

SURGE CONCEPTS

Introduction

A key aspect of hospital disaster response is the ability to surge, which is defined as:

- Rapidly creating the **capacity** to expand care for many patients with different acuities and/or
- Expanding **capabilities** (e.g., decontamination, isolation) for those who require specialized care (e.g., pediatric patients, patients with burn injuries).

This chapter focuses on capacity generation while other chapters address specific capabilities. Maximizing surge capacity at individual hospitals also increases regional capacity. When a hospital is overwhelmed such that it is unable to provide its usual quality of care, regional load-balancing of patients across hospitals is a key adaptive strategy.

Historically, surge planning includes four elements, often referred to as the four “S’s” of surge capacity:

- Space: Optimizing utilization of space at the hospital for patient care.
- Staff: Ensuring adequate staff for the number of casualties and space utilized.
- Stuff (Supplies): Having sufficient disposable and durable materials and pharmaceuticals.
- Systems: Including systems both within the hospital and externally that support surge and/or the balanced distribution of patients to maximize use of healthcare resources.

In some cases, the “Systems” “S” has been used to represent “Special considerations” (e.g., pediatrics, burn, or decontamination) or “Structure” (e.g., to reflect the need for functional infrastructure to provide patient care). Both of these topics are addressed in other chapters of this guidebook as are patient load balancing systems such as Medical Operations Coordination Centers.

This chapter focuses on developing hospital plans for space, staff, and stuff to generate capacity and includes related considerations for clinical support systems. The surge capacity plan should specify how space and staff will be adjusted to the needs of the incident and include steps to ensure the plan is understood across the hospital to facilitate rapid implementation. The

Chapter Quick Links

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Related Resource

Templates included in ASPR TRACIE’s [Mass Casualty Hospital Capacity Expansion Toolkit](#) can help provide structure to annexes of the hospital Emergency Operations Plan.

hospital Incident Commander should gather information from media, emergency medical services (EMS), and other sources as quickly as possible to determine the scope of the incident and likely need for additional resources.

Disaster care is provided on a spectrum from conventional to contingency to crisis. Conditions may be dynamic, and space, staff, and stuff may be affected to varying degrees at different times, but primarily:

- It is important to first use conventional spaces and staff to accommodate patient surge.
- Then, contingency adaptations that are non-traditional but provide essentially equivalent care, such as using the post anesthesia care unit (PACU) for temporary intensive care unit (ICU) care, should be followed.
- Finally, planning should address crisis adaptations (i.e., those that place patients at significant risk but represent the best care that can be provided based on demand).

Note that the use of crisis strategies implies the need for regional coordination (e.g., with a healthcare coalition or Emergency Support Function [ESF] #8) to load-balance patients and address other needs as necessary. Particularly during the initial phases of a no-notice incident, the resource situation often changes rapidly as both staff and patients continue to arrive while conventional resources are depleted. These dynamic changes require providers and the Hospital Command Center to adapt rapidly to the situation.

Related Resources

ASPR TRACIE offers [a series of tip sheets](#) for healthcare facilities responding to mass violence/active shooter incidents, including:

- [Hospital Triage, Intake, and Throughput](#)
- [Non-Trauma Hospital Considerations](#)
- [Trauma System Considerations](#)

Considerations

Though this chapter primarily focuses on immediate steps hospitals should take to address patient surge following a no-notice incident, considerations for situations other than no-notice incidents are also included. While much of the content also applies to emergencies with advance warning (e.g., a hurricane forecasted days in advance) or for surges that continue for an extended time (e.g., a seasonal respiratory outbreak), those incidents may differ from a no-notice incident in their focus and timelines. Hospitals may have more time for deliberative planning and the acquisition of additional resources than for a no-notice incident, but they may also have to sustain a surge response for weeks to months. Hospitals should have plans for anticipated incidents that are high on the facility's hazard vulnerability analysis (HVA) and consider the unique characteristics of responding to an infectious disease patient surge. The hospital should also consider where care operations can be relocated in case of infrastructure failure (e.g., physical damage, contamination, loss of critical utilities). These failures may be confined to a single unit or be more widespread, and may greatly affect the space, staff, and system considerations described in this chapter.

Space

Hospital spaces for clinical and non-clinical response will be needed. Though this chapter concentrates on clinical space utilization, a scalable plan should exist for setting aside space for a family support center, the media, and decedent management, among others, to support operations as needed. Family support spaces should be kept far away from media spaces. Decedent management may require a secure holding area near the emergency department (ED) for family viewing or until the decedents are ready for the morgue area and sufficient personnel to move them are available.

