories and departments, increasing the complexity of decision-making and impact on patients and providers. **A combination of situational levels of care may be delivered simultaneously,** depending on the type and duration of the event, the resources required and the tactics that are being employed. Implementation of previously approved adaptation strategies for isolated or time-limited scarcity of certain resources may or may not require calling a Code Yellow, "a pending emergency," depending on the facility.
4. Appendix C, Table C-1, offers a summary of possible alternative resource strategies. An extensive listing by resource category and situational level(s) of care is provided as an example of alternative strategies in Appendix C, Table C-2 (adapted from the Agency for Healthcare Research and Quality and the Minnesota Department of Health). These lists may be helpful to technical experts on the RPAT to initiate discussions about appropriate alternative resource strategy policies proactively for their department and/or the organization.
5. A comprehensive review of alternative resource strategies may necessitate re-examining the projected conventional to contingency triggers.

Establish Written Implementation Processes for Secondary and Tertiary Triage

1. The RPAT is responsible for oversight and development of written triage processes related to conventional and contingency events (sudden and/or insidious) and crisis events
2. A crisis triage protocol is used to identify critically-ill patients that are most likely to survive with intensive-care interventions. An objective tool removes the bedside provider from having to make the agonizing decision of which critically-ill patients will receive scarce life-saving resources. The process provides a fair and consistent method for allocating scarce critical care resources.
3. The crisis disaster triage inclusion/exclusion protocols will be utilized to determine admission into critical care for new patients and as an assessment tool for those patients already in a

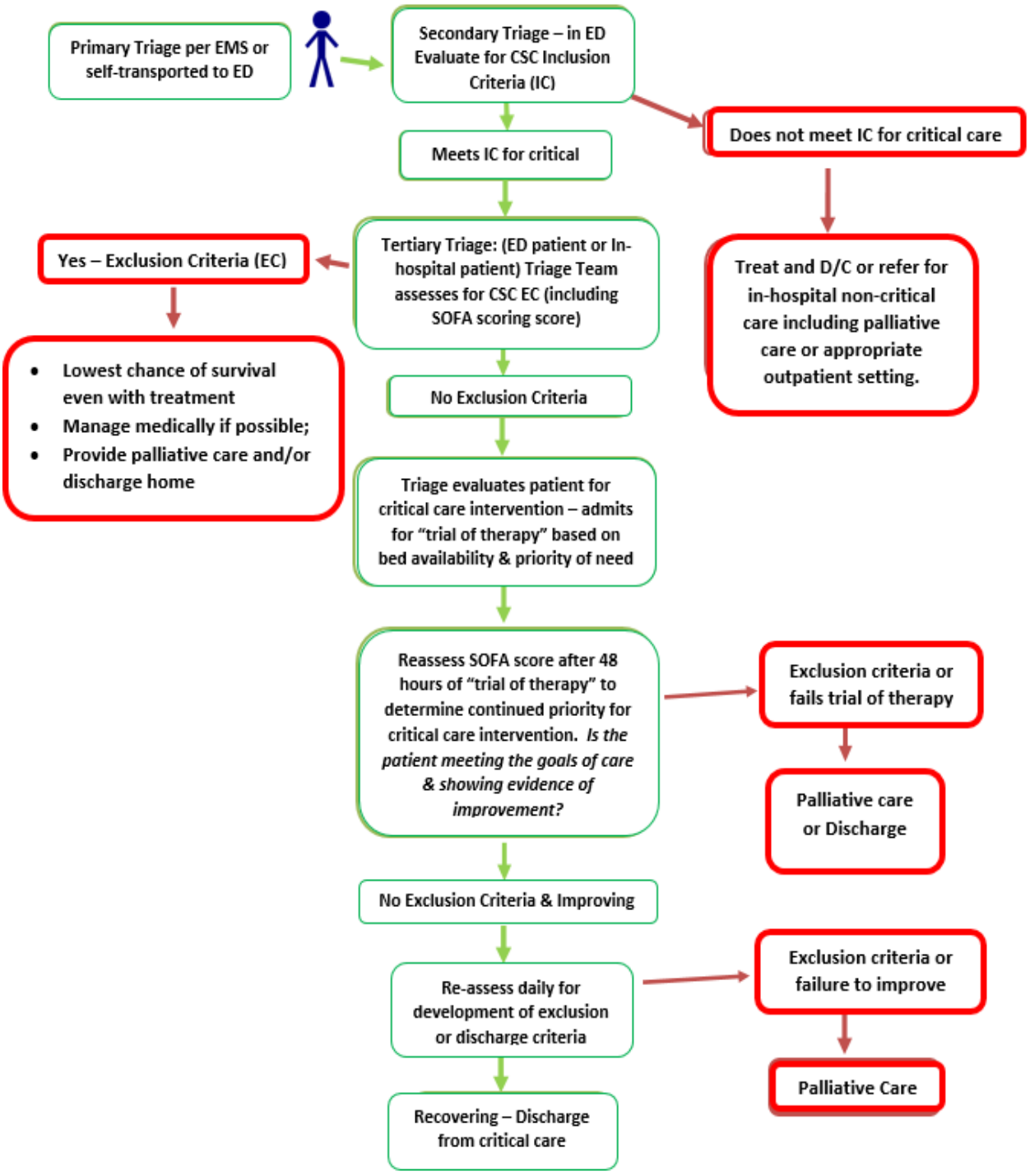
critical care setting. If a patient is withdrawn from critical care, they are provided with palliative care options and referred to appropriate care sites based on community resources available.

A. CSC Inclusion Criteria (for patients 18 years and older)

INCLUSION CRITERIA
1. PURPOSE- Identify patients who MAY BENEFIT from critical care intervention 2. Patient is included for consideration for critical care intervention if either of the following is present: a) **Respiratory failure** requiring invasive ventilator support/or b) **Hypotension** as evidenced by: • SBP <90 mm HG or relative hypotension with clinical evidence of shock (altered level of consciousness; decreased urine output; other end-stage organ failure) refractory to volume resuscitation requiring vasopressor/inotrope support that cannot be managed in a regular unit; OR hemodynamic support not available elsewhere in the hospital.

B. CSC Exclusion Criteria (for patients 18 years and older)

EXCLUSION CRITERIA
1. **Identify patients who are** UNLIKELY TO BENEFIT from critical care intervention 2. Patients, in general, are excluded from consideration for critical care intervention when: a) There is a low probability of survival despite intensive care b) They require resources that cannot be provided; and c) Their underlying illness has a poor prognosis with a high likelihood of death
3. The patients is excluded from admission or transfer for critical care treatment if any of the following is present: (Refer to Appendix B Triage Tools and Tables) a) **SOFA score equal to or greater than 11** b) **Cardiac arrest** unwitnessed and/or recurrent arrest unresponsive to standard measures (defibrillation and pacing) c) **Severe trauma** with Trauma injury Severity Score & predicted mortality of >90% d) **Severe burns** with predicted mortality of >90% e) **Incurable metastatic malignant disease** f) **Advanced and irreversible immune-compromised condition** g) Known and/or previously documented **end-stage organ failure** meeting the following criteria: • Heart (NYHA class III or IV heart failure) • Lungs (End stage COPD, Cystic Fibrosis, Pulmonary Fibrosis or End state Pulmonary HPT • Liver (Child-Pugh score equal or greater than 7) h) **Patient preference to be excluded**


Primary Triage per EMS or self-transported to ED
Secondary Triage – in ED Evaluate for CSC Inclusion Criteria (IC)
Does not meet IC for critical care
Meets IC for critical
Treat and D/C or refer for in-hospital non-critical care including palliative care or appropriate outpatient setting.
Tertiary Triage: (ED patient or In-hospital patient) Triage Team assesses for CSC EC (including SOFA scoring score)
Yes – Exclusion Criteria (EC)
Lowest chance of survival even with treatment
Manage medically if possible;
Provide palliative care and/or discharge home
No Exclusion Criteria
Triage evaluates patient for critical care intervention – admits for "trial of therapy" based on bed availability & priority of need
Reassess SOFA score after 48 hours of "trial of therapy" to determine continued priority for critical care intervention. Is the patient meeting the goals of care & showing evidence of improvement?
Exclusion criteria or fails trial of therapy
Palliative care or Discharge
No Exclusion Criteria & Improving
Re-assess daily for development of exclusion or discharge criteria
Exclusion criteria or failure to improve
Palliative Care
Recovering – Discharge from critical care

VI. ESTABLISH RECIPROCAL OBLIGATIONS

Human resources are the most critical asset during any surge event. It is imperative that every facility address its obligations to staff and providers through pre-planned strategies that recognize threats to their physical and psychological health and occupational safety. The ability to make reasoned decisions under unique and dynamic situations is crucial to patient outcomes. The adverse impact of emotional and physical stress on decision-making capabilities is well documented.

Oversight of the availability and well-being of a facility's human resources, during surge events, sudden and/or insidious, is a responsibility of the RPAT.

Define Facility Duty of Care Standards

1. Thoughtful, open discussions, facilitated by appropriate member(s) of the RPAT, must take place early in the scarce resource planning process to determine healthcare workers' and providers' (including employed and independent physicians) perceived limits on their duty to provide care under fluctuating and adverse working conditions that:
    a. Pose greater risks both personally and professionally;
    b. Create moral distress; and/or,
    c. Give rise to dual obligations to work and family.
2. Openly addressing duty of care issues, and potential conflicts, allows for better assumption-based planning and is not only respectful of staff, but may assist in anticipating potential limited human resource issues.
3. Operational and educational procedures should be developed to realistically adjust to staff and medical provider needs, concerns and potential availability. The processes should be appropriately communicated to staff.

Define Institutional Obligations

1. Reciprocal Institutional obligations involve developing appropriate procedures to comprehensively address the protection of staff/providers in order to:
    a. Ensure an adequately trained and knowledgeable workforce;
    b. Provide for the basic physical and emotional needs of staff;
    c. Promote a safe work environment
    d. Mitigate occupational health risks to manage exposure;
    e. Establish a method of providing peer support and expert consultation to physicians making allocation decisions and those who must implement those decisions;
    f. Establish a method for staff and providers to communicate concerns to administration;
    g. Provide appropriate advance and "just in time" training for RPAT, triage teams; and,
    h. Provide opportunities to participate in facility-level crisis exercises.

2. Written policies that address all reciprocal obligations identified above should be included in the facility emergency operations plan. The RPAT is responsible for oversight and annual review of these policies and procedures.

VII. ESTABLISH SCHEDULE FOR ON-GOING ACTIVITIES OF THE RPAT

Develop Practices to Sustain Established Processes and Preserve Institutional Knowledge

1. Orient and educate new members and ad hoc participants on the RPAT.
2. Facilitate and oversee sustainable processes for on-going education for staff and providers.
3. Review current resource management policies annually and/or develop new policies/processes as needed; and revise indicators and triggers as required.
4. Ensure revisions/additions are incorporated into the appropriate emergency operations plans.
5. Provide advice regarding organizational exercise inputs to include contingency to crisis triggers in order to adequately stress the response(s).
6. Assist departments in establishing alternative thru-put measures for surgical services and radiology as needed.

(Recommendation to convene at least quarterly once all functions/strategies/processes are in place)

Research Emerging Threats

1. Review current literature and lessons learned from incidents or potential incidents within the organization, in the region, the U.S. and around the world.
2. Identify possible gaps in current resource allocation strategies, including for high-risk outcome.

PART TWO – CONTINGENCY LEVEL GUIDANCE FOR FACILITY SCARCE RESOURCE MANAGEMENT

Successfully responding to a catastrophic disaster will require integrated planning, coordination, cooperation and consultation of many response disciplines and agencies, including state and local governments, EMS, health care organizations, and health care providers in the community.

Additional assumptions can also be used to enhance crisis level planning in incidents. One such assumption includes Federal-level emergency declarations (e.g., HHS public health emergency declaration under Section 319 of the Public Health Service Act; HHS declaration of emergency justifying the emergency use of certain medical countermeasures under Section 564 of the federal Food, Drug, and Cosmetic [FD&C] Act) and waivers of federal law (e.g., under Emergency Medical Treatment and Active

Labor Act) can facilitate and support medical and public health responses by authorizing specific emergency action, providing funding to support response or recovery efforts, or even waiving sanctions for failure to comply with specified federal laws and regulation during a disaster (CMS, 2009).

This planning guidance identifies some potential actions that can be taken across the continuum of care in order to implement life sustaining interventions.

Space Options to deal with the medical surge on healthcare system:

- Surge guidance
- Establish clinical advisory board to recommend diversion options to main critical trauma/specialty capabilities
- Reach out to federal and interstate partners to assess the availability of resources
- Awareness of statewide bed availability

Staff Options to alleviate the surge on acute care hospital staff to include telehealth, and community paramedicine:

- Modifications on licensure board requirements
- Updated guidance to local EMS medical directors to increase
- Health Insurance Portability and Accountability Act rule amendments or waivers

Supplies and resource allocation:

- Brokers resource requests from local/regional partners and convey resource needs to federal government
- Assist with prioritization of resources
- Manage and maintain state medical resource caches

Standards of care:

- Request regulatory relief from governor's office
- Coordinate with state advisory boards and organizations to promulgate policies

The primary driver for proactive, contingency level planning for medical surge events is comprehensive resource management that maintains a functional level of patient care when demand for resources puts stress on the organization beyond a conventional surge. Contingency planning is the responsibility of the RPAT and is best accomplished by establishing facility strategies to meet the recommendations detailed in Part 1.

The goals for RPAT contingency scarce resource planning at the facility level are to: 1) Maintain situational awareness of pre-established indicators/triggers to address resource needs when supply/demand exceeds conventional surge levels; 2) Return to conventional standard of care as soon as possible; 3) Mitigate progression to crisis care by adhering to realistic stretch parameters for contingency thresholds.

RESPONSE ROLE OF THE RPAT DURING CONTINGENCY LEVEL SURGE EVENT

Advise and Communicate

1. Convene as a team and/or through designated representatives for the duration of a sudden medical surge event that eclipses daily surge levels; and at least daily in an insidious event depending on the scope of the situation.
2. Advise Incident Command (IC), if opened, regarding all aspects of medical resource management including current or anticipated space, staff and stuff shortfalls and adaptive strategies currently being employed. (The RPAT functions within the HICS as technical support to the planning section chief and medical support to the medical branch officer).
3. Collect and report situational data relevant to demand versus supply through established methods and channels as requested by facility/region/state as the situation warrants.
4. Report need for resource importation through established MOU's or the regional coordination plan.

Assess and Analyze

1. Monitor the pre-determined indicators of stress on the organization.
2. Established resource shortage thresholds to indicate need to progress along the continuum or return to conventional care.
3. Evaluate and monitor the facility's availability of resources and projected need for additional resources.
4. Monitor and report stressors on staff and providers to IC for actionable policy implementation.
5. Report ethical disputes arising from resource allocation decisions to IC.
6. Analyze and report on the effectiveness of implemented strategies on a scheduled basis throughout the event.
7. Evaluate and report need, content, method and targeted staff/providers for "just in time training."

Adapt

1. Develop and advise on additional tactics required based on the event and situational awareness.
2. Initiate pre-determined contingency-level surge tactics and alternative resource strategies as deemed appropriate; including expedited operational/through-put procedures as required.
3. Recommend activation of triage officers to augment facility established contingency-level secondary and tertiary triage processes as appropriate to the situation:
    a. Mitigate surge into ED;
    b. Direct appropriate numbers of triage teams (according to established capabilities) to treat absolute critical patients;

c. Prioritize/direct casualties of incident to appropriate in hospital treatment areas (OR/ICU) based on criticality; and,
d. Prioritize patients in OR and/or radiology to mitigate through-put issues.

PART 3 – FACILITY LEVEL CRISIS CARE DISCUSSION POINT

In certain situations, due to the number, criticality, and/or rate of arrival of patients in sudden surge events, a hospital's resources may not be adequate to provide functional care to everyone. The sudden nature of these events and the advent of citizen transport of critical patients to facilities unprepared to provide appropriate patient care may preclude timely procurement of needed resources from local and/or regional providers.

Under these transient periods of critical resource imbalance beyond planned contingency resource thresholds, allocation decisions may be necessary to save the most lives possible in the shortest period of time until additional resources can be obtained and/or patient transfers to other facilities can be arranged. Facility-level crisis care indicators and scarce resource thresholds should be pre-determined to the extent possible but certain situations may preclude the effectiveness of any planning efforts.

GLOSSARY

DEFINITIONS

Primary Triage (the 1st sorting) the first point of contact for many critically ill patients is the emergency medical system in the prehospital field. Pre-hospital dispatchers and EMS providers during surge events will apply their current, usual system of triage.

Secondary Triage (Emergency Department (ED) role) upon arrival (by any means) to the hospital ED, the patient is assessed for admission into the ED according to the receiving hospital's current triage protocol. Once admitted to the ED, secondary triage is conducted by emergency department physicians who will further assess patients according to the CSC triage protocol inclusion criteria. If it is determined that a patient is a candidate for critical care intervention, the facility's triage team/officer will further assess the patient using the prescribed exclusion criteria. Those patients determined to be non-critical will be treated and released and/or referred to an appropriate care site.

Tertiary Triage is conducted within the hospital and deals with decisions such as disposition to critical care areas or to the operating room in trauma scenarios.

Telehealth Although many different varieties of telehealth exist, there are four main categories of telehealth that exist in today's medical industry. The benefits of each category vary and can support healthcare providers and patients in different ways depending on what is needed to get a full scope of their health.

- Live Video-Conferencing – a live, two-way video-based conference between a patient and their healthcare provider.
- Asynchronous Video - the electronic delivery of a patient's documented health history outside of real-time, used by a healthcare provider.
- Remote Patient Monitoring - the collection of a patient's health data from a patient or resident in one location that is then electronically sent to a healthcare professional (provider, nurse, etc.) for monitoring and review
- Mobile Health - the use of smart devices (smartphones, tablets, etc.), and the health-based software apps developed for these devices, that supports continued healthcare.

Undertriage is defined as the proportion of severely injured patients not managed by a dedicated trauma team,

Overtriage is the proportion of patients not severely injured but still receiving such care.

ACRONYMS

ASMR	Allocation of Scarce Medical Resources
COC	Continuum of Care
CSC	Crisis Standards of Care
ECMO	Extracorporeal Membrane Oxygenation
ED	Emergency Department
EMS	Emergency Medical Services
EMTALA	Emergency Medical Treatment and Active Labor Act
HICS	Hospital Incident Command
HIPAA	Health Insurance Portability and Accountability Act
HVA	Hazard Vulnerability
IC	Incident Commander
ICU	Intensive Care Unit
MOU	Memorandum of Understanding
NIMS	National Incident Management System
OR	Operating Room
OVA	Outcomes-Based Vulnerability Analysis
PREP	Public Readiness and Emergency Preparedness
RPAT	Resource Planning and Allocation Team

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APPENDIX A: SITUATIONAL LEVELS OF CARE

Table 1: SAMPLE INDICATORS and DECISION-POINTS

	Conventional	Contingency	Crisis
Space	• Usual patient care space fully utilized • ED wait time >___hours	• Outpatient/surgical/diagnostic patient care areas re-purposed to the fullest extent • ED wait time >_____hours	• Non-patient care areas used for patient care • <___% available beds or no available beds • No intensive care beds available
Staff	• Absenteeism is >___% but managed with staff call-ins	• Absenteeism >_ % • Doubling of conventional staff/patient ratio • Staff extension such as broad change in responsibilities/documentation, length of shifts • Brief deferrals of non-emergent service	• Trained /specialty staff unavailable or unable to adequately care for volume of patients • Staffing extension techniques exhausted • Practicing outside experience
Supplies	• Routine supplies available but supply is limited to (1) day • Supply chain intact but need is widespread and demand for resources is increasing	• Maximal efforts at conservation, adaptation and substitution w/occasional re-use of select supplies • Current demand for ventilators exceeds supply • Current demand for hemodynamic support exceeding supply	• Critical life-saving resources severely limited or unavailable ANYWHERE • Patient transfer not an option • Reuse strategies in effect • Reallocation of life-sustaining resources required for the greater good
Standard of Care	• Usual standard of care • Focus of care = individual patient	• Functionally equivalent standard of care w/moderate alterations in operations • Focus of care = individual patient	• Crisis standards of care may apply • Focus of care = population

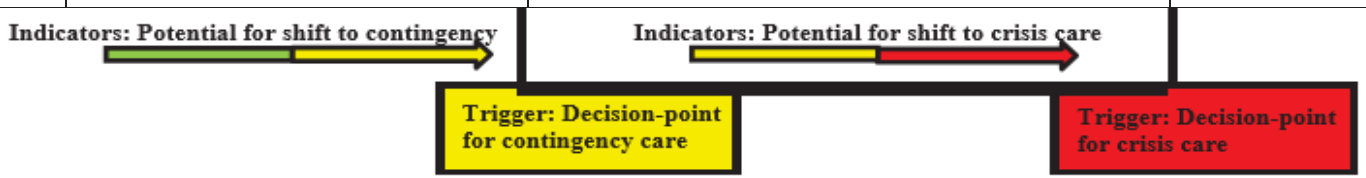
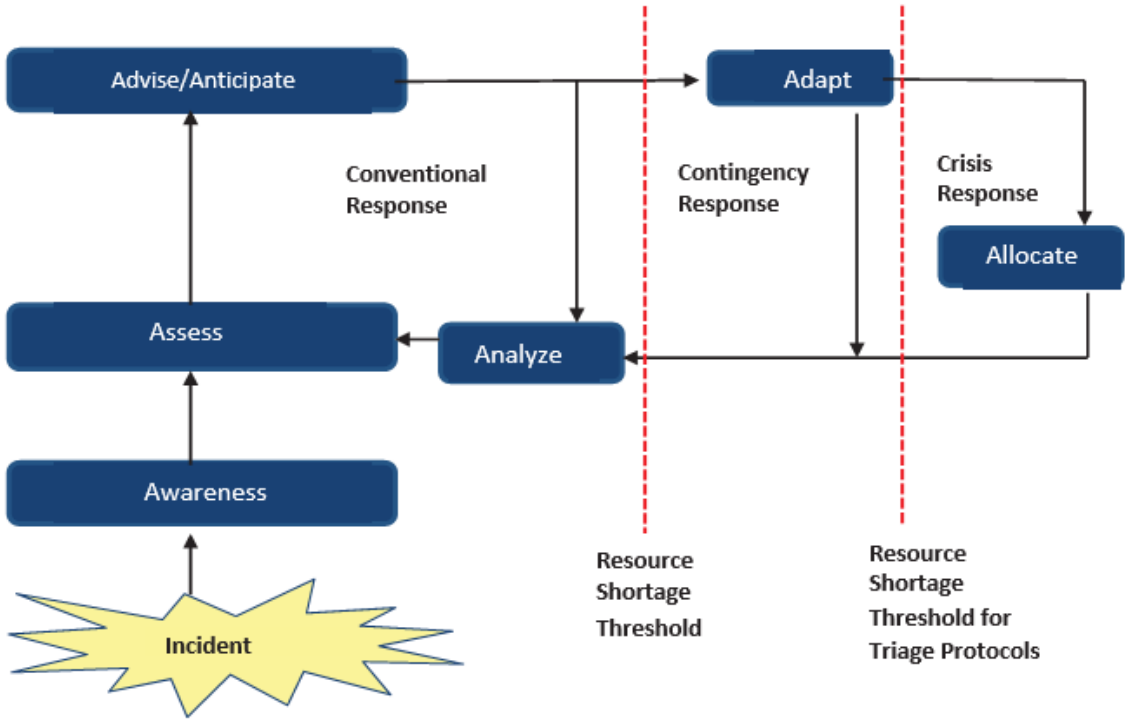


FIGURE A - 2 **Implementation of the Surge Response Framework: Conventional, Contingency, and Crisis Response Cycle**



After an incident occurs, the first priority is to develop situational **AWARENESS** and then **ASSESS** the situation relative to the available resources. The incident commander with relevant technical experts and/or the Scarce Resource Allocation Team **ADVISES** on strategies and **ANTICPATES** resource deficits. If a resource is scarce, **ADAPTIVE** strategies (such as conservation, substitution, adaptation and reuse) should be implemented. In a crisis, a deliberate triage decision to **ALLOCATE/REALLOCATE** resources may be necessary. In all cases, the response and strategies should be **ANALYZED** at regular intervals as part of the disaster response cycle, and the elements repeated until the incident concludes.

Source: Crisis Standards of Care Hospitals and Acute Care Facilities, IOM 2014.

APPENDIX B: TRIAGE TOOLS AND TABLES

TABLE B-1: SOFA SCORE Sequential Organ Failure Assessment Score

For patients recommended for critical care interventions, the Triage Team will obtain labs to calculate the SOFA score. Refer to chart in below. The SOFA is used to assess acute inpatient severity of illness and is to be calculated daily after initial 48 hours of "trial of therapy". SOFA is recommended as the most appropriate decision support tool for use related to adult crisis standards of care when appropriate resources are available given its basis on physiologic parameters, ease of calculation, requirement for simple laboratory tests and its validation for use in patients with a wide variety of conditions requiring critical care.

The SOFA score is not required for non-critical care settings. Currently, SOFA has not been tested or validated as a mortality prediction tool in persons below eighteen (18) years of age. See *Appendix D* for pediatric protocols.

To meet the exclusion criteria using the SOFA score, a patient has to have at minimum a 90% risk of mortality. This mortality level can be reassessed and adjusted in the midst of a mass casualty based on the severity of the demand placed on resources. Based on published evidence, the following SOFA criteria are highly likely to represent a mortality of at least 90%:

a) Highest SOFA greater than or equal to 15 at any time during the hospital admission
b) Mean SOFA score greater than or equal to 5 for at least 5 days and with a SOFA trend that is either rising or flat
c) Any patient who has six or more organ failures at any time.

Organ system	0	1	2	3	4
Respiratory PaO_2/FiO_2	>400	≤400	≤300	≤200	≤100
Renal Creatinine (µmol/L)	<106	106-168	169-300	301-433 Urine output <500 mL/day	>433 Urine output <200 mL/day
Hepatic Bilirubin (µmol/L)	<20	20-32	33-100	101-203	>203
Cardiovascular Hypotension	No hypotension	MAP <70 mm Hg	Dopamine ≤5 µg/kg/min	Dopamine >5 or epinephrine ≤0.1 or norepinephrine ≤0.1 µg/kg/min	Dopamine >15 or epinephrine >0.1 or norepinephrine >0.1µg/kg/min
Haematological Platelet count ($x10^3/mm^3$)	>150	≤150	≤100	≤50	≤20
Neurological Glasgow Coma Scale score	15	13-14	10-12	6-9	<6

Source: The Intensive Care Society 2009

**Note: Clinical staff should check for underlying disability conditions that are not consistent with disease progression before patients are scored.*

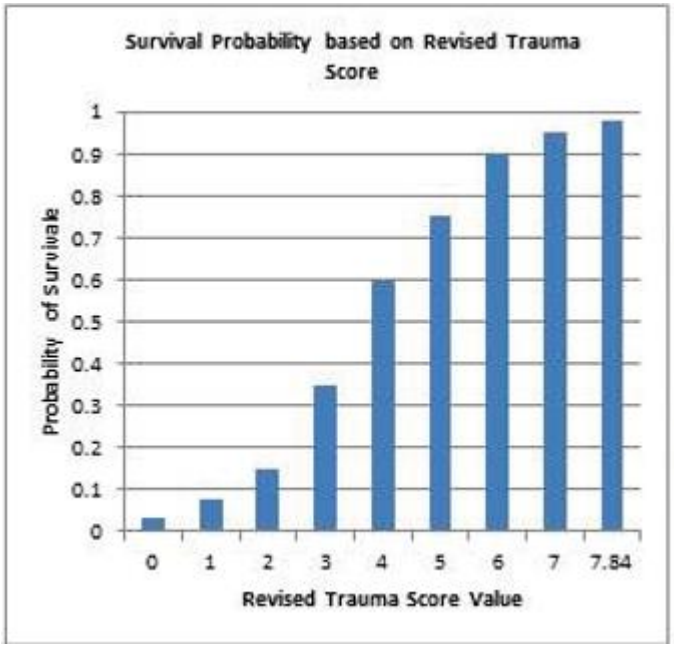
TABLE B-2: GLASGOW COMA SCORE (GCS)

**Note: Clinical staff should check for underlying disability conditions that are not consistent with disease progression before patients are scored.*

Glasgow Coma Scoring Criteria				
Criteria	**Adults and Children**	**Infants and Young Toddlers**	**Score**	**Criteria Score**
Best Eye Response (4 possible points)	No eye opening	No eye opening	1	
	Eye opens in pain	Eye opens in pain	2	
	Eye opens to verbal command	Eye opens to speech	3	
	Eyes open spontaneously	Eyes open spontaneously	4	
Best Vebal Response (5 possible points)	No verbal response	No verbal response	1	
	Incomprehensible sounds	Infant moans in pain	2	
	Inappropriate words	Infant cries in pain	3	
	Confused	Infant is irritable and continually cries	4	
	Oriented	Infant coos to babbles (normal activity)	5	
Best Motor Respons	No motor response	No motor response	1	
	Extension to pain	Extension to pain	2	
	Flexion to pain	Abnormal flexion to pain	3	
	Withdraws from pain	Withdraws from pain	4	
	Localizes to pain	Withdraws from touch	5	
	Obeys commands	Moves spontaneously or purposefully	6	
			Total Score (add 3 sub-scores; ranges 3 to 15):	

TABLE B-3: Revised Trauma Score (RTS)

Values for the Revised Trauma Score (RTS) range from 0 to 7.8408. The RTS is heavily weighted towards the Glasgow Coma Score (GCS) to compensate for major head injury without multisystem injury or major physiological changes. The RTS correlates well with the probability of survival.



Revised Trauma Score Calculation				
Criteria	**Score**	**Coded Value**	**Weighting**	**Adjusted Score**
Glasglow Coma Score	3	0	x 0.9368	
	4 to 5	1		
	6 to 8	2		
	9 to 12	3		
	13 to 16	4		
Systolic Blood Pressure (SBP)	0	0	x 0.7326	
	1 to 49	1		
	50 to 75	2		
	76 to 89	3		
	>89	4		
Respiratory Rate (RR) in breaths per minute (BPM)	0	0	x 0.2908	
	1 to 5	1		
	6 to 9	2		
	>25	3		
	10 to 29	4		
Revised Trauma Score (add 3 adjusted scores):				

TABLE B-4: SCORING TOOL BURN VICTIMS

Age	Burn Size (% total body surface area)									
	0-10%	11-20%	21-30%	31-40%	41-50%	51-60%	61-70%	71-8-0%	81-90%	91%+
0-1.9	Very High	Very High	Very High	High	Medium	Medium	Medium	Low	Low	Low/ expectant
2.0-4.9	Outpatient	Very High	Very High	High	High	High	Medium	Medium	Low	Low
5.0-19.9	Outpatient	Very High	Very High	High	High	High	Medium	Medium	Low	Low
20.0-29.9	Outpatient	Very High	Very High	High	High	Medium	Medium	Medium	Medium	Low
30.0-39.9	Outpatient	Very High	Very High	High	Medium	Medium	Medium	Medium	Low	Low
40.0-49.9	Outpatient	Very High	Very High	Medium	Medium	Medium	Medium	Low	Low	Low
50-509.9	Outpatient	Very High	Very High	Medium	Medium	Medium	Low	Low	Low/ expectant	Low/ expectant
60-69.9	Very High	Very High	Medium	Medium	Low	Low	Low	Low/ expectant	Low/ expectant	Low/ expectant
70.0+	Very High	Medium	Medium	Low	Low	Low/ expectant	Low/ expectant	Low/ expectant	Low/ expectant	Low/ expectant

Outpatient: Survival and good outcome expected, without requiring initial admission; Very High: Survival and good outcome expected with limited/short-term admission and resource allocation (straightforward resuscitation, LOS, 14-21 days, 1-2 surgical procedures); High: Survival and good outcome expected (survival greater than or equal to 90%) with aggressive and comprehensive resource allocation, including aggressive fluid resuscitation, admission greater than or equal to 14-21 days, multiple surgeries, prolonged rehabilitation; Medium: Survival 50-90% and/or aggressive care and comprehensive resource allocation required, including aggressive resuscitation, initial admission greater than or equal to 14-21 days, multiple surgeries and prolonged rehabilitation; Low: Survival less <50% even with long-term aggressive treatment and resource allocation; Expectant: Predicted survival less than or great to 10% even with unlimited aggressive treatment.

Table B-6 PUGH SCORE			
Scoring Criteria			
Criteria	Value	Points	Total for Criteria
Total Serum Billirubin	<2 mg/dL	1	
	3-2 mg/dL	2	
	>3 mg/dL	3	
Serum Albumin	>3.5 g/dL	1	
	<2.8-3.5 g/dL	2	
	2.8 g/dL	3	
INR	<1.70	1	
	1.71-2.20	2	
	>2.20	3	
Ascites	None	1	
	Controlled medically	2	
	Poorly controlled	3	
Encephalopathy	None	1	
	Controlled medically	2	
	Poorly controlled	3	
		Total Pugh Score	
Score Interpretation			
Total PUGH Score	Class		
5 to 6	A	Life expectancy 15-20 years Abdominal surgey perioperative mortality 10%	
7 to 9	B	Livertransplant evaluation indicated Abdominal surgey perioperative mortality 30%	
10 to 15	C	Life expectancy 15-20 years Abdominal surgey perioperative mortality 82%	

APPENDIX C: PATIENT CARE STRATEGIES FOR SCARCE RESOURCE SITUATIONS

Necessary adaptive strategies under the Crisis Standards of Care (CSC) will rarely be evidence-based. Actions that will improve the survival of the population will weigh heavily on the professional expertise and situational awareness of the healthcare facility leaders. Under similar circumstances, the professional judgment of reasonable decision-makers may differ in the choice of adaptation strategies. The tables in this appendix (adapted from the Agency for Healthcare Research and Quality and the Minnesota Department of Health) are tools to supplement, rather than replace, the professional judgment of facility decision-makers. The intention of providing these examples is primarily to facilitate discussions within healthcare organizations rather than being viewed as an all-inclusive list of tactics.

Appendix C-Table C-1

Table C-1: Strategies Based Upon Recourse Type

RESOURCE	STRATEGIES
Oxygen	Use minimum liter flow to keep O2 saturation > target (85-95% depending on situation). Use O2 conserving devices. No oxygen driven nebs. Eliminate or reduce equipment with high O2 consumption.
	Appropriately disinfect and reuse cannulas, masks and tubing.
	May have to base therapy on triage decision tool similar to ventilator allocation.
Medication Administration	Use alternative, inexpensive medications (morphine, lorazepam, doxycycline) that are easily stockpiled prior to an event.
	Use morphine and benzodiazepines for sedation drips when possible. Run drips via gravity rather than IV pumps. Administer more medications via subcutaneous or intramuscular route than intravenous.
	Give adjunctive non-steroidal and other analgesics/medications including orally when possible.
Hemodynamic Support & IV Fluids	Use inexpensive, alternative vasopressor agents such as epinephrine.
	May have higher threshold to initiate vasopressors; may use gravity drips (e.g. 1mg epi in 100cc NS) instead of infusions pumps. Consider nasogastric fluid replacement or subcutaneous hydration rather than IV.
	Minimize invasive monitoring.
	Consider reusing central venous catheter, other tubes and catheters with appropriate sterilization/disinfection.
Mechanical Ventilation	Use of anesthesia machine, BiPAP and short-term manual ventilation.
	Adjust threshold for intubation; decrease elective surgeries to free up vents/anesthesia machines.
	Reuse of ventilator circuits after appropriate sterilization/disinfection.
	Last resort – allocation of ventilators to patients who can most benefit/will use least resources must be according to pre-planned processes using decision support tool and clinical expertise.
Staffing	Outside, equally qualified staff brought into facility via compact agreements or other mechanisms (DMAT, MRC, other local, regional state, federal sources). Use family or non-professional staff to provide basic non-clinical patient care.
	Less administrative staff or volunteers to provide basic patient care with crucial care nursing and physician staff monitoring larger number of patients. Just-in-time training and orientation to job duties. Change shifts duration. Use family/non- professional staff to provide some clinical care with training.
	Reduce administrative demands (teaching & administration, documentation, etc.).

Appendix C-Table C-2

Table C-2: Possible Staffing Strategies for Scarce Resource	**Strategy**	**Conventional**	**Contingency**	**Crisis**
Staff and Supply Planning • Assure facility has process and supporting policies for disaster credentialing and privileging – including degree of supervision required, clinical scope of practice, mentoring and orientation, and verification of credentials • Encourage employee preparedness planning (www.ready.gov and other resources). • Cache adequate personal protective equipment (PPE) and support supplies. • Educate staff on institutional disaster response. • Educate staff on community, regional and state disaster plans and resources. • Develop facility plans addressing staff's family/pets or staff shelter needs.	***Prepare***			
Focus Staff Time on Core Clinical Duties • Minimize meetings and relieve administrative responsibilities not related to event. • Reduce documentation requirements. • Cohort patients to conserve PPE and reduce staff PPE donning/doffing time and frequency. • Restrict elective appointments and procedures.	***Conserve***			
Use Supplemental Staff • Bring in equally trained staff(burn or critical care nurses, Disaster Medical Assistance Team [DMAT], other health system or federal sources. • Equally trained staff from administrative positions (nurse managers). • Adjust personnel work schedules (longer but less frequent shifts, etc.) if this will not result in skill/PPE compliance deterioration. • Use family members/lay volunteers to provide basic patient hygiene and feeding – releasing staff for other duties.	***Substitute*** ***Adapt***			
Focus Staff *Expertise* on Core Clinical Needs • Personnel with specific critical skills (ventilator, burn management) should concentrate on those skills; specify job duties that can be safely performed by other medical professionals. • Have specialty staff oversee larger numbers of less-specialized staff and patients (for example, a critical care nurse oversees the intensive care issues of 9 patients while 3 medical/surgical nurses provide basic nursing care to 3 patients each). • Limit use of laboratory, radiographic, and other studies, to allow staff reassignment and resource conservation. • Reduce availability of non-critical laboratory, radiographic, and other studies	***Conserve***			

Table C-2: Possible Staffing Strategies for Scarce Resource	Strategy	Conventional	Contingency	Crisis
Use Alternative Personnel to Minimize Changes to Standard of Care • Use less trained personnel with appropriate mentoring and just-in-time education (e.g. healthcare trainees or other health care workers, Minnesota Responds Medical Reserve Corps, retirees). • Use less trained personnel to take over portions of skilled staff workload for which they have been trained. • Provide just-in-time training for specific skills. • Cancel most sub-specialty appointments, endoscopies, etc. and divert staff to emergency duties including in-hospital or assisting public health at external clinics/screening/dispensing sites.	*Adapt*			

TABLE C-3: POSSIBLE OXYGEN USE STRATEGIES FOR SCARCE RESOURCE SITUATIONS	**Strategy**	**Conventional**	**Contingency**	**Crisis**
Inhaled Medications • Restrict the use of Small Volume Nebulizers when inhaler substitutes are available. • Restrict continuous nebulization therapy. • Minimize frequency through medication substitution that results in fewer treatments (6h-12h instead of 4h-6h).	***Substitute & Conserve***			
High-Flow Applications • Restrict the use of high-flow cannula systems as these can demand 12 to 40 LPM flows. • Restrict the use of simple and partial rebreathing masks to 10 LPM maximum. • Restrict use of Gas Injection Nebulizers as they generally require oxygen flows between 10 LPM and 75 LPM. • Eliminate the use of oxygen-powered Venturi suction systems as they may consume 15 to 50 LPM.	***Conserve***			
Air-Oxygen Blenders • Eliminate the low-flow reference bleed occurring with any low-flow metered oxygen blender use. This can amount to an additional 12 LPM. Reserve air-oxygen blender use for mechanical ventilators using high-flow non-metered outlets. (These do not utilize reference bleeds). • Disconnect blenders when not in use.	***Conserve***			
Oxygen Conservation Devices • Use reservoir cannulas at 1/2 the flow setting of standard cannulas. • Replace simple and partial rebreather mask use with reservoir cannulas at flowrates of 6-10 LPM.	***Substitute & Adapt***			
Oxygen Concentrator if Electrical Power is Present • Use hospital-based or independent home medical equipment supplier oxygen concentrators if available to provide low-flow cannula oxygen for patients and preserve the primary oxygen supply for more critical applications.	***Substitute & Conserve***			
Monitor Use and Revise Clinical Targets • Employ oxygen titration protocols to optimize flow or % to match targets for SPO2 or PaO2. • Minimize overall oxygen use by optimization of flow. • Discontinue oxygen at earliest possible time. **Starting Example** / **Initiate O2** / **O2 Target** • Normal Lung Adults — SPO2 <90% — SPO2 90% • Infants & Peds — SPO2 <90% — SPO2 90-95% • Severe COPD History — SPO2 <85% — SPO2 90% **Note**: Targets may be adjusted further downward depending on resources available, the patient's clinical presentation, or measured PaO2 determination.	***Conserve***			

TABLE C-3: POSSIBLE OXYGEN USE STRATEGIES FOR SCARCE RESOURCE SITUATIONS	**Strategy**	**Conventional**	**Contingency**	**Crisis**
Expendable Oxygen Appliances • Use terminal sterilization or high-level disinfection procedures for oxygen appliances, small & large-bore tubing, and ventilator circuits. Bleach concentrations of 1:10, high-level chemical disinfection, or irradiation may be suitable. Ethylene oxide gas sterilization is optimal but requires a 12-hour aeration cycle.	***Re-use***			

TABLE C-4: POSSIBLE MEDICATION ADMINISTRATION STRATEGIES FPR SCARCE RESOURCE SITUATIONS	**Strategy**	**Conventional**	**Contingency**	**Crisis**
Oxygen Re-Allocation • Prioritize patients for oxygen administration during severe resource limitations.	***Allocate***			
Cache / Increase Supply Levels • Patients should have at least 30-day supply of home medications and obtain 90-day supply if pandemic, epidemic or evacuation is imminent. • Examine formulary to determine commonly used medications and classes that will be immediate/high demand. • Increase supply levels or cache critical medications. – particularly for low-cost items and analgesics. • Key Examples include: ○ ***Analgesia:*** Morphine, other narcotic and non-narcotic (non-steroidal, acetaminophen) class – injectable and oral (narcotic conversion tool at http://www.globalrph.com/narcoticonv.htm) ○ ***Sedation:*** Particularly benzodiazepine (lorazepam, midazolam, diazepam) injectables ○ ***Anti-infective:*** Narrow and broad-spectrum antibiotics for pneumonia, skin infections, open fractures, sepsis (e.g. cephalosporins, quinolones, tetracyclines, macrolides, aminoglycosides, clindamycin, etc.), select antivirals ○ ***Pulmonary:*** Metered dose inhalers (albuterol, inhaled steroids), oral steroids (dexamethasone, prednisone) ○ ***Behavioral Health:*** Haloperidol, other injectable and oral anti-psychotics, common anti-depressants, anxiolytics ○ ***Other:*** Sodium bicarbonate, paralytics, induction agents (etomidate, propofol), proparacaine/tetracaine, atropine, pralidoxime, epinephrine, local anesthetics, antiemetics, insulin, common oral antihypertensive and diabetes medications	***Prepare***			
Cache / Increase Supply Levels • Obtain medications from alternate supply sources (pharmaceutical representatives, pharmacy caches, etc.) ○ ***Pulmonary:*** Metered dose inhalers instead of nebulized medications ○ ***Analgesia/Sedation:*** Consider lorazepam for propofol substitution (and other agents in short supply); ICU analgesia/sedation drips Morphine 4-10mg IV load then 2mg/h and titrate / re-bolus as needed usual 3-	***Substitute***			

TABLE C-4: POSSIBLE MEDICATION ADMINISTRATION STRATEGIES FPR SCARCE RESOURCE SITUATIONS	**Strategy**	**Conventional**	**Contingency**	**Crisis**
20mg/h); lorazepam 2-8mg or midazolam 1-5 IV load the 2-8/h drip				
○ ***Anti-infective:*** Examples: cephalosporins, gentamicin, clindamycin substitute for unavailable broad-spectrum antibiotic; Target therapy as soon as possible based upon organism identified. ○ ***Other:*** Beta blockers, diuretics, calcium channel blockers, ace inhibitors, anti-depressants, anti-infectives	***Substitute***			
Reduce Use During High Demand • Restrict use of certain classes if limited stocks likely to run out (restrict use of prophylactic / empiric antibiotics after low risk wounds, etc.). • Decrease dose; consider using smaller doses of medications in high demand / like to run out (reduce doses of medications allowing blood pressure or glucose to run higher to ensure supply of medications adequate for anticipated duration of shortage). • Allow Use of personal medications inhalers, oral medications) in hospital. Do without – consider impact if medications not taken during shortage (statins, etc.)	***Conserve***			
Modify Medication Administration • Emphasize oral, nasogastric, subcutaneous routs of medication administration. Administer medications by gravity drip rather than IV pump if needed: *IV drip rate calculation – drops / minute = amount to be infused x drip set / time (minutes) (drip set = gtts / mL -60, 10, etc.).* • Rule of 6: patient weight (kg) x 6 = mg drug to add to 100mL fluid = 1mcg / kg / min for each 1 mL / hour NOTE: For examples, see http://www.dosagehelp.com/iv_rate_drop.html	***Adapt***			
• Consider use of select medications beyond expiration date* • Consider use of veterinary medications when alternative treatments are not available*	***Adapt***			
Restrict Allocation of Select Medications • Allocate limited stocks of medications with consideration of regional/state guidance and available epidemiological information (e.g.: anti-viral medications such as oseltamivir)	***Re- Allocate***			
• Allocate limited stock to support other re-allocation decisions (ventilator use, etc.)	***Re- Allocate***			

*Legal protection such as Food and Drug Administration approval or waiver required.

Table C-5: Possible Hemodynamic Support and IV Fluids for Scarce Resource Situations	**Strategy**	**Conventional**	**Contingency**	**Crisis**
Cache Additional Intravenous (IV) Cannulas, Tubing, Fluids, Medications and Administrative Supplies	***Prepare***			
Use Scheduled Dosing and Drip Dosing When Possible • Reserve IV pump use for critical medications such as sedatives and hemodynamic support	***Conserve***			
Minimize Invasive Monitoring • Substitute other assessments (e.g. clinical signs, ultrasound) of central venous pressure [CVP]) • When required, assess CVP intermittently via manual methods using bedside saline manometer or transducer moved between multiple patients as needed, or by height of blood column in CVP line held vertically while patient supine	***Conserve***			
Emphasize Oral Hydration Instead of IV Hydration When Possible **Utilize Appropriate Oral Rehydration Solution**: • Oral rehydration solution: 1-liter water (5 cups) + 1 tsp salt + 8 tsp sugar, add flavor (e.g., ½ cup orange juice, other) as needed • Rehydration for moderate dehydration 50-100mL / kg over 2-4 hours **Pediatric Hydration**: • Pediatric maintenance fluids: • 4 mL/kg/h for first 10kg of body weight (40 mL/h for 1st 10 kg) • 2 mL/kg/h for second 10kg of body weight (20 mL/h for 2nd 10ky=60 mL/h for 20kg child) • 1 mL/kg/h for each kg over 20kg (example – 40 kg child=60 mL/h plus 20 mL/h=80 mL/h • Supplement for each diarrhea or emesis **Note[1]**: Clinical (urine output, etc.) and laboratory (BUN, urine specific gravity) assessments and electrolyte correction are key components of fluid therapy and are not specifically addressed by these recommendations. **Note[2]**: For further information and examples, see http://rehydrate.org, http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5216a1.htm and http://www.ped.med.utah.edu/cai/howto/intravenousFluidOrders.pdf	***Substitute***			
Provide Nasogastric Hydration Instead of IV Hydration When Practical Provide • Patients with impediments to oral hydration may be successfully hydrated and maintained with nasogastric (NG) tubes • For fluid support, 8-12F (pediatric: infant 3.5F, <2yrs 5F) tubes are better tolerated than standard size tubes				

Table C-5: Possible Hemodynamic Support and IV Fluids for Scarce Resource Situations	Strategy	Conventional	Contingency	Crisis
Consider Substituting Epinephrine for Other Vasopressor Agents • For hemodynamically unstable patients who are adequately volume-resuscitated, consider adding 6ms epinephrine (6mL of 1:1000) to 1000mL NS on mini-drip tubing and titrate to target blood pressure. • Epinephrine 1:1000 (1mg/mL) multi-dose vials available for drip use.				
Consider Re-Use of CVP, NG and Other Supplies After Appropriate Sterilization/Disinfection • Cleaning for all devices should precede high-level disinfection or sterilization. • High-level disinfection for at least twenty minutes for devices in contact with body surfaces (including mucous membranes); glutaraldehyde, hydrogen peroxide 6%, or bleach (5.25%) diluted 1:20 (2500 ppm) are acceptable solutions. NOTE: chlorine levels reduced if stored in polyethylene containers – double the bleach concentration to compensate). • Sterilize devices in contact with bloodstream (e.g., ethylene oxide sterilization for CVP catheters).				
Intraosseous / Subcutaneous (Hypodermoclysis) Replacement Fluids • Consider as an option when alternative routes of fluid administration are impossible/unavailable • Intraosseous before percutaneous **Intraosseous** • Intraosseous infusion is not generally recommended for hydration purposes but may be used until alternative routes are available. Intraosseous infusion requires pump or pressure bag. Rate of fluid deliver is often limited by pain of pressure within the marrow cavity. This may be reduced by pre-medication with lidocaine 0.5mg/kg slow IV push. **Hypodermoclysis** • Cannot correct more than moderate dehydration via this technique. • Many medications cannot be administered subcutaneously. • Common infusion sites: pectoral chest, abdomen, thighs, upper arms. • Common fluids: normal saline (NS), DSNS, D5 ½ NS (can add up to 20-40 mEQ potassium if needed.) • Insert 21/24-gauge needle into subcutaneous tissue at a 45-degree angle, adjust drip rate to ½ mL per minute. (May use 2 sites simultaneously if needed.) • Maximal volume about 3 liters / day; requires site rotation. • Local swelling can be reduced with massage to area. • Hyaluronidase 150 units/liter facilitates fluid absorption but not required; may not decrease occurrence of local edema.				
Consider Use of Veterinary and Other Alternative Sources for Intravenous Fluids and Administration Sets				

TABLE C-6 POSSIBLE MECHANICAL VENTILATION/EXTERNAL OXYGENATION STRATEGIES FOR SCARCE RESOURCE SITUATIONS	Strategy	Conventional	Contingency	Crisis
Increase Hospital Stock of Ventilators and Ventilator Circuits, ECMO or Bypass Circuits	*Prepare*			
Access Alternative Sources for Ventilators/Specialized Equipment • Obtain specialized equipment from vendors, healthcare partners, regional, state, or Federal stockpiles via usual emergency management processes and provide just-in-time training and quick reference materials for obtained equipment	*Substitute*			
Decrease Demand for Ventilators • Increase threshold for intubation/ventilation • Decrease elective procedures that require post-operative intubation • Decrease elective procedures that utilize anesthesia machines • Use non-invasive ventilator support when possible	*Conserve*			
Re-Use Ventilator Circuits • Appropriate cleaning must precede sterilization. • If using gas (ethylene oxide) sterilization, allow full 12-hour aeration cycle to avoid accumulation of toxic byproducts on surface. • Use irradiation or other techniques as appropriate.	*Prepare*			
Use Alternative Respiratory Support Technologies • Use transport ventilators with appropriate alarms – especially for stable patients without complex ventilationrequirements. • Use anesthesia machines for mechanical ventilation as appropriate / capable. • Use bi-level (BiPAP) equipment to provide mechanical ventilation. • Consider bag-valve ventilation as temporary measure while awaiting definitive solution / equipment (as appropriate to situation – extremely labor intensive and may consume large amounts of oxygen).	*Adapt*			
Assign Limited Ventilators to Patient Most Likely to Benefit if No Other Options are Triage Protocols	*Re-allocate*			

APPENDIX D: FACILITY OUTCOMES VULNERABILITY ANALYSIS

Facility Outcomes Vulnerability Analysis

* 0=Not Applicapable; 1=Low; 2=Moderate; 3=High

Category	Hazard	Impact 0-3*	Probability 0-3*	Risk Score (Impact x Probability)	Primary Outcomes: Mass Trauma	Multiple Pediatric Patients	Infectious Disease	Burn	Radiation Exposure	Chemical Exposure	Worried Well/Displaced	Structural Damage	Security Issues	Communications Failure	inoperable Systems	Evacuation	Selected Transfer of Patients	Mass Mortality	Shelter-in-Place	Labor Shortage	Supply Shortage	Financial Impact
Natural	Tornado			0																		
	Ice/Snow Storm			0																		
	Earthquake			0																		
	Flood			0																		
	Epidemic			0																		
	Pandemic			0																		
Technological	Utility Interruption			0																		
	Mass Transit Incident			0																		
	Hazmat Release-Fixed Facility			0																		
	Cyber Attack			0																		
	Hazmat Release-Transportation			0																		
Other	Labor Action			0																		
	Riots			0																		
	High Occupancy Fire			0																		
	Structural Collapse			0																		
Terrorism	Mass Shooting			0																		
	Chemical			0																		
	Biological			0																		
	Vehicular			0																		
	Nuclear			0																		
	Explosive			0																		
			Total		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0