Healthcare System Readiness Measurement Framework

NATIONAL QUALITY FORUM

CONTENTS

EXECUTIVE SUMMARY

The ability to prepare for and respond to disasters and emergencies—such as bioterrorism, disease outbreaks, and inclement weather—is vital to meet the health needs of the nation. To ensure delivery of healthcare services during disasters, healthcare systems must be ready for all types of events (i.e., take an "all-hazards" approach). Readiness is key: the ability to prepare for, mitigate against, rapidly identify, evaluate, react to, and recover from a wide spectrum of emergency conditions related to a disaster or emergency. Measuring the quality of a healthcare system's "readiness" is an important concept to ensure that the health of individuals in a community is maintained and that the ill and injured receive appropriate and time-sensitive care during disasters and public health emergencies. Currently, measurement efforts are focused on quantifying day-to-day activities and outcomes for providers, clinics, health systems, and health plans. Only a few readiness measures focus on non-day-to-day healthcare activities such as a high volume of unscheduled visits related to a particular incident, structural challenges, or operational challenges in maintaining high-quality operations during and following disaster events, including access to subspecialists and critical care.[1,2]

At the request of the Department of Health and Human Services (HHS), the National Quality Forum (NQF) has developed an actionable all-hazards measurement framework to assess the readiness of healthcare systems to respond to and recover from disasters and emergencies. Early in this process, NQF conducted an environmental scan and published the results in the Healthcare System Readiness Environmental Scan Report. Additionally, NQF convened an expert, multistakeholder Healthcare System Readiness Committee to provide input and guide the creation of a framework. Throughout this project, NQF solicited input from a multistakeholder audience, including NQF membership and public stakeholders.

Development of the framework originated from the concept that readiness exists at the intersection of the four phases of emergency management: mitigation, preparedness, response, and recovery. The concept of readiness is a holistic concept that applies to all entities that deliver care (i.e., the healthcare system) within a particular community that is, or may be, affected by a disaster or emergency.

With this view of readiness in mind, the Committee developed a set of guiding principles to define the key criteria when considering the measure concepts to guide their development into performance measures. Guiding principles were then further divided into the subcategories of "the what," "the where," and "the how" to provide a primer of factors that users should consider when applying this framework. An overarching subcategory of "why" was also created.

Why	Need for measure concepts and performance measures
What	Person-Centered
	Capacity- and Capability-Focused
	Available and Accessible
	Maintenance of Health
Where	Care Beyond Hospitals
	Scalability & Geographical Considerations
	Healthcare System Size Considerations
How	Communication Among Entities
	Preparing for the Known and Unknown
	Maintenance of Readiness
	Ongoing Measurement

Domain	Subdomain
Staff*	Staff Safety
	Staff Capability
	Staff Sufficiency
	Staff Training
	Staff Support
Stuff	Pharmaceutical Products
	Durable Medical Equipment
	Consumable Medical Equipment and Supplies
	Nonmedical Supplies
Structure	Existing Facility Infrastructure
	Temporary Facility Infrastructure
	Hazard-Specific Structures
Systems	Emergency Management Program
	Incident Management
	Communications
	Healthcare System Coordination
	Surge Capacity
	Business Continuity
	Population Health Management

* Also applies to volunteers (both paid and unpaid), where appropriate

The measurement framework contains essential categories (domains) and subcategories (subdomains) to ensure comprehensive performance measurement of readiness. The Committee determined that the following domains and subdomains reflect the critical areas of evaluation needed to provide a comprehensive understanding of readiness and its impact on health processes and outcomes.

Using these domains and subdomains, NQF worked with the Readiness Committee to examine and develop measure concepts based on information gathered through the literature and the individual knowledge of each of the Committee members.

This framework contains two distinct sections that identify both the measure concepts and measures. Appendix A includes identified measure concepts aligned with the appropriate domains and subdomains within the report. Appendix B shows existing measures that can pertain to readiness.

FOREWORD

This report from the National Quality Forum (NQF) endeavors to establish a unifying framework that can be used to organize and guide the future development of meaningful and objective measures of healthcare systems' readiness for disasters and emergencies. The journey to develop this framework began in June 2018 with the call for nominations and subsequent selection of a diverse panel of Committee members from across the country with a significant breadth of experience, knowledge, and skills in the clinical, operational, and administrative areas of emergency response, preparedness, and/or readiness.

At the beginning of the project, the NQF team performed an environmental scan to provide the Committee members with a common understanding of the currently available literature, research, tools, and resources. While this scan provided the academic foundation for the conceptual development of a framework, it also highlighted the existing gaps across national approaches to the evaluation and measurement of system-level readiness. The NQF team, along with the Committee members, noted that several federal and state governmental, regulatory, and professional group resources address pieces of the readiness puzzle. Yet, there has been little effort to date to consolidate and organize the collective work and to systematically identify the gaps that stand in the way of developing a more comprehensive, cross-cutting, all-hazards methodology that would propel healthcare delivery systems toward improved disaster readiness.

The NQF Healthcare System Readiness Committee was charged with developing a conceptual framework and measure concepts to support the development of individual measures that apply to both individual healthcare entities, as well as systems of healthcare organizations of varying size, resources, geography, accessibility, and populations served. In addition, the idea of "systemness"—or the coming together of a given geographic area, community, or group of services—is not foreign to the healthcare, emergency management, or disaster preparedness communities. However, the establishment of standards and measures that apply across the spectrum of healthcare delivery resources in times of disaster is a relatively new concept. The Committee took on the major challenge of making sure that the framework was both sufficiently inclusive and sufficiently detailed to encourage the development of actionable and meaningful measures for healthcare systems.

Both the individual and collective voices of Committee members have been critical to building the conceptual measurement framework, and not surprisingly, members have expressed many thoughtful and differing opinions in the course of developing this framework. The Committee members' purposeful pursuit to set a solid foundation on which others may build feasible, actionable, and relevant measures is commendable. Committee members have made many more excellent contributions on these topics than this report can represent, and the Committee feels strongly that this is just the beginning of the work in this area and that it has only opened the door for further exploration. The NQF Healthcare System Readiness Committee offers this report as a roadmap to guide the next steps in the quality measurement of healthcare system readiness. It eagerly anticipates the additional progress that must follow.

INTRODUCTION

In the past 15 years, there has been substantial progress toward improving healthcare delivery and public health systems and their capacity to manage health security threats. Yet, many complex challenges persist, and many of the nation's readiness efforts are still insufficient to respond to specific events (e.g., terrorism, pandemics, severe weather, and others), particularly those that produce high numbers of patients that need specialty and/or intensive care.[3]

Along with regional emergency medical services, police, and fire services, healthcare systems are on the front lines of disaster response when events occur. For this framework, the definition of a healthcare system is an all-inclusive model taking into account all entities that directly deliver healthcare services to people while promoting continuity and timely care across providers, health organizations, and communities. Healthcare systems are critical resources during disasters and emergencies, which can cause both acute illness and injury that private healthcare entities will mainly treat. These events also often disrupt community access to routine healthcare services. The potential for disruption of services coupled with an increased need for managing all available healthcare resources requires engagement both across healthcare entities and between healthcare entities and nonhealthcare entities in the community. Lives saved or lost depend on the readiness of healthcare systems for disasters.

While some cross-sector programs have been developed or enhanced to improve the nation's healthcare readiness capabilities during national and regional emergencies, these programs often do not address fundamental challenges of limited healthcare capacity before, during, and after disasters. This results in uneven responses that typically take time to mobilize, which can limit care effectiveness in time-sensitive crises, particularly for specific populations such as those with chronic conditions, socioeconomic challenges, and for children. Unfortunately, uneven response often results from the lack of a business case for private healthcare enterprises to invest in readiness sufficiently to respond to all hazards.

A critical need exists for quality and accountability metrics of healthcare system readiness to encourage investment as well as successful collaboration between the private and public sectors to ensure high quality care during times of crisis and community-wide strain. Quality measurement and accountability are vital and have driven healthcare system improvement in other areas, such as improving patient safety in hospitals through reducing the rate of central line associated blood stream infections and improving systems that care for patients with acute myocardial infarction, stroke, and traumatic illness.[4,5]

To ensure delivery of healthcare services during disasters, healthcare systems must be ready for all types of events (i.e., take an all-hazards approach). The term "readiness" differs from "preparedness" and is a more comprehensive concept. Specifically, readiness is the ability to prepare for, mitigate against, rapidly identify, evaluate, react to, and recover from a wide spectrum of emergency conditions related to a disaster or emergency. This difference is important because readiness measures involve not only how a healthcare system may prepare prior to an event, but also how it actually performs during an event and after it ends.

Measuring the quality of a healthcare system's readiness is important to ensure that the health of individuals in a community is maintained and that the ill and injured receive appropriate and time-sensitive care during an emergency. The National Quality Forum (NQF) has engaged in several related projects, specifically the Regionalized Emergency Care Services Framework (2012), the Emergency Department Quality in Transitions in

Care (2017), and Trauma Care Outcomes (2019). In addition, other work has addressed similar measurement goals in attempts to standardize performance measurement for readiness outside of NQF. Despite this related work, many gaps still remain in how quality metrics for readiness have been operationalized within and across communities.

Currently, measurement efforts are focused on quantifying day-to-day activities and outcomes for providers, clinics, health systems, and health plans. Most existing metrics related to readiness focus on a narrow set of day-to-day emergency care settings and emergency departments (ED), such as ED throughput and specific conditions, and are relatively underdeveloped compared to measurement portfolios for the longitudinal quantification of chronic conditions.[6] Only a few readiness measures focus on non-day-to-day healthcare activities such as a high volume of unscheduled visits related to a particular incident, structural challenges (flooded basements, loss of power), or operational challenges (staffing, surge capacity) in maintaining high-quality operations during and following disaster events, including access to subspecialists and critical care.[1,2] While this approach is effective in capturing some elements of readiness assessment, it is important to expand beyond this approach to include real-time measurement accuracy since performance of the healthcare system during a disaster or emergency presents unique challenges that have not traditionally been part of the broader effort in quality measurement development.

Several factors contribute to this gap in measurement of public health and disaster response capacity. Unlike routine clinical care, disasters and public health emergencies are relatively infrequent events, making it a challenge for healthcare systems to test and/or demonstrate their readiness during daily activities. However, maintaining efficient operations is an important element of disaster readiness. Exercises that simulate disaster events are important practices to demonstrate response capabilities. However, exercises can be expensive, difficult to plan,

and can substantially disrupt normal healthcare operations, all of which make them challenging to implement. Additionally, disaster events have steadily increased and are an ever-present threat for the healthcare enterprise and for communities. Furthermore, the variety of potential disasters that can occur presents a unique set of challenges for healthcare systems and for measurement.[7] The capabilities required for various disasters can be disparate, and a multiplicity of factors can impact outcomes during disaster response. These factors have contributed to sparse empirical research supporting readiness practices that clearly link a structure or process with a disaster response outcome. Consequently, most frameworks and guidance for readiness are drawn from case studies and focus on lessons learned from specific situations.

The National Quality Forum (NQF) is a consensus-based, experienced convener of multistakeholder groups for developing consensus around diverse and challenging topics like readiness. NQF has taken on this project at the request of the Department of Health and Human Services (HHS) to develop an actionable all-hazards measurement framework to assess the readiness of healthcare systems to respond to and recover from disasters and emergencies. As a first step toward achieving these goals, NQF conducted an environmental scan and published the results in the Healthcare System Readiness Environmental Scan Report.[8] Additionally, NQF convened an expert, multistakeholder Healthcare System Readiness Committee to provide input and help guide the creation of a framework. Throughout this project, NQF solicited input from a multistakeholder audience, including NQF membership and public stakeholders.

The findings from the environmental scan and Committee feedback helped to inform the development of a foundational measurement framework, which provides insight into the key components necessary to develop new measures to assess healthcare system readiness objectively. A measurement framework is a conceptual model for organizing ideas that are important

to measure in a topic area and for describing how measurement should take place (i.e., whose performance should be measured, care settings where measurement is needed, when measurement should occur, or which individuals should be included in measurement).

Frameworks provide a structure for organizing currently available measures, areas where gaps in measurement exist, and prioritization for future measure development. The framework must flexibly accommodate changes in data standards, data transport mechanisms, data sources, changes in settings of care, and changes in users of these

systems so that it consistently provides utility for those seeking to measure and assess healthcare system readiness. The goal is that stakeholders use this framework to identify high-priority measure concepts to inform future measure development efforts that fill identified measurement gaps in this area. Those measures could then potentially be submitted for NQF endorsement and/or for consideration for state- or federal-level quality improvement, public reporting, or payment programs as a way to integrate readiness—specifically performance before, during, and after events—to determine hospital quality and reimbursement.

MEASUREMENT FRAMEWORK CONSIDERATIONS

Development of the framework originated from the concept that readiness exists at the intersection of the four phases of emergency management: mitigation, preparedness, response, and recovery (Figure 1). Readiness depends on successfully addressing the essential components in all of these emergency management phases. Additionally, this framework takes an all-hazards approach to readiness, meaning that the measures created from the framework need to be broad enough to apply to any natural, technological, or human-caused incident. The framework focuses on measurement of the quality of healthcare delivery by the healthcare system prior to, during, and after any emergency or disaster.

The concept of readiness is a holistic concept that applies to all entities that deliver care (i.e., the healthcare system) within a particular community that is, or may be, affected by a disaster or emergency. These entities vary depending on geography, resources, and community structure; however, this framework includes all entities that provide direct care to the populations they serve. In this framework, the goal is to provide targeted guidance for the measurement of the

quality of readiness across the healthcare system. The characteristics of the associated healthcare entities within the healthcare system to which this framework may be applied will vary based on the needs of the community and the potential event.

FIGURE 1. READINESS CONCEPT
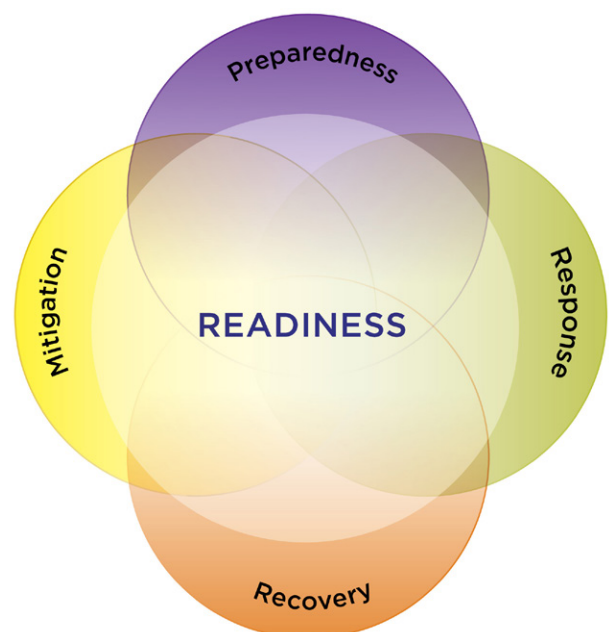
To successfully respond to any disaster and emergency, healthcare entities need to work together to meet the health needs of the community. Therefore, this framework is intended to include measures that assess individual healthcare entities, health systems, and the established healthcare system as a whole.[9] The overall goal is to think holistically about the care delivery macrosystem made up of many different individual entities. In addition, this framework is intended to apply across multiple healthcare entities and health systems simultaneously during a disaster—particularly when they need to work together across adjacent communities to ensure the best quality of care for patients across the healthcare continuum. Please note that for this report, a health system differs from a healthcare system. Health systems are often seen as multiple entities that are affiliated with each other financially and/or are under the same umbrella company. The definition of healthcare system is much broader and all-encompassing to include care delivery entities that might not be associated or affiliated with each other under normal circumstances but must work together during a disaster to provide continuity of care to their community; however, this definition does not include resources that do not directly deliver care but do impact healthcare (e.g., manufacturers).

GUIDING PRINCIPLES

Recognizing the vast diversity in the scale and type of hazards potentially addressed by this framework, the Committee created a set of guiding principles. These guiding principles define key criteria that steer the development of measure concepts into performance measures for healthcare system readiness. Guiding principles were then further divided into the subcategories of "the what," "the where," and "the how" to provide a primer of factors that users should consider when applying this framework. An overarching subcategory of "why" was also created.

The Why

As demonstrated above, readiness is a complex, relatively new concept that must take into consideration each of the four phases of emergency management, making it a difficult concept to measure. However, healthcare system readiness measurement is very important in ensuring the welfare of our communities. Measurement assists healthcare systems to set targets for improvement and determine where to invest resources. Additionally, healthcare system readiness requires a more holistic approach to measurement that goes beyond just determining if a healthcare system has planned for a hazard or how well it did afterwards. Thus, "the why" is part of all of the guiding principles and is the driver behind the development of measure concepts and performance measures for healthcare system readiness.

The What

The "what" addresses factors and system characteristics that broadly impact readiness that pervade each phase, domain, and subdomain. Essentially, they define what system characteristics are necessary for ensuring readiness: for example, the need for a person-centered system that addresses issues of system capacity and capability for all hazards. This also pertains to maintenance of health as well as availability and accessibility of care for all, including those not directly affected by the emergency who may have long-term, chronic, complex care management needs and persons with specialized needs (such as children, the elderly, institutionalized populations, individuals

on dialysis, individuals using mobility devices, or those requiring long-term ventilators).

Person-Centered

The Committee noted that the concept of readiness should be defined and addressed from a person-centered perspective, where the needs of all individuals who will need to access healthcare services during and after a disaster are considered when planning, developing, and practicing system readiness. It is important that effective communication and patient care preferences be built into the system's practices, especially during a disaster. Additionally, it is important to understand and accommodate the varying needs of individuals who might seek care, including populations with specialized needs that arise from the extremes of patient age, comorbid medical or psychiatric conditions, people with disabilities and others with access and functional needs, and those with socioeconomic challenges (e.g., the homeless), among others.

Capacity- and Capability-Focused

By definition, disasters are disruptive, and they may create extraordinary challenges for institutions charged with disaster response. Creating and maintaining sufficient capacity is one such challenge. This is particularly relevant in emergency departments that often operate at or above capacity. Nonetheless, institutions must have surge capacity to provide both immediate, short-term care in scenarios for which they may lack advance notice, and care on a sustained basis for extended emergency events. In addition, institutions may need to be able to rapidly expand certain selected critical capabilities, such as trauma, pediatric, or infectious disease capabilities, within their system. This must occur in the context of day-to-day issues including maintaining current inventories, as well as drug shortages and staffing challenges. Quality measures should assess the healthcare system's ability to address clinical capacity needs and to rapidly and effectively

mobilize needed clinical capabilities in the face of disaster.

Available and Accessible

During an emergency, especially during the response and recovery phases, access to the continuum of care should not be compromised. Not only do healthcare systems need to have necessary services available, members of the community should be able to access these services without undue delay or difficulty. This principle applies to individuals affected by the disaster and individuals in the community who rely on healthcare services for chronic care. This is particularly relevant in the context of the broader movement of transferring care from in-patient to community settings.

Maintenance of Health

Often, when considering healthcare system readiness, the focus is on those requiring emergent care and those directly affected by the event. However, maintenance of health for those in the community and not directly affected by the emergency is equally important. For example, individuals with chronic complex care needs require continuous care and attention during emergency response and recovery phases, ensuring that patients with conditions such as diabetes, heart failure, and chronic lung disease, among others, have ongoing access to preventive and maintenance therapies.

The Where

Readiness as a concept encompasses locations where care is delivered. Therefore, the "where" encompasses sites providing care while taking into consideration issues related to size, scalability, and geographic differences within and across communities.

Care Beyond Hospitals

Planning for healthcare system readiness is often associated with hospital-based care only. However,

healthcare services are delivered in many settings, including outpatient settings, mobile settings (e.g., Mobile Integrated Healthcare – Community Paramedicine), and even in people's homes.[10] Additionally, in emergencies and disasters, care may be provided in nontraditional settings such as shelters, tents, and schools. During a disaster or emergency, all entities will need to work together to deliver quality care across all designated settings, specifically when it comes to data sharing and smooth transitions in care.

Scalability

During normal operations, most organizations and institutions are operating at or above capacity. However, based on healthcare needs related to a disaster, institutions are expected to appropriately scale their services and increase capacity. Scaling up requires preparation and needs to be tailored to the type of hazard event or emergency. Furthermore, scalability is not an independent concept, but works in conjunction with the principles of capacity and capability.

Geographical Considerations

The geographic location of a community will often dictate resource availability, distribution, and the types of disasters or hazards that may occur. This consideration is especially important when determining how entities should interact with one another during a disaster to meet the healthcare needs of a population. For example, a rural or frontier health system might only include one hospital and a few local clinics in the community, while an urban or a suburban healthcare network may include several health systems, clinics, and at-home services. Consequently, geographical location is a factor that affects the effectiveness of the response and specifically the healthcare system's ability to increase and/or decrease care capacity based on the type of disaster. Geographical considerations also play a role in how priorities influence investments in disaster planning. For example, health systems in major

cities might focus more on maximizing local treatment capacities and capabilities, whereas systems in more rural areas might focus heavily on patient transport and redistribution after a disaster event.

Healthcare System Size Considerations

With respect to healthcare system readiness, the size of the community's healthcare system is an important consideration, especially since size can often be considered a proxy for resource availability and the broader system's ability to expand care capacity. Larger healthcare systems within larger communities may be expected to have greater care capacity and resources that the response enterprise can call upon during disasters. The Committee noted that smaller healthcare systems within smaller communities—particularly rural ones—may not have the same care capacity and resources as larger ones and that measures within the framework should accommodate this.

The How

The principle of "how" addresses actions such as preparation, communication, and evaluation pre- and post-hazard event. This includes actions necessary to promote readiness such as communication among responders and care providers, maintenance of skills related to preparedness, as well as ability to respond to all types of hazards.

Communication Among Entities

Successful coordination of efforts requires open and clear communication among all entities within the healthcare system. Communication channels and protocols should be developed proactively and managed via agreements, emergency response protocols, and appropriate technologies such as health information exchanges. The success of emergency response and appropriate coordination of efforts hinges on the ability of communications systems and plans to ensure adequate situational awareness (i.e., a clear

understanding of what is going on) across all impacted healthcare entities.

Preparing for the Known and Unknown

The Committee noted that, to be ready, healthcare systems need to be prepared for all hazards, which includes commonly occurring events such as natural and weather-related disasters as well as uncommon and difficult to predict events such as bioterrorism. Preparations for readiness must be broad enough to address the anticipatable emergency needs of any emergency. Further, readiness programs must constantly learn and incorporate lessons learned from disaster incidents as they occur around the world, so healthcare system plans and protocols can be adjusted when new data regarding response effectiveness are gathered.

Maintenance of Readiness

Committee discussions noted that creating a preparedness plan and undergoing exercises do not guarantee maintenance of actual readiness skills and knowledge. To be truly ready for any hazard, healthcare systems need to continuously and consistently perform activities, trainings, drills, and simulations that are incorporated into their daily work to optimize staff knowledge and maintenance of necessary skills.

Ongoing Measurement

Any successful quantification of readiness requires measurement of outcomes before, throughout, and after the incident. Consequently, the Committee members noted that the full spectrum of readiness measures may be difficult to quantify before an event. While the results of drills and exercises can provide important data, it may still be impossible to predict precisely how well the healthcare system will perform in a disaster before an event occurs. Therefore, the Committee noted that it is extremely important to continue to correlate pre-event measures of quality with post-event measures of outcomes when events occur to improve predictive measures and systems. The timeframe between pre- and post-event may vary based on the nature of the event, as well as associated care needs specific to time passed since an event.
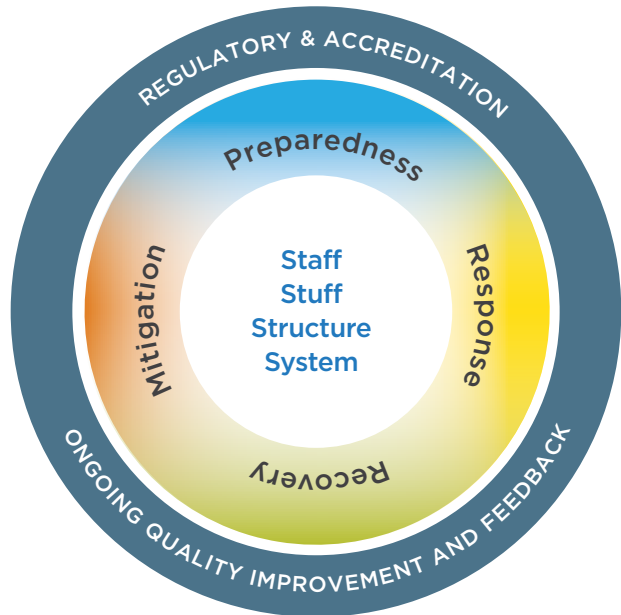
DOMAINS AND SUBDOMAINS

After consideration of the information gathered through the environmental scan and discussion of the guiding principles above, the Healthcare System Readiness Committee determined that a four-domain model based on the four S's of surge capacity (staff, stuff, structure, systems) and the four phases of emergency management (mitigation, preparedness, response, and recovery) provided the best combination of utility, simplicity, and accuracy in identifying and covering the main components of healthcare system readiness (Figure 2).[11]

In this framework, the four S's—depicted as concentric circles—are in the center and form the basis of domains from which measure concepts can be created. The cyclical nature of the emergency management phases is depicted by showing the continuity across phases and their importance in addressing each domain. The outer circle outlines the structure around which readiness is maintained and measured. Specifically, it depicts the ongoing activities of both quality improvement and feedback and the accreditation and regulatory requirements vital to ongoing improvement efforts. This includes specific activities assessed by government (such as HHS) and nongovernmental organizations (such as The Joint Commission).

A domain is a categorization or grouping of high-level ideas and measure concepts that further describes the measurement framework. Along with developing high-level measurement domains, the Committee defined more in-depth subdomains that further delineate the measure concepts. The Committee intends that these measures will not be static, but rather undergo an iterative process of continual development for the achievement of an optimal state of readiness. This model helped to frame the Committee's ideas about the measurement and evaluation of key healthcare system readiness elements.

FIGURE 2. READINESS MEASUREMENT FRAMEWORK

The table below lists the domains and subdomains from the Committee:

Domain	Subdomain
Staff*	Staff Safety Staff Capability Staff Sufficiency Staff Training Staff Support
Stuff	Pharmaceutical Products Durable Medical Equipment Consumable Medical Equipment and Supplies Nonmedical Supplies
Structure	Existing Facility Infrastructure Temporary Facility Infrastructure Hazard-Specific Structures
Systems	Emergency Management Program Incident Management Communications Healthcare System Coordination Surge Capacity Business Continuity Population Health Management

* Also applies to volunteers (both paid and unpaid), where appropriate

Domain 1: Staff

The staff domain applies to all personnel who may be engaged in the healthcare system in response to a disaster. It examines whether staff are professionally capable and properly trained to perform the roles and responsibilities that may be assigned to them. The domain applies to both the clinical and nonclinical personnel necessary for successful mitigation, preparedness, response, and recovery efforts. Measures related to staffing may be applied to nurses, physicians, pharmacists, respiratory therapists, technicians, and other clinicians as well as institutional/organizational leaders, clerical and other support personnel, security specialists, housekeeping and physical plant specialists, and volunteers. Measures within this domain may also be applied to citizen volunteers who may be mobilized by the healthcare system during a disaster.

Staff-related issues that could potentially impact quality may include: factors within the system that keep staff safe, the number of staff whose professional skills and practice make them capable of performing necessary disaster response tasks, and the number of staff who could become capable of performing the necessary disaster response tasks if given additional training or supervision. Staff-related issues also include the adequacy of training for staff that allows them to use their professional skills and practice experience to successfully execute tasks within the roles and responsibilities assigned to them during a disaster. Measures related to the training of staff include both routine pre-event training as well as "just-in-time" training during a response. Other measures related to staffing evaluate the support available to meet the needs of staff outside of their work within the healthcare system.

The staff domain is divided into the following subdomains:

Staff Safety: Measures assess the ability of the healthcare system to protect the physical and emotional welfare of personnel responding during a disaster.

Staff Capability: Measures assess the ability of the healthcare system to ensure staff are available whose professional skills and practice make them capable of performing necessary disaster response tasks. Measures also assess the ability of the healthcare system to identify additional staff who could become capable of performing the necessary disaster response tasks if given additional training or supervision. This could be achieved with technology through telemedicine.

Staff Sufficiency: Measures assess the number of capable staff who are available to respond to disasters. Measures evaluate the healthcare system's recruitment and maintenance of the necessary workforce for a disaster, as well as techniques to ensure their presence during response, and to mitigate attrition. This might include credentialing capabilities that would involve staff and/or events that cross state lines, and/or solutions that would involve the mobilization of healthcare coalitions.

Staff Training: Measures assess whether routine and just-in-time training opportunities allow staff to use their professional skills and practice experience to successfully execute tasks within the roles and responsibilities assigned to them during a disaster. Measures may address training for general disaster response tasks, training in specific skills or functions, hazard-specific training (e.g., infectious disease outbreaks), and/or training related to the care of subpopulations or those with access or functional needs (e.g., training to care for children or those with mental/physical disabilities). Measures address the ability of staff to function appropriately within the incident management system used for disaster response.

Staff Support: Measures assess the ability of the healthcare system to support the needs of staff both inside and outside of their direct work within the healthcare system. Internal measures may address sleeping quarters, food and nutrition, laundry, and personal hygiene while on site during a disaster. External measures may address the availability of support for the welfare of staff families and pets, financial support, and psychological support, among other needs.

Domain 2: Stuff

This domain examines whether the healthcare system has sufficient access to the full range of material (i.e., equipment and supplies) needed to provide adequate clinical care in a disaster, including its distribution and logistics. Measures related to material address the quantity, quality, and availability of equipment and supplies that may be mobilized as needed. The timeliness of delivery, the fairness and appropriateness of its distribution and use, and the appropriateness of substituted material used may also be examined. Measures within this domain may be applied to material resources that are owned and stored within the healthcare system, and also to material resources that are owned and/or maintained outside of the direct control of the healthcare system, such as those resources that are under the control of suppliers, distributors, and/or the local, state, or regional coalitions or governments, or the federal government (e.g., the strategic national stockpile).

The stuff domain is divided into the following subdomains:

Pharmaceuticals: Measures relate to the availability and timeliness of access to medications, both over-the-counter and prescription, in all their forms, including parenteral, oral, topical, and others. Measures address the availability of medications needed for routine patient care, such as antibiotics and vaccines, as well as medications needed for specialized patient care needs, such as chemical warfare agent antidotes.

Durable Medical Equipment: Measures relate to the availability and timeliness of access to medical equipment designed for multiple patient uses. Examples include ventilators, beds, and wheelchairs. Measures address the availability of equipment needed for routine patient care, such as cardiac monitors, as well as equipment needed for specialized patient care needs, such as decontamination equipment. Durable medical equipment also includes the medical equipment necessary to support patient care such as

laboratory equipment and radiology/imaging equipment.

Consumable Medical Equipment and Supplies: Measures relate to the availability and timeliness of access to any item or equipment that is designed for single use only and is used to provide direct patient care. Examples include gloves, masks, bandages, IV tubing, decontamination materials, personal protective equipment (PPE), as well as oxygen and other consumables.

Nonmedical Supplies: Measures relate to the availability and timeliness of access to all other nonmedical supplies which are necessary to support the ongoing operation of the medical system. This includes items such as drinking water, food, and toilet paper, as well as environmental cleaning supplies. This also includes consumable nonmedical supplies such as fuel oil for emergency generators and nonconsumable, nonmedical supplies such as computers, phones, radios, satellite phones, and other equipment necessary for effective disaster response.

Domain 3: Structure

The structure domain refers to the physical structures that the healthcare system uses to provide medical care, including both the existing facilities used in daily patient care, as well as other facilities that may be re-purposed for use for care only in a disaster, and temporary facilities that may be constructed or deployed during an event. Measures related to structure that may impact quality include the appropriateness of the facility to support the necessary clinical care, the accessibility of the facilities to all patients who require care, the resilience of the structure in the face of known or suspected threats, and the capacity for timely mobilization of core facility areas to address clinical needs.

The structure domain is divided into the following subdomains:

Existing Facility Infrastructure: Measures relate to the ability of the existing medical structures

(e.g., hospital beds, outpatient facilities, free-standing community health centers, etc.) to support medical care in a disaster. This includes assessment of the facility's resilience with respect to known or anticipatable hazards, such as flooding, high winds, severe heat or cold, earthquakes, and others. This subdomain also includes assessment of the critical infrastructure services necessary for facility operations such as power, heating/cooling, steam, water supply, sewage, and technology (servers, switch gear, facility monitoring systems, etc.). Measures within this domain also address physical security.

Temporary Facility Infrastructure: Measures relate to the availability and adequacy of temporary and/or repurposed facilities to support medical care in a disaster. This includes assessment of the facility's ability to support safe patient monitoring, infection control, security, and other care needs. This subdomain also includes assessment of the time necessary to modify or construct such facilities, the accessibility of such facilities, and the resilience of these facilities.

Hazard-Specific Structures: Measures relate to the availability and appropriateness of the healthcare system's structures to support specialized care need scenarios. Examples of such scenarios include chemical decontamination, radiation screening, waste management, and biological containment.

Domain 4: Systems

The systems domain examines the plans, policies, and protocols, as well as the laws, technologies, and structures that affect readiness. Measures within this domain examine incident leadership as well as communications and information sharing networks. Measures apply to healthcare systems' relationships, both formal and informal, with one another as well as with their local, state, and federal government partners and other nongovernmental organizations, both professional and volunteer.

The systems domain is divided into the following subdomains:

Emergency Management Program: Measures relate to the effectiveness of the organization's emergency management program to develop, test, and improve plans, policies, and protocols for disaster response. This includes assessment of the organization's exercises of emergency response capabilities, its evaluation of performance in exercises and real events, and its ability to demonstrate continual performance improvement based on measurement of its capabilities and performance in all domains. Determining health information technology needs during a disaster, such as a cybersecurity attack, is also needed.

Incident Management: Measures relate to the effectiveness of the organization's leaders to receive notification of an incident, mobilize assets, respond, and recover. This includes assessment of the healthcare system's ability to identify and prioritize incident response objectives, to monitor and manage progress towards achieving those objectives, and to frequently reassess the effectiveness of the institutional response and recovery. This also includes monitoring of the effectiveness and quality of care delivered during incident response and recovery as well as appropriate financial monitoring and management of the response.

Communications: Measures relate to the ability to effectively share needed information with those who need it in a timely manner. This includes both internal and external sharing of information across facilities, as well as the ability to receive, document, and organize incoming information. This subdomain includes measures of both the plans and the technologies required to support communications between the healthcare system and its patients, the system and its employees, as well as between the system and its external response partners. This subdomain also includes assessment of the healthcare system's ability both to efficiently request and offer information related to resource needs during a response.

Healthcare System Coordination: Measures relate to the effectiveness of the healthcare system to collaborate in planning, mitigation, response, and recovery with external partners. This includes assessment of existing memoranda of understanding (MOUs) among systems and governments, suppliers, and others. This subdomain also includes assessment of the shared planning, training, exercising, and response activities across the community that are necessary for effective response.

Surge Capacity: Measures relate to the ability of the healthcare system to alter its usual operations in order to accommodate a surge in incoming patient volume. This includes plans and mechanisms to reallocate resources, request additional external resources, and/or alter the usual delivery of care as needed during response. This subdomain includes both the need to suddenly surge clinical capacity in response to a no-notice incident as well as the need to surge clinical capacity in response to a prolonged event, such as a pandemic. In addition, surge capacity encompasses the ability to implement crisis standards of care and thus be able to adjust care delivery in a fair, equitable, ethical, and evidence-based manner when the incident-related response needs significantly exceed the response resources available.

Population Health Management: Measures relate to the ability of healthcare systems to appropriately identify, address, and manage care needs of populations across the community who require emergent and chronic care before, during, and after a disaster or emergency. Measure concepts are directed at tracking and reporting the extent to which care is appropriately provided based on needs of different populations. This subdomain also includes assessment of the healthcare system's ability to plan for, and respond to, incidents that may affect populations at greater risk, such as children, persons with access and functional needs, pregnant women, or other groups. While every facility may not have the ability to respond to every scenario, there should be a plan in place which ensures capacity across the system; this may involve creation of temporary facilities or relying on other facilities with specific capabilities.

Business Continuity: Measures relate to the healthcare system's ability to identify, prioritize, and sustain its essential functions in any disaster scenario. This includes plans for continuity of leadership and continuity of operations, as well as analyses of the business impact of loss of essential functions and setting of recovery time objectives for reinstatement of those essential functions.

MEASURES AND MEASURE CONCEPTS

Developing measure concepts and identifying existing measures are important to address gaps appropriately, assess quality in care provided, and encourage cross-sector collaboration to drive improvements in health outcomes.

NQF worked with the Healthcare System Readiness Committee to examine and develop these measure concepts based on information gathered through the literature, and the individual knowledge of each of the Committee members. A measure concept is an idea for a measure, including the target population for measurement. The Committee worked collectively to identify measure concepts that aligned to each of the domains and subdomains. Readiness applies to all four phases of emergency management and acknowledges the fluid and oftentimes overlapping transition between the phases. This allows for the inclusion of distinct yet related activities in areas such as communication, coordination, training and education, and operating plans. This framework is intended to be a broad, common approach applicable to all hazards. While the inability to address nuances of emergencies and hazards, as well as the narrower focus on concepts applicable to entities that directly deliver care, may be considered a limitation, healthcare emergency management experts, providers, quality leaders, and policymakers can still benefit from a framework that gathers all of the potential readiness-related concepts into one cohesive format.

Appendix A identifies the measure concepts broken down by appropriate domains, subdomains, and emergency management phases. Each domain has its own table. The first column of the table lists the subdomain. The next four columns represent each of the four emergency

management phases (mitigation, preparedness, response, and recovery). Each row represents the same general measure concept idea, but the measure concept has been slightly restructured for the associated phase. Not every measure concept idea will be appropriate for each phase, and thus many squares have been left blank. Unless otherwise stated, each measure may be applied to individual healthcare entities within the healthcare system, and to the healthcare system as a whole.

There are currently no specific readiness measures available. However, there are some preparedness measures and measure concepts identified in the *Healthcare System Readiness Environmental Scan Report*.[8] These measures are grouped by appropriate domains, subdomains, and emergency management phase (Appendix B). In addition, some measures of readiness are included as requirements in current accreditation and government regulatory programs (i.e., conditions of participation). While the Committee did not specifically discuss measure selection, they noted many emergency management documents that present concepts and guidance on activities to undertake to ensure preparedness for any and all hazard events, such as the Federal Emergency Management Agency (FEMA)/Department of Homeland Security (DHS) National Planning Frameworks, The Joint Commission Emergency Management Standards, Centers for Disease Control and Prevention (CDC) Public Health Preparedness Capabilities: National Standards for State and Local Planning, the Hospital Preparedness Program Capabilities Document, and the Emergency Medical Services for Children Readiness Toolkit.[2,12–15] These documents provide detailed information that may complement this broader, all-hazards framework.

NEXT STEPS

Moving from measure concepts to quality measures will require a concerted collaboration between healthcare entities, measure developers, and the federal government. Today, there are specific requirements for accreditation and regulatory obligations. A future state might involve continuation of these requirements and the adoption of a few metrics related to readiness that could be deployed across healthcare entities and measure whether entities are actually ready to meet the needs of patients during a disaster or emergency.

Metrics will need to be specified at the correct, specific level of analysis to incentivize individual investment by healthcare systems in readiness efforts, initiate community-wide preparation, and ensure metrics are geared towards the appropriate accountable entity. Organizations will need to be fully invested in healthcare coalitions, information sharing, and cooperation in order to deploy the most effective interventions. In addition, sharing of resources and transparent capacity across the community and healthcare systems will be needed to ensure all patients get the best possible care, particularly to ensure that the needs of specific populations—such as those with access and functional needs—are met. To those ends, the Committee offered several recommended next steps:

1. Investment in the development of high-priority measures. The Committee discussed the multitude of measure concepts created, and advised of the need to first create a process to prioritize concepts, and then to select the concepts deemed to be highest priority to move the healthcare system towards readiness.

2. Developing a feasibility scale so that any healthcare entity can determine its current capacities and capabilities to better streamline readiness efforts.

3. Better define readiness responsibilities across private and public healthcare entities. Currently, there is a distribution of responsibility for readiness among the private and public sectors. Further defining specific roles and tying specific metrics to those specific roles may lead to more thoughtful investment, as well as coordinated response among entities.

4. Alignment of government stakeholders and initiating conversations with the private sector. Currently, there are several different organizations involved in readiness. However, these organizations, both government and nongovernment, are not always aligned in their efforts and activities. In order to align the activities, incentives, capacities, and capabilities, the private healthcare sector will need to be aligned with government entities in this space. To accomplish this, the government will need to invite and involve the private sector in conversations regarding readiness. This could be done through several mechanisms such as existing government working groups.

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APPENDIX A:
Healthcare System Readiness Subdomains and Measure Concepts

Staff Subdomains and Measure Concepts*

Subdomain	Mitigation Measure Concept	Preparedness Measure Concept	Response Measure Concept	Recovery Measure Concept
Staff Safety	Identification of elements that place staff at physical, psychological, or social risk in their normal operations during a response to a disaster.	Development and implementation of staff disaster safety plans.	Monitoring and effective interventions for identified staff physical, psychological, and social safety threats during a response to a disaster.	Developing and implementing a corrective action plan to address observed threats to staff physical, psychological, and social safety threats and outcomes related to response.
Staff Safety	Identification of all high-risk scenarios where staff may be expected to perform tasks within or outside their normal daily operations (including hazards requiring use of specialized protective equipment).	Creation, resourcing, and active practice of plans for scenarios requiring specialized procedures, clothing, equipment or personal protective equipment (PPE).	Monitoring of staff placed in high-risk areas during a disaster to ensure appropriate use of specialized procedures, clothing, equipment, or PPE.	Developing and implementing a corrective action plan to address observed challenges or errors in the appropriate use of specialized procedures, equipment, or PPE.
Staff Capability	Identification of areas within the system where staff with unique skills (i.e., trauma, burn, dialysis, mental health, etc.) are required for effective clinical response to a disaster.	Creation, resourcing. and active practice of plans to assure availability of staff with unique skills to support effective clinical response to a disaster.	Monitoring of, and intervention in, areas within the system that require staff with unique skills to ensure sufficient numbers of capable staff are present.	Developing and implementing a corrective action plan to address observed challenges in assuring availability of appropriate staff with needed clinical skills.
Staff Capability	Identification of areas within and/or outside the system where staff can be cross trained or used as flex staff to cover areas outside their assigned duty areas during and after a disaster.	Creation, resourcing, and active practice of plans that effectively support deployment of selected staff outside their normal duty areas to provide quality care during and after a disaster.	Monitoring and oversight of staff who have been assigned outside of normal duty areas to ensure quality of care and competency during a disaster.	Developing and implementing a corrective action plan to address observed challenges in the use of staff outside of their normal duty areas during disaster response.

Subdomain	Mitigation Measure Concept	Preparedness Measure Concept	Response Measure Concept	Recovery Measure Concept
Staff Sufficiency	Identification of disaster scenarios where the number of staff present may be inadequate to fully meet the response needs of the disaster.	Creation, resourcing, and active practice of plans to ensure sufficient staffing (including consideration of discipline, specialty training requirements) for full operations during and after a disaster.	Tracking and providing oversight to ensure appropriate staffing (including consideration of discipline, specialty requirements) to sustain clinical operations during a disaster.	Developing and implementing a corrective action plan to address observed challenges in assuring appropriate staffing (staffing ratios, discipline, specialty requirements) to sustain clinical operations or return to full operations post-disaster.
Staff Sufficiency	Identification of an effective methodology to ensure appropriate credentials, privileges, and licensing of formally arranged staff utilized in the response to a disaster.	Creation, resourcing, and active practice of plans to credential, privilege, and ensure licensure of formally arranged staff utilized in the response to a disaster	Tracking and oversight of credentialing, privileging, and licensure of formally arranged staff utilized during a disaster.	Developing and implementing a corrective action plan to address observed challenges in the credentialing, privileging, and licensure of formally arranged staff during response and recovery.
Staff Sufficiency	Identification of an effective methodology to ensure appropriate credentials, privileges, licensing, and roles and responsibilities of volunteers during a disaster.	Creation, resourcing, and active practice of plans to credential, privilege, ensure licensure, and deploy volunteers during a disaster.	Tracking and oversight of credentialing, privileging, and licensure of volunteers and their assigned duties during a disaster.	Developing and implementing a corrective action plan to address observed challenges, such as credentialing, privileging, licensure, and use of volunteers and their assigned duties post-disaster.
Staff Sufficiency	Identification of root causes of expected levels of absenteeism and attrition during a disaster.	Development of a plan that attempts to minimize absenteeism and attrition during disaster response.	Tracking and oversight of absenteeism and attrition during disaster response.	Developing and implementing a corrective action plan to address observed challenges with and causes of absenteeism and attrition during response and recovery.
Staff Training	Identification of the minimum training and skill maintenance requirements applicable to all staff for disaster response (including personal preparedness)	Creation, resourcing, and delivery of system-wide training and skill maintenance for all staff to support disaster readiness based on identification of needs (periodically).	Capability to develop and deploy just-in-time training as needed for staff applicable to the disaster response.	Developing and implementing a corrective action plan to address observed challenges in baseline of staff training and skill maintenance for response and recovery.

Subdomain	Mitigation Measure Concept	Preparedness Measure Concept	Response Measure Concept	Recovery Measure Concept
Staff Training	Identification of the training and skill maintenance requirements needed for staff and staff teams with specialty roles in disaster response (e.g., emergency, surgical, intensive care, other staff).	Creation, resourcing, and delivery method of training and skill maintenance for individual staff and staff teams based on identification of needs (periodically).	Tracking and monitoring of the adequacy of staff and team training and skill maintenance during a disaster.	Developing and implementing a corrective action plan to address observed challenges in training and skill maintenance of staff and teams for their roles in response and recovery.
Staff Training	Identification of a system to track and monitor compliance with disaster training requirements.	Implementation of a system to track and monitor compliance with disaster training requirements.	Capability to utilize the developed system to identify trained staff during a disaster.	Evaluation of the effectiveness of the system for tracking and monitoring compliance with disaster training requirements.
Staff Training	Identification of indicators of staff resiliency that are critical for disaster response.	Incorporation of staff resilience indicators in the disaster plan and assessment of baseline staff resiliency.	Tracking and monitoring of staff resilience indicators during a disaster.	Developing and implementing a corrective action plan to address observed challenges in resilience indicators post disaster.
Staff Training	Identification of system needs for tabletop, functional, and full-scale disaster plan exercises to ensure staff readiness.	Development, resourcing, and execution of a multiyear training and exercise program to meet identified needs.	Structured and critical evaluation of all exercises and incidents resulting in formal after-action reports.	Development of improvement plans based on observed challenges documented in after-action reports and execution of improvement plan tasks.
Staff Training	Identification of staff training needs related to the delivery of crisis standards of care during a disaster response.	Creation and delivery of a training curriculum that addresses the implementation of crisis standards of care in designated settings and multiple scenarios.	Capability to develop and deploy just in time training as needed to address utilization of crisis standards of care in designated settings.	Development of improvement plans for training programs based on observed challenges documented in implementing crisis standards of care
Staff Support	Identification of potential personal support elements (e.g., behavioral and mental health needs, laundry, nutrition, housing, child care, pet care, etc.) for staff that may be necessary during and following a disaster.	Creation and resourcing for plans to support staff personal needs during disaster response and recovery (especially if required to stay onsite during or post-disaster).	Tracking and monitoring of effectiveness and efficiency of delivery and availability of personal provisions during a disaster.	Development of improvement plans for training programs based on observed challenges in supporting staff personal needs during and after disaster response and recovery (especially if required to stay onsite during a disaster).

Subdomain	Mitigation Measure Concept	Preparedness Measure Concept	Response Measure Concept	Recovery Measure Concept
Staff Support	Identification of needs (e.g., behavioral and mental health needs, laundry, nutrition, housing, child care, pet care, etc.) to support training or other resources available to the family or caregivers of staff prior to, during, and after a disaster.	Creation and resourcing of plans to train and provide resources as needed to family or caregivers of staff during a disaster.	Tracking and monitoring of effectiveness of delivery of family/ caregiver support plans during a disaster.	Development of improvement plans based on observed challenges in supporting staff families or caregivers.

*All measure concepts created with appropriate regulatory requirements and boundaries in mind.

Stuff Subdomains and Measure Concepts*

Subdomain	Mitigation Measure Concept	Preparedness Measure Concept	Response Measure Concept	Recovery Measure Concept
Pharmaceutical Products	Identification, storage security, and distribution of par levels of general care pharmaceuticals necessary for disaster response, including those under an emergency use authorization (EUA) or investigational new drug (IND).	Creation of the appropriate acquisition, inventory, storage, security, distribution, and tracking procedures to monitor and manage necessary general care pharmaceuticals needed for disaster response, including those under an emergency use authorization (EUA) or investigational new drug (IND).	Tracking, storage, security, distribution, and management of general care pharmaceutical inventories during a disaster, including those under an emergency use authorization (EUA) or investigational new drug (IND).	Developing and implementing a corrective action plan to address observed challenges in the storage, security, distribution, and maintenance of adequate general care pharmaceuticals during disaster response and recovery, including those under an emergency use authorization (EUA) or investigational new drug (IND).
Pharmaceutical Products	Identification, storage, security, and distribution of approximate par levels of specialty pharmaceuticals (e.g., antidotes, antibiotics, etc.) necessary for disaster response, especially for special populations and specifically, those at greatest risk due to underlying health needs or conditions.	Creation of the appropriate acquisition, inventory, storage, security, distribution, and tracking procedures to monitor and manage necessary specialty pharmaceuticals, especially for special populations and specifically, those at greatest risk due to underlying health needs or conditions.	Tracking, storage, security, distribution, and management of specialty pharmaceutical inventories during a disaster, especially for special populations and specifically, those at greatest risk due to underlying health needs or conditions.	Developing and implementing a corrective action plan to address observed challenges in the storage, security, distribution, and maintenance of adequate specialty pharmaceuticals during disaster response and recovery, especially for special populations and specifically, those at greatest risk due to underlying health needs or conditions.
Pharmaceutical Products	Identification of processes to supplement local inventory of pharmaceuticals (i.e., access regional, state, national caches and/or share within the healthcare system, including healthcare coalitions)	Creation, resourcing, and active practice of plans to supplement local inventories of pharmaceuticals during a disaster.	Tracking and monitoring of efficient and effective supplementation of the local inventory of pharmaceuticals during a disaster.	Developing and implementing a corrective action plan to address observed challenges in utilizing external pharmaceutical caches post-disaster; timeliness and capacity to replenish pharmaceutical caches post-disaster.

Subdomain	Mitigation Measure Concept	Preparedness Measure Concept	Response Measure Concept	Recovery Measure Concept
Pharmaceutical Products	Identification of a process to store, secure, distribute, and manage pharmaceutical inventories when medications are nationally in short supply during disasters.	Creation, resourcing, and active practice of plans to store, secure, distribute, and manage pharmaceutical shortage events during disasters.	Tracking and monitoring of efficient and effective strategies to respond to pharmaceutical shortages during disasters.	Developing and implementing a corrective action plan to address observed challenges in storing, securing, distributing, and managing pharmaceutical shortages during disasters.
Pharmaceutical Products	Identification of a process to ensure rotation of stock and cache pharmaceuticals before expiration.	Create, resource, and active practice of a plan for rotating pharmaceuticals based on expiration dates, regulatory requirements, and current standards of practice.	Tracking and monitoring of efficient and effective rotation of stock during a disaster.	Developing and implementing a corrective action plan to address observed challenges in rotating pharmaceutical inventories.
Pharmaceutical Products	Identification of a process to perform an annual review of the appropriateness of stored pharmaceuticals.	Perform annual review of the appropriateness of stored pharmaceuticals.	Track and monitor use and/or rotation of cache pharmaceuticals	Evaluation post-event to ensure appropriateness of stored medications during a disaster and replenishment of the cache.
Durable Medical Equipment	Identification, storage security, and distribution of essential medical equipment needed to meet the needs of the general population, as well as special populations and specifically, those at greatest risk due to underlying health needs or conditions served during and after a disaster.	Acquire and maintain key equipment identified as necessary for the general population, as well as special populations and specifically, those at greatest risk due to underlying health needs or conditions during and after a disaster.	Tracking and monitoring of storage, security, distribution, access to, and use of medical equipment across the system during a disaster.	Developing and implementing a corrective action plan to address observed challenges with storage security, distribution, and access to medical equipment across the system post-disaster; timeliness and capacity to replenish stock post-disaster.
Durable Medical Equipment	Identification of a process to perform and document an annual review of equipment inventory across locations and ensure future operability.	Create, resource, and active practice of a plan to inventory, locate, and ensure operability of identified equipment necessary during and after a disaster.	Tracking and monitoring of accessibility and functionality of equipment during a disaster.	Developing and implementing a corrective action plan to address observed challenges in availability and/or operability of equipment post-disaster.

Subdomain	Mitigation Measure Concept	Preparedness Measure Concept	Response Measure Concept	Recovery Measure Concept
Durable Medical Equipment	Identification of a process to evaluate potential need for shared durable medical equipment among the healthcare system, including healthcare coalitions, during a disaster.	Creation, resourcing, and active practice of a plan to share durable medical equipment among the healthcare system, including healthcare coalitions, when appropriate.	Tracking and monitoring of shared durable medical equipment during a disaster.	Developing and implementing a corrective action plan to address observed challenges in sharing durable medical equipment post disaster.
Consumable Medical Equipment and Supplies	Identification of key consumable medical equipment and supplies needed across the general population, as well as special populations and specifically, those at greatest risk due to underlying health needs or conditions served during and after a disaster.	Acquire and maintain key consumable medical equipment and supplies identified as necessary for the general population, as well as special populations and specifically, those at greatest risk due to underlying health needs or conditions during and after a disaster.	Tracking and monitoring of access to consumable medical equipment and supplies during a disaster.	Developing and implementing a corrective action plan to address observed challenges with access to consumable medical equipment and supplies across the system post-disaster; timeliness and capacity to replenish stock post-disaster.
Consumable Medical Equipment and Supplies	Identification of a process to perform and document an annual review of supplies inventory and rotate expiring stock.	Creation, resourcing, and active practice of a plan for rotating consumable medical equipment and supplies based on expiration dates, regulatory requirements, and current standards of practice.	Tracking and monitoring of accessibility and functionality of consumable medical equipment and supplies during a disaster.	Developing and implementing a corrective action plan to address observed challenges in accessing and utilizing consumable medical supplies post disaster; timeliness and capacity to replenish caches post-disaster.
Consumable Medical Equipment and Supplies	Identification of appropriate types and par levels of personal protective equipment (PPE) necessary during relevant disasters.	Acquisition and maintenances of adequate types and par levels of personal protective equipment (PPE) needed during a disaster.	Tracking and monitoring of accessibility, adequacy, and function of PPE during a disaster.	Developing and implementing a corrective action plan to address observed challenges with access to appropriate PPE across the system post-disaster; timeliness and capacity to replenish stock post-disaster.

Subdomain	Mitigation Measure Concept	Preparedness Measure Concept	Response Measure Concept	Recovery Measure Concept
Consumable Medical Equipment and Supplies	Identification of a process to evaluate potential need for shared consumable medical equipment and supplies among the healthcare system, including healthcare coalitions, during a disaster.	Creation, resourcing, and active practice of a plan to share consumable medical equipment and supplies among the healthcare system, including healthcare coalitions, when appropriate.	Tracking and monitoring of shared consumable medical equipment and supplies during a disaster.	Developing and implementing a corrective action plan to address observed challenges in sharing consumable medical equipment and supplies post-disaster.
Nonmedical Supplies	Identification of critical needs list of nonmedical supplies for different disaster scenarios.	Resource and acquire par levels of nonmedical supplies needed during a disaster.	Tracking and monitoring of inventory, location, accessibility, adequacy, and function of nonmedical supplies during a disaster.	Tracking and monitoring of inventory, location, accessibility, adequacy, and function of nonmedical supplies post-disaster; timeliness and capacity to replenish stock post-disaster.
Nonmedical Supplies	Identification of a process to perform and document an annual review of non-medical supplies and rotate expiring stock.	Creation, resourcing, and active practice of a plan for rotating non-medical equipment and supplies based on expiration dates, regulatory requirements and current standards of practice.	Tracking and monitoring of accessibility and functionality of nonmedical equipment during a disaster.	Developing and implementing a corrective action plan to address observed challenges in accessing and utilizing nonmedical supplies post disaster; timeliness and capacity to replenish caches post-disaster.
Nonmedical Supplies	Identification of a process to evaluate potential need to share nonmedical supplies among the healthcare system, including healthcare coalitions, during a disaster.	Creation, resourcing, and active practice of a plan to share nonmedical supplies among the healthcare system, including healthcare coalitions, when appropriate.	Tracking and monitoring of shared nonmedical supplies during a disaster.	Developing and implementing a corrective action plan to address observed challenges in sharing nonmedical supplies post-disaster.

*All measure concepts created with appropriate regulatory requirements and boundaries in mind.

Structure Subdomains and Measure Concepts*

Subdomain	Mitigation Measure Concept	Preparedness Measure Concept	Response Measure Concept	Recovery Measure Concept
Existing Facility Infrastructure	Identification of the specific infrastructure elements needed to sustain ongoing operations during a disaster (i.e., power, HVAC, oxygen delivery, etc.)	Creation, resourcing, and active practice of plans to ensure function of each infrastructure element needed to sustain operations during a disaster.	Tracking and monitoring of infrastructure elements needed to sustain ongoing operations during a disaster.	Developing and implementing a corrective action plan to address observed challenges in maintaining infrastructure functioning during response and recovery from a disaster.
Existing Facility Infrastructure	Identification of infrastructure vulnerabilities relevant to disaster preparedness and climate change.	Creation and resourcing of plans to protect against identified facility infrastructure design vulnerabilities that may be relevant during disaster response or affected by climate change.	Monitoring infrastructure for signs of failure during a disaster and outcomes to response.	Evaluation of the efficiency and effectiveness of infrastructure design elements during disaster response and recovery.
Existing Facility Infrastructure	Identification of community infrastructure vulnerabilities (e.g., utilities, transportation systems, roadways, etc.) that may affect healthcare system operations during disasters.	Creation, resourcing, and active practice of plans to respond to community infrastructure failures during a disaster.	Monitoring of community infrastructure for signs of failure during a disaster and outcomes to response.	Developing and implementing a corrective action plan to address observed challenges in responding to community infrastructure failures during response and recovery from a disaster.
Existing Facility Infrastructure	Identification of existing locations/facilities that can be adapted to support clinical or other necessary operational functions during a disaster.	Creation, resourcing, and active practice of plans to adapt existing locations/facilities to support clinical or other necessary operational functions during a disaster.	Tracking and monitoring of accessibility and use of existing locations/facilities to support clinical or other necessary functions during a disaster.	Developing and implementing a corrective action plan to address observed challenges in adapting existing locations/facilities to support clinical or other necessary operational functions during response and recovery from a disaster.

Subdomain	Mitigation Measure Concept	Preparedness Measure Concept	Response Measure Concept	Recovery Measure Concept
Existing Facility Infrastructure	Identification of building codes and standards required for facilities to be resilient against relevant disasters.	Creation, resourcing, and active practice of plans to evaluate the structural integrity of system structures during a disaster.	Identification and prioritization of structures in need of repair during a disaster; repair or maintenance of structures damaged during a disaster.	Developing and implementing a corrective action plan to address observed failures in the structural integrity of facilities during response and recovery from a disaster.
Temporary Facility Infrastructure	Identification of locations where temporary structures may be used as alternate care delivery sites during and after a disaster.	Creation of plans, acquisition of needed material, and testing of operations of temporary alternate care sites.	Monitoring of timeliness, accessibility, appropriateness, and functioning of alternate delivery care sites during a disaster.	Developing and implementing a corrective action plan to address observed challenges in utilizing temporary facilities as alternate care sites during response and recovery from a disaster.
Hazard-Specific Structures	Identification of the location and structures necessary for the care of victims with hazard-specific needs (e.g., scalable airborne infection isolation capabilities; appropriate staging areas and decontamination facilities to care for victims with chemical, radiological, and biological exposures).	Creation, resourcing, and active practice of plans to deploy and utilize hazard-specific structures (which have been previously and properly tested).	Tracking and monitoring of the utilization of hazard-specific structures during a disaster.	Developing and implementing a corrective action plan to address observed challenges in utilizing hazard-specific facilities during response and recovery from a disaster.

*All measure concepts created with appropriate regulatory requirements and boundaries in mind.

Systems Subdomains and Measure Concepts*

Subdomain	Mitigation Measure Concept	Preparedness Measure Concept	Response Measure Concept	Recovery Measure Concept
Emergency Management Program	Identification of key elements of an emergency management program.	Creation, resourcing, and annual review of an emergency management program consisting of sufficient staff with sufficient expertise in healthcare emergency management.	Monitoring the ability of the system's emergency management program to support notification, mobilization, and coordination of response during a disaster.	Developing and implementing a corrective action plan to address observed challenges in mitigation, planning, response, and recovery from disaster events.
Emergency Management Program	Identification of key elements and regulatory requirements of a hazard vulnerability assessment (HVA).	Creation and annual re-evaluation of an HVA	Tracking and monitoring of key elements of the HVA through performance during the disaster	After-action analysis and adoption of improvement strategies identified through the HVA and disaster response.
Emergency Management Program		Hazards ranked highly in the HVA are represented in the system's multiyear training and exercise program.		
Emergency Management Program	Identification of key elements of a comprehensive emergency operations plan for the system.	Creation, training, and active practice of the system's emergency operations plan for use during and after a disaster.	Utilization of the system's emergency operations plan during the disaster.	Evaluation of the effectiveness of the emergency operations plan through documentation of testing/drills, or response and recovery outcomes; implementation of necessary identified corrective actions.
Emergency Management Program	Identification of a systematic methodology to develop and disseminate after-action evaluations and reports (AARs) following all exercises, incidents, and events to contribute to the evaluation of the emergency management plans and systems.	Creation and utilization of a standardized after-action evaluation and reporting process to support continuous improvement of the emergency management plans and systems.	Collection and documentation of key metrics during exercises, and during response and recovery to support after-action reviews and reporting.	Developing and Implementing a corrective action plan that incorporates feedback from after-action reviews, hotwashes, and reports into corrective action plans that address observed challenges in exercises, incidents, and events.

Subdomain	Mitigation Measure Concept	Preparedness Measure Concept	Response Measure Concept	Recovery Measure Concept
Emergency Management Program	Identification of key elements and systems of health information technology (HIT) that are required to track and monitor patients within and across health systems during and after a disaster, including success in repatriation of evacuated patients and reunification with family.	Creation, resourcing, and active practice of a plan to track and monitor patients using HIT within and across health systems during and after a disaster, including success in repatriation of evacuated patients and reunification with family.	Tracking and monitoring of patients within and across health systems using HIT during a disaster.	Developing and implementing a corrective action plan that incorporates after-action reviews and reports related to observed challenges in patient tracking and monitoring, including success in repatriation of evacuated patients and reunification with family.
Emergency Management Program	Identification of a methodology without operable HIT systems to track and monitor patients within and across health systems during and after a disaster, including success in repatriation of evacuated patients and reunification with family.	Create, resource, and active practice of a plan to track and monitor patients without the use of HIT within and across health systems during and after a disaster, including success in repatriation of evacuated patients and reunification with family.	Tracking and monitoring of patients within and across health systems without the use of HIT during a disaster.	Developing and implementing a corrective action plan that incorporates feedback from after-action reviews and reports related to observed challenges in patient tracking and monitoring, including success in repatriation of evacuated patients and reunification with family.
Emergency Management Program	Identification of key elements required for cybersecurity during a disaster.	Creation, resourcing, and active practice of plans to assure cybersecurity during and after a disaster, as well as to respond to and recover from cybersecurity attacks.	Tracking and monitoring of key elements of cybersecurity response during a disaster.	Developing and implementing corrective action plans that incorporate after-action reviews and reports related to observed challenges, response to, and recovery from cybersecurity events.
Business Continuity	Identification of critical business functions during and after a disaster.	Creation and testing of formal business continuity plans for essential business functions (including all necessary contracts and MOUs with partners and vendors).	Monitoring of the performance of critical business functions required during and after a disaster.	Developing and implementing corrective action plans that incorporate after-action reviews and reports related to observed challenges in maintaining and/ or recovering critical business functions.

Subdomain	Mitigation Measure Concept	Preparedness Measure Concept	Response Measure Concept	Recovery Measure Concept
Business Continuity	Identification of recovery time objectives for critical business functions.			
Business Continuity	Identification of annual costs and funding needed to support mitigation activities.	Identification of annual costs and funding needed to support preparedness and planning activities.	Monitoring and tracking of costs associated with response to disaster.	Monitoring and tracking costs associated with recovery; ensuring system is fully able to access recovery resources, when available; return to normal operations is equitable across the healthcare system.
Population Health Management	Identification of populations across the system who may be at higher risk of adverse outcomes during relevant disaster scenarios.	Creation, resourcing, and active practice of plans to meet the needs of populations across the system who may be at higher risk.	Identify, monitor, and respond to the needs of individuals at higher risk within the healthcare system to ensure access to services during a disaster.	Developing and implementing corrective action plans that incorporate after-action reviews related to observed challenges in ensuring care for individuals and populations at higher risk.
Population Health Management	Identification of key elements of disaster-related patient experience.	Creation, resourcing, and active practice of a methodology to gather key patient experience elements in a disaster.	Gather, track, and monitor patient experience data based on identified key elements during a disaster.	Developing and implementing corrective action plans that incorporate after-action reviews and reports related to observed challenges in patient experience.

Subdomain	Mitigation Measure Concept	Preparedness Measure Concept	Response Measure Concept	Recovery Measure Concept
Population Health Management	Identification of languages -both verbal and written -most used by the health system population: identification of critical information important to provide to patient populations before, during, and after a disaster (e.g., relevant warning functions, website content, education materials, etc.); identification of effective methodologies to communicate in multiple languages during a disaster.	Creation, resourcing, and active practice of plans to provide critical information to patient populations in multiple languages and using multiple media.	Provide critical information to patient populations during a disaster.	Developing and implementing a corrective action plan that incorporates after-action reviews, hotwashes, and reports related to observed challenges in providing critical information to patient populations in a disaster.
Population Health Management	Identification of potential behavioral health needs among all populations relevant to disaster planning.	Creation, resourcing, and active practice of plans to accommodate and care for identified patients with behavioral health needs during and after a disaster.	Efficient and effective care provided to patients having a behavioral health crisis during a disaster.	Developing and implementing a corrective action plan that incorporates after-action reviews and reports related to observed challenges in providing behavioral health resources.
Population Health Management	Identification of populations at higher risk, especially people with access and functional needs, including people with disabilities, and pediatric and geriatric populations, within a community served by the system.	Creation, resourcing, and active practice of plans to provide care, health maintenance, deliver services, and rescue or relocate the general population, as well as special populations and specifically, those at greatest risk due to underlying health needs or conditions. (Note: federal law requires the relocation of people with disabilities must be to the most integrated setting appropriate to the needs of the individual.)	Monitor and respond to the needs of populations at higher risk within the community during a disaster.	Developing and implementing a corrective action plan that incorporates after-action reviews and reports related to observed challenges in providing care to populations at higher risk.

Subdomain	Mitigation Measure Concept	Preparedness Measure Concept	Response Measure Concept	Recovery Measure Concept
Incident Management	Identification of an incident management system to be used during disaster incidents and events.	Creation, training, and active practice of the system's incident management system for use during and after a disaster.	Utilize the incident management system during exercises, incident response, and recovery.	Developing and implementing a corrective action plan that incorporates after-action reviews and reports related to observed challenges in utilizing the system's incident management system.
Incident Management	Identification of key leadership personnel for the system during a disaster.	Training and active practice is provided for all personnel serving in leadership roles during and after a disaster.	Monitoring effective use of the incident management system by leadership personnel.	Developing and implementing a corrective action plan that incorporates reviews and reports related to observed challenges in the effective use of the incident management system by leadership personnel.
Incident Management	Identification of command center location and necessary supporting incident management technologies.	Creation, resourcing, and active practice of the utilization of the system primary and backup emergency operations centers.	Utilize the system emergency operations center to lead, monitor, and communicate effectively during disaster response and recovery.	Developing and implementing a corrective action plan that incorporates after-action reviews and reports related to observed challenges with emergency operations center (EOC) operations.
Incident Management	Identification of potential causes of disaster-related morbidity and mortality.	Creation and resourcing of plans to monitor, mitigate, and minimize morbidity and mortality during and after a disaster.	Monitor and document the incidence and causes of morbidity and mortality during and after a disaster.	Developing and implementing a corrective action plan that incorporates after-action reviews and reports related to observed excess morbidity and mortality during disaster response and recovery.

Subdomain	Mitigation Measure Concept	Preparedness Measure Concept	Response Measure Concept	Recovery Measure Concept
Incident Management	Identification of decision criteria for shelter in place, or full/partial facility evacuation during a disaster.	Creation, resourcing, and active practice of plans for sheltering in place or evacuation.	Track and monitor timeliness of decisions and actual full or partial evacuation during a disaster.	Developing and implementing a corrective action plan that incorporates after-action reviews and reports related to observed challenges in sheltering in place or evacuating in a disaster.
Incident Management	Identification of mechanisms to ensure realistic and appropriate transportation for designated populations within the system during and after a disaster.	Creation, multiple contracts for resourcing, and active practice of plans to transport a variety of patient populations during and after a disaster.	Track and monitor timeliness and efficiency of patient transportation during a disaster.	Developing and implementing a corrective action plan that incorporates after-action reviews and reports related to observed challenges with patient transportation in a disaster. Review accessibility, appropriateness, and effectiveness of transportation during a disaster response.
Communications	Identification of key elements of a communication plan for both internal and external stakeholders before, during, and after a disaster.	Creation, resourcing, and active practice of plans to test the effectiveness of internal and external communication plans before, during, and after a disaster.	Effective use of the internal and external stakeholder communication plans during a disaster.	Developing and implementing a corrective action plan that incorporates after-action reviews and reports related to observed challenges with internal and external communications before, during, and after a disaster.
Communications	Identification of key elements of a system-wide patient communication plan before, during, and after a disaster.	Creation, resourcing, and active practice of plans to test the effectiveness of patient communication plans before, during, and after a disaster.	Effective communication of essential information to and from patients.	Developing and implementing a corrective action plan that incorporates after-action reviews and reports related to observed challenges with patient communications before, during, and after a disaster.

Subdomain	Mitigation Measure Concept	Preparedness Measure Concept	Response Measure Concept	Recovery Measure Concept
Communications	Identification of a methodology and systems that allow internal and external stakeholders to share information effectively before, during, and after a disaster.	Creation, resourcing, and active practice of systems, elements, processes, and procedures that allow internal and external stakeholders to share information effectively before, during, and after a disaster.	Internal and external stakeholders able to share necessary information in a timely and efficient manner during a disaster.	Developing and implementing a corrective action plan that incorporates after-action reviews and reports related to observed challenges with information sharing systems before, during, and after a disaster.
Communications	Identification of backup systems, equipment, processes, and procedures to be used for communication across the system when traditional methods are nonoperational.	Creation, resourcing, and active practice of backup systems, elements, processes, and procedures that allow internal and external stakeholders to share information effectively during and after a disaster.	Internal and external stakeholders able to share necessary information during a disaster when primary systems are impaired.	Developing and implementing a corrective action plan that incorporates after-action reviews and reports related to observed challenges with backup systems.
Communications	Identification of key elements necessary for health information exchange when technology is unavailable; identification of methodology for health information exchange to occur during a disaster.	Creation, resourcing, and active practice of systems that allow internal and external stakeholders to share information effectively during and after a disaster when technologies are unavailable.		
Communications	Identification of systems and process to automate warnings and alerts, mobilization, and other information before, during, and after a disaster.	Creation, resourcing, and active practice of a systems and plans to automate warning, notification, mobilization, and other information during disaster response and recovery.	Effective use of the automated emergency communications systems during disasters.	Review of effectiveness of automated emergency communications systems post-disaster.

Subdomain	Mitigation Measure Concept	Preparedness Measure Concept	Response Measure Concept	Recovery Measure Concept
Healthcare System Coordination	Identification of key partnerships to be developed and maintained with community stakeholders (i.e., local/state public health/emergency management departments, the healthcare system, including healthcare coalitions, community-based organizations).	Creation, resourcing, and active practice of plans testing performance of system level preparedness exercises including community partners.	Partnerships activated and appropriately utilized during a disaster.	Developing and implementing a corrective action plan that incorporates after-action reviews and reports related to observed challenges in partnership functions during and after a disaster.
Healthcare System Coordination	Identification of key data elements regarding response needs and/or available resources to be shared with the healthcare system, including healthcare coalitions; identification of systems to effectively share and monitor key data elements.	Creation, resourcing, and active practice with systems that support sharing key data elements during exercises and events to improve situational awareness and response across the healthcare system, including healthcare coalitions.	Effective monitoring and use of key data elements to guide healthcare system, including healthcare coalitions, coordination during disasters.	Developing and implementing a corrective action plan that incorporates after-action reviews and reports related to observed challenges with healthcare system, including healthcare coalitions, information sharing systems during and after a disaster.
Healthcare System Coordination	Identification of key elements (e.g., demographics, community wealth, resources, and community organizations) within a community needs assessment that contribute to community disaster planning.	Performance of a community needs assessment; incorporation of relevant elements of the community needs assessment related to disaster planning into the emergency operations plan.		Evaluation of the effectiveness of incorporating elements of the community needs assessment into the emergency operations plan.
Healthcare System Coordination	Identification of how the system coordinates with its healthcare and community partners, including coalitions, to ensure community needs are addressed.	Creation, resourcing, and testing of healthcare and community partners, including coalitions, plans to coordinate response to and recover from disasters.	Monitoring of community-wide needs following disaster and participation in healthcare and community partnerships including coalition response efforts.	Developing and implementing a corrective action plan that incorporates after-action reviews and reports related to observed challenges in meeting community needs during and after a disaster.

Subdomain	Mitigation Measure Concept	Preparedness Measure Concept	Response Measure Concept	Recovery Measure Concept
Healthcare System Coordination	Identification of mechanisms to identify and respond to uniquely stressed care capabilities within the system (e.g., overwhelmed EDs, ICUs, mental/behavioral health practices, long-term care facilities, health centers, etc.).	Creation, resourcing, and active practice of plans to identify overloaded services during a disaster and develop alternative response options.	Continuous provision of identified key services during a disaster.	Developing and implementing a corrective action plan that incorporates after-action reviews and reports related to observed challenges with delivery of key services after a disaster.
Healthcare System Coordination	Identification of triggers and indicators for crisis standards of care across the system by provider/partner type.	Creation, resourcing, and active practice of plans to define and implement community crisis standards of care if needed.	Identify need for, implement, and monitor defined community crisis standards during a disaster.	Evaluate use of crisis standards of care and their effectiveness of use during a disaster.
Surge Capacity	Identification of key elements required to create hospital and nonhospital-based (e.g., outpatient, emergency department, inpatient floor, intensive care unit settings, telehealth, and home care) surge capacity within a system.	Creation, resourcing, and active practice of plans to create additional surge capacity in hospital and nonhospital settings.	Monitoring of capacity in hospital and nonhospital settings and implementation of surge capacity plans when needed.	Developing and implementing corrective action plan that incorporates after-action reviews and reports related to observed challenges during exercises and events to create surge capacity during and after a disaster.
Surge Capacity	Identification of tools that help identify available capacity during a disaster.	Creation, resourcing, and active practice with systems that identify available system capacity in outpatient, emergency department, inpatient floor, and intensive care unit settings, especially for special populations and specifically, those at greatest risk due to underlying health needs or conditions.	Monitor, identify, and utilize all available capacity across the system during a disaster.	Developing and implementing a corrective action plan that incorporates after-action reviews and reports related to observed challenges during exercises and events to identifying available capacity during and after a disaster.

Subdomain	Mitigation Measure Concept	Preparedness Measure Concept	Response Measure Concept	Recovery Measure Concept
Surge Capacity	Identification of data elements that would indicate a need to activate surge capacity plans.	Creation of plans and systems to monitor and share data related to health system, including healthcare coalitions, capacity during a disaster.	Tracking and monitoring of census, capacity, equipment, personnel resources, etc.; implementation of surge plans across the community when required.	Developing and implementing corrective action plan that incorporates after-action reviews and reports related to observed challenges during exercises and events to create surge capacity during and after a disaster.
Surge Capacity	Identification of sites within and outside of the system that can provide alternate level of care bed availability.	Creation of plans and systems to develop alternate care sites during a disaster	Tracking and monitoring of patients transitioned to alternate levels of care during a disaster.	Developing and implementing a corrective action-plan that incorporates after-action reviews and reports related to observed challenges utilizing alternate care sites during and after a disaster.

*All measure concepts created with appropriate regulatory requirements and boundaries in mind.

APPENDIX B:
Healthcare System Readiness Measures

Staff Measures

Subdomain	Mitigation Measures	Preparedness Measures	Response Measures	Recovery Measures
Staff Sufficiency			Access to Specialists (Agency for Healthcare Research and Quality)	
Staff Training			Pre-identified staff reported to the public health Emergency Operations Center within the target time of 2.5 hours (Centers for Disease Control and Prevention)	
Staff Training			Time for pre-identified staff covering activated public health agency incident management lead roles (or equivalent lead roles) to report for immediate duty. Performance Target: 60 minutes or less (Centers for Disease Control and Prevention)	

Subdomain	Mitigation Measures	Preparedness Measures	Response Measures	Recovery Measures
Staff Safety	Safety Climate: Overall Performance Measure: Develop and evaluate a set of new best practices or recommended performance measures to improve the organization of emergency response activities and to promote a pro-active crew-based safety climate. Reduce exposures, illnesses, or injuries attributable to improvements in safety climate (Centers for Disease Control and Prevention – National Institute for Occupational Safety and Health)	Safety Climate: Overall Performance Measure: Develop and evaluate a set of new best practices or recommended performance measures to improve the organization of emergency response activities and to promote a pro-active crew-based safety climate. Reduce exposures, illnesses, or injuries attributable to improvements in safety climate (Centers for Disease Control and Prevention – National Institute for Occupational Safety and Health)		
Staff Safety	Surveillance: Overall performance measure: Reduce the development of illnesses or injuries attributable to occupational exposure during disaster response through the use of prevention tools developed from information from short- and long-term surveillance reporting systems. (Centers for Disease Control and Prevention – National Institute of Occupational Safety and Health)	Surveillance: Overall performance measure: Reduce the development of illnesses or injuries attributable to occupational exposure during disaster response through the use of prevention tools developed from information from short- and long-term surveillance reporting systems. (Centers for Disease Control and Prevention – National Institute of Occupational Safety and Health)	Surveillance: Overall performance measure: Reduce the development of illnesses or injuries attributable to occupational exposure during disaster response through the use of prevention tools developed from information from short- and long-term surveillance reporting systems. (Centers for Disease Control and Prevention – National Institute of Occupational Safety and Health)	Surveillance: Overall performance measure: Reduce the development of illnesses or injuries attributable to occupational exposure during disaster response through the use of prevention tools developed from information from short- and long-term surveillance reporting systems. (Centers for Disease Control and Prevention – National Institute of Occupational Safety and Health)

Stuff Measures

Subdomain	Mitigation Measures	Preparedness Measures	Response Measures	Recovery Measures
Pharmaceutical Products			Composite performance indicator from the Division of Strategic National Stockpile* in CDC's Office of Public Health Preparedness and Response (Centers for Disease Control and Prevention) – Activate dispensing modalities	
Pharmaceutical Products			Composite performance indicator from the Division of Strategic National Stockpile in CDC's Office of Public Health Preparedness and Response (Centers for Disease Control and Prevention) – Dispense medical countermeasures to identified population	Composite performance indicator from the Division of Strategic National Stockpile in CDC's Office of Public Health Preparedness and Response (Centers for Disease Control and Prevention) – Dispense medical countermeasures to identified population
Consumable Medical Equipment and Supplies			Access to medical equipment (Mathematica)	Access to medical equipment (Mathematica)
Consumable Medical Equipment and Supplies			Composite performance indicator from the Division of Strategic National Stockpile in CDC's Office of Public Health Preparedness and Response (Centers for Disease Control and Prevention) – Direct and activate medical material management and distribution	Composite performance indicator from the Division of Strategic National Stockpile in CDC's Office of Public Health Preparedness and Response (Centers for Disease Control and Prevention) – Direct and activate medical material management and distribution
Consumable Medical Equipment and Supplies			Access to medical equipment (Mathematica)	

Subdomain	Mitigation Measures	Preparedness Measures	Response Measures	Recovery Measures
Pharmaceutical Products **Consumable Medical Equipment and Supplies**		Composite performance indicator from the Division of Strategic National Stockpile in CDC's Office of Public Health Preparedness and Response (Centers for Disease Control and Prevention) – Acquire medical material	Composite performance indicator from the Division of Strategic National Stockpile in CDC's Office of Public Health Preparedness and Response (Centers for Disease Control and Prevention) – Acquire medical material	
Pharmaceutical Products **Consumable Medical Equipment and Supplies**	Composite performance indicator from the Division of Strategic National Stockpile in CDC's Office of Public Health Preparedness and Response (Centers for Disease Control and Prevention) – Maintain updated inventory management and reporting system	Composite performance indicator from the Division of Strategic National Stockpile in CDC's Office of Public Health Preparedness and Response (Centers for Disease Control and Prevention) – Maintain updated inventory management and reporting system	Composite performance indicator from the Division of Strategic National Stockpile in CDC's Office of Public Health Preparedness and Response (Centers for Disease Control and Prevention) – Maintain updated inventory management and reporting system	Composite performance indicator from the Division of Strategic National Stockpile in CDC's Office of Public Health Preparedness and Response (Centers for Disease Control and Prevention) – Maintain updated inventory management and reporting system
Pharmaceutical Products **Consumable Medical Equipment and Supplies**	Composite performance indicator from the Division of Strategic National Stockpile in CDC's Office of Public Health Preparedness and Response (Centers for Disease Control and Prevention) – Establish and maintain security	Composite performance indicator from the Division of Strategic National Stockpile in CDC's Office of Public Health Preparedness and Response (Centers for Disease Control and Prevention) – Establish and maintain security	Composite performance indicator from the Division of Strategic National Stockpile in CDC's Office of Public Health Preparedness and Response (Centers for Disease Control and Prevention) – Establish and maintain security	Composite performance indicator from the Division of Strategic National Stockpile in CDC's Office of Public Health Preparedness and Response (Centers for Disease Control and Prevention) – Establish and maintain security
Pharmaceutical Products **Consumable Medical Equipment and Supplies**			Composite performance indicator from the Division of Strategic National Stockpile in CDC's Office of Public Health Preparedness and Response (Centers for Disease Control and Prevention) – Distribute medical material	Composite performance indicator from the Division of Strategic National Stockpile in CDC's Office of Public Health Preparedness and Response (Centers for Disease Control and Prevention) – Distribute medical material

Subdomain	Mitigation Measures	Preparedness Measures	Response Measures	Recovery Measures
Pharmaceutical Products **Consumable Medical Equipment and Supplies**				Composite performance indicator from the Division of Strategic National Stockpile in CDC's Office of Public Health Preparedness and Response (Centers for Disease Control and Prevention) – Recovery medical material and demobilize distribution operations

*Note: The Strategic National Stockpile program was transferred to the Assistant Secretary for Preparedness and Response about a year ago.

Structure Measures

Subdomain	Mitigation Measures	Preparedness Measures	Response Measures	Recovery Measures
Existing Facility Infrastructure **Temporary Facility Infrastructure** **Hazard-Specific Structures**	Engineering/ Technological Interventions and Controls: Overall Performance Measure: Reduce exposure through improved engineering/ technological interventions and controls. (Centers for Disease Control and Prevention – National Institute of Occupational Safety and Health)	Engineering/ Technological Interventions and Controls: Overall Performance Measure: Reduce exposure through improved engineering/ technological interventions and controls. (Centers for Disease Control and Prevention – National Institute of Occupational Safety and Health)		

Systems Measures

Subdomain	Mitigation Measures	Preparedness Measures	Response Measures	Recovery Measures
Emergency Management Program		AAR/IPs developed following an exercise or real incident. After-Action Reports/ Improvement Plans (ARR/IPs) (Centers for Disease Control and Prevention)	AAR/IPs developed following an exercise or real incident. After-Action Reports/ Improvement Plans (ARR/IPs) (Centers for Disease Control and Prevention)	AAR/IPs developed following an exercise or real incident. After-Action Reports/ Improvement Plans (ARR/IPs) (Centers for Disease Control and Prevention)
Emergency Management Program			AAR/IPs developed within target time of 60 days (Centers for Disease Control and Prevention)	AAR/IPs developed within target time of 60 days (Centers for Disease Control and Prevention)
Emergency Management Program	Characterization/ Assessment of Potential Hazards: Overall Performance Goal: Reduce the incidence and severity of injuries and illnesses through improved and more rapid characterization/ assessment of potential hazards. (Centers for Disease Control and Prevention – National Institute of Occupational Safety and Health)	Characterization/ Assessment of Potential Hazards: Overall Performance Goal: Reduce the incidence and severity of injuries and illnesses through improved and more rapid characterization/ assessment of potential hazards. (Centers for Disease Control and Prevention – National Institute of Occupational Safety and Health)	Characterization/ Assessment of Potential Hazards: Overall Performance Goal: Reduce the incidence and severity of injuries and illnesses through improved and more rapid characterization/ assessment of potential hazards. (Centers for Disease Control and Prevention – National Institute of Occupational Safety and Health)	Characterization/ Assessment of Potential Hazards: Overall Performance Goal: Reduce the incidence and severity of injuries and illnesses through improved and more rapid characterization/ assessment of potential hazards. (Centers for Disease Control and Prevention – National Institute of Occupational Safety and Health)
Emergency Management Program		Conducted at least one unannounced activation (Centers for Disease Control and Prevention)		
Emergency Management Program		Conducted at least one unannounced notification outside of normal business hours (Centers for Disease Control and Prevention)		
Emergency Management Program		EOC– Incident Action Planning (Centers for Disease Control and Prevention)		

Subdomain	Mitigation Measures	Preparedness Measures	Response Measures	Recovery Measures
Emergency Management Program				EOC - After-Action Report/Improvement Plan Annual (Centers for Disease Control and Prevention)
Emergency Management Program			Performance Measure 74 (formerly PM 66c medical) (Emergency Medical Services for Children)	Performance Measure 74 (formerly PM 66c medical) (Emergency Medical Services for Children)
Emergency Management Program			Performance Measure 75 (formerly PM 66c trauma) (Emergency Medical Services for Children)	Performance Measure 75 (formerly PM 66c trauma) (Emergency Medical Services for Children)
Emergency Management Program			Performance Measure 73 (formerly PM 66b) (Emergency Medical Services for Children)	Performance Measure 73 (formerly PM 66b) (Emergency Medical Services for Children)
Emergency Management Program			Time to complete a draft of an After-Action Report and Improvement Plan (Centers for Disease Control and Prevention)	Time to complete a draft of an After-Action Report and Improvement Plan (Centers for Disease Control and Prevention)
Emergency Management Program			NQF 0489: (Not Endorsed) The Ability for Providers with HIT to Receive Laboratory Data Electronically Directly into their ONC-Certified EHR System as Discrete Searchable Data (Centers for Medicare and Medicaid Services)	NQF 0489: (Not Endorsed) The Ability for Providers with HIT to Receive Laboratory Data Electronically Directly into their ONC-Certified EHR System as Discrete Searchable Data (Centers for Medicare and Medicaid Services)
Emergency Management Program			NQF 0491: (Not Endorsed) Tracking Clinical Results between Visits (Centers for Medicare and Medicaid Services)	NQF 0491: (Not Endorsed) Tracking Clinical Results between Visits (Centers for Medicare and Medicaid Services)

Subdomain	Mitigation Measures	Preparedness Measures	Response Measures	Recovery Measures
Emergency Management Program	Personal Protective Equipment (PPE): Overall Performance Measure: Reduce the number of injuries and illnesses to first responders as a result of improper selection or use (or non-use) of PPE. (Centers for Disease Control and Prevention – National Institute of Occupational Safety and Health)	Personal Protective Equipment (PPE): Overall Performance Measure: Reduce the number of injuries and illnesses to first responders as a result of improper selection or use (or non-use) of PPE. (Centers for Disease Control and Prevention – National Institute of Occupational Safety and Health)	Personal Protective Equipment (PPE): Overall Performance Measure: Reduce the number of injuries and illnesses to first responders as a result of improper selection or use (or non-use) of PPE. (Centers for Disease Control and Prevention – National Institute of Occupational Safety and Health)	
Emergency Management Program	Production of the approved Incident Action Plan before the start of the second operational period (Centers for Disease Control and Prevention)	Production of the approved Incident Action Plan before the start of the second operational period (Centers for Disease Control and Prevention)		
Emergency Management Program	Re-evaluated response capabilities following approval and completion of corrective actions identified in AAR/IP (Centers for Disease Control and Prevention)			
Incident Management			Access to Care (Agency for Healthcare Research and Quality)	Access to Care (Agency for Healthcare Research and Quality)
Incident Management			Acute Care Hospitalization (Claims Based) (Centers for Medicare and Medicaid Services)	
Incident Management			Acute Care Hospitalization (OASIS Based) (Centers for Medicare and Medicaid Services)	

Subdomain	Mitigation Measures	Preparedness Measures	Response Measures	Recovery Measures
Incident Management			Comprehensive assessment for patients with complex needs (National Committee for Quality Assurance)	Comprehensive assessment for patients with complex needs (National Committee for Quality Assurance)
Incident Management		Pre-identified staff notified to fill all eight Incident Command System (ICS) core functional roles due to a drill, exercise, or real incident (Centers for Disease Control and Prevention)	Pre-identified staff notified to fill all eight Incident Command System (ICS) core functional roles due to a drill, exercise, or real incident (Centers for Disease Control and Prevention)	
Incident Management			Pre-identified staff acknowledged notification within the target time of 60 minutes (Centers for Disease Control and Prevention)	
Incident Management		Public health EOC (Emergency Operations Center) activated as part of a drill, exercise, or real incident (Centers for Disease Control and Prevention)	Public health EOC (Emergency Operations Center) activated as part of a drill, exercise, or real incident (Centers for Disease Control and Prevention)	
Incident Management			Care Coordination (Centers for Medicare and Medicaid Services)	Care Coordination (Centers for Medicare and Medicaid Services)
Incident Management			NQF 0703 (Not Endorsed) Intensive Care: In-hospital mortality rate (Philip R. Lee Institute for Health Policy Studies)	
Communications			NQF 0291 (Endorsed) Emergency Department Transfer Communication Measure (EDTC) (University of Minnesota Rural Health Research Center)	NQF 0291 (Endorsed) Emergency Department Transfer Communication Measure (EDTC) (University of Minnesota Rural Health Research Center)

Subdomain	Mitigation Measures	Preparedness Measures	Response Measures	Recovery Measures
Communications			Emergency Public Information and Warning (EPIW) - Public Message Dissemination (Centers for Disease Control and Prevention)	
Communications			Physician Information (University of Minnesota Rural Health Research Center)	Physician Information (University of Minnesota Rural Health Research Center)
Communications			Physician Notification Guidelines Established (Centers for Medicare and Medicaid Services)	Physician Notification Guidelines Established (Centers for Medicare and Medicaid Services)
Communications			Vital Signs (University of Minnesota Rural Health Research Center)	
Healthcare System Coordination		Community Preparedness (CP) – Identification of key organizations annual (Centers for Disease Control and Prevention)		
Healthcare System Coordination		CP – Community engagement in risk identification annual (Centers for Disease Control and Prevention)		
Healthcare System Coordination		CP – Community engagement in public health preparedness activities annual (Centers for Disease Control and Prevention)		
Healthcare System Coordination		CP – Community engagement in recovery planning annual (Centers for Disease Control and Prevention)		
Healthcare System Coordination			Emergency Department Use with Hospitalization (OASIS Based) (Centers for Medicare and Medicaid Services)	

Subdomain	Mitigation Measures	Preparedness Measures	Response Measures	Recovery Measures
Surge Capacity			NQF 0497 (Endorsed) Admit decision time to ED departure time for admitted patients (Centers for Medicare and Medicaid Services)	NQF 0497 (Endorsed) Admit decision time to ED departure time for admitted patients (Centers for Medicare and Medicaid Services)
Surge Capacity	Inpatient Hospital Utilization (National Committee for Quality Assurance)			
Surge Capacity			Medical and public health surge outcome (Centers for Disease Control and Prevention)	
Surge Capacity			Surge capacity: beds (Health Resources and Services Administration)	Surge capacity: beds (Health Resources and Services Administration)
Surge Capacity			NQF 0498 (Not Endorsed) Evaluation by a Qualified Medical Personnel (Louisiana State University)	
Surge Capacity			Emergency Medical Services (University of Louisville)	Emergency Medical Services (University of Louisville)
Surge Capacity			NQF 0496 (Endorsed) Median time from ED arrival to ED departure for discharged ED patients (Centers for Medicare and Medicaid Services)	
Surge Capacity			NQF 0495 (Endorsed) Median time from ED arrival to ED departure for admitted ED patients (Centers for Medicare and Medicaid Services)	

APPENDIX C:
Healthcare System Readiness Committee and NQF Staff

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APPENDIX D:
Public Comments

Guiding Principles

Merck & Co., Inc.

Maria Scarlatos

Thank you for the consideration of this important topic and for the opportunity to provide public comment.

The What - Patient Centered: Recommend specifically noting the unique needs of institutionalized populations, which vary by type of institution and populations housed (jail/prison; university; specialized care facilities).

The How - Recommend that this section note the well-established SOPS and training available through NIMS: https://training.fema.gov/nims/

Thank you for your comment. We appreciate you taking the time to provide a thoughtful response on the report. We will take your thoughts on the report into consideration during revision.

Domains and Subdomains

Merck & Co., Inc.

Maria Scarlatos

Domain 2 - Pharmaceuticals: Recommend including vaccines in addition to pharmaceuticals.

Domain 2 - Consumable Medical Equipment and Supplies: Recommend explicitly calling out needed diagnostics here and above.

Thank you for your comment. We appreciate you taking the time to provide a thoughtful response on the report. We will take your thoughts on the domains into consideration when revising the final framework report.

Uniform Services University of the Health Sciences

Kyle Remick

Using the phases of emergency management and surge was valuable. I have issues with the current framework for disaster response. Overall unless you "train as you want to fight" on a daily basis, you

will not have the optimal outcome. For national preparedness, we must construct a STANDING framework that functions optimally on a daily basis that can have a scaled response. Conducting a table top exercise or a mascal exercise once per year or even once a quarter is not adequate for an optimal outcome. Our metrics need to be created based on what will provide an optimal disaster response. Some details:

1) STAFF: staff must be trained in advance and practice their craft on a daily basis. Ad hoc or "just in time training" doesn't work. The highest performing teams (like the Army Special Forces) train together on a daily basis to reach an expert level in combat. We want an expert level response, not an ad hoc response. The trauma and emergency SMEs in the military understand that throwing together a trauma team and putting them in the worst environments to care for the most severely injured patients is a formula for failure. Thus, staff must be trained in advance and there must be a cadre of trained staff that can be called in above the usual volume when needed.

2) STUFF: I support the concept noted well in your text regarding the difference between "immediately available" on site or very nearby versus available from the manufacturer on a rush basis. The metric of "immediately available" is valuable.

3) STRUCTURE: I believe we do not have much of a bed surge capacity in our nation. "Surging" 20-30 beds is valuable for a small event but nowhere near the capacity we will need for a catastrophic event. Plans for a peer enemy war estimate 10,000 casualties per month. Our military facilities cannot handle this. Our VAs will be quickly filled. Can civ hospitals absorb 9,000+ patients per month? The same surge would be needed for a catastrophic event on our soil. We need to have metrics that include a massive surge volume.

4) SYSTEM: This is the crux of national preparedness. Like we have done with trauma systems in our country, we need an all hazards response system for the nation. The just in time "incident command

system" is not the best solution. We need standing, integrated regional "command and control" system (like STRAC in TX) that coordinate response activities on a daily basis with the ability to upscale to match the disaster when needed. The key is that it needs to be a running engine of command and control and not a structure created only when needed. Only a standing system can be a solid foundation for an optimal disaster response.

Thank you for your comment. We appreciate you taking the time to provide a thoughtful response on the report. We will take your thoughts on the domains and subdomains into consideration when revising the final framework report.

Appendix A

Merck & Co., Inc.

Maria Scarlatos

Appendix A: Healthcare System Readiness Measure Concepts: Recommend these concepts be stated as SMART objectives to the degree possible. As presented a "plan" is a binary construct (0 for no plan, 1 for plan), but the quality, completeness, and currency of plans are essential to their utility.

Thank you for your comment. We appreciate you taking the time to provide a thoughtful response on the report. We will take your thoughts on the measure concepts into consideration when revising the final framework report.