The hospital should maximize ED capacity; surge plans should include a process to quickly send patients in the ED awaiting admission prior to the incident to inpatient floors. Patients may need to be boarded in inpatient hallways or placed in repurposed medical/surgical holding areas adjacent or outside of the ED. Following a no-notice incident, operating rooms (OR) should automatically hold surgeries for nonemergent cases. Care should be taken not to compromise the ongoing care of existing critically ill patients while taking actions to increase capacity for incoming cases.

Considerations

Providing space to accommodate staff who cannot safely return home during an incident (e.g., flooding) should be considered. Plans should also consider allocating space and resources to members of the public who seek help from the hospital when utility failures impact the operation of their durable medical equipment (e.g., ventilators, oxygen concentrators) or community conditions prevent safe patient discharge.

Considerations

When isolation room capacity is exceeded during an infectious disease incident, the ED should consider how cohorting will be conducted. This process includes promptly separating potentially infectious patients at triage, rapidly placing them in appropriate locations, and, if necessary, cohorting them in areas where air does not recirculate into other locations of the hospital. Ideally, these areas are where airflow can be manipulated to achieve some degree of negative pressure and/or augmented air exchanges.

Conventional

Operational leadership such as the hospital nursing supervisor/patient flow coordinator and the ED charge nurse should be able to rapidly determine the maximal use of usual spaces and staff. If this is the only response required, further mobilization of resources may not be needed.

Contingency

Emergency Department

The ED should have a plan to obtain and deploy additional patient stretchers and wheelchairs from other areas of the hospital. Existing patients may be discharged or moved back to triage or to chairs and other locations in the hospital as needed. Conventional and contingency ED space should be designated for the most critical patients. Patients may need to be re-triaged to identify where they are in their care progress and what level of continued care they will need. Space near the ED should be designated for those with minor injuries to avoid congesting the main ED. Ideally, EMS should be familiar with the space allocated for those with minor injuries and/or a triage officer could sort patients on arrival and direct them to the appropriate care area. These minor care areas may be existing patient care areas or designated nearby flat space areas such as conference rooms. Hallway beds should be used as needed for existing or new patients.

Inpatient

Inpatient and observation units aside from ICUs should be prepared to take a certain number of admissions (either existing or incident patients) to their hallways. If the Hospital Command Center requests a “surge discharge” process, each unit should determine potential discharges and patients who can be redistributed to a lower level of care. Patients to be

From the Field

To avoid confusion with the red/yellow/green triage designation of casualties, one hospital uses the ski slope symbols for easiest/intermediate/difficult to designate by unit the patients who can be moved or discharged relative to the effort/risk involved. The easiest patients are moved to hallways, anticipating relocation to a discharge holding area if needed.

From the Field

A Las Vegas hospital rapidly triaged arriving patients and diverted all minor injuries to its pediatric ED after a mass shooting.

discharged should be moved to a designated holding area or hallway to wait. Discharge holding areas should be suitably sized with a limited number of staff to provide supervision and needed assistance.

The facility should be aware of rooms that are adequately sized or have dual header design that can be used for the care of more than one patient and be prepared to “double up” these rooms when necessary. This includes ensuring portable curtains and other supplies are available to facilitate conversion from private to double rooms.

Considerations

Hospitals should have plans to adapt spaces to address a surge in infectious patients requiring airborne isolation during an infectious disease incident (e.g., seasonal epidemic, pandemic, or high consequence infectious disease). This may include designating units, floors, or other areas that can be isolated. Ideally, these are marked by distinct hazard signage and separated from other units by fixed or temporary double sets of doors with areas for staff to don and doff personal protective equipment (PPE). Additionally, considerations regarding heating, ventilation, and air conditioning (HVAC) system air distribution should be considered to avoid cross contamination of locations with an airborne pathogen. Use of high efficiency particulate air (HEPA) units and other modifications to individual rooms can also expand capacity. If the risk profile in the community or the role of the hospital suggests the need to plan for surges of patients with more complex diseases such as viral hemorrhagic fevers, this should also be considered during surge planning.

Surgical and Procedure Spaces

Pre- and post-induction spaces can offer rapid critical space expansion during a mass casualty incident (MCI) or other no-notice incident. Priority should be given to operative cases, but additional overflow space may be available. Staffing may need to be adjusted in these areas to provide adequate ongoing care, but the space can also be conducive to temporarily caring for complex patients. Off-hours activation of same-day surgery spaces often contributes to space expansion.

Related Resource

ASPR TRACIE’s [Mass Violence/Active Shooter Incidents: Trauma Surgery Adaptations and Lessons](#) tip sheet includes considerations for hospitals to expand their surgical capacity following no-notice incidents.

Ambulatory Care Space

If the hospital has ambulatory care areas, these can be rapidly leveraged during daytime hours to care for patients with minor injuries. Off-hours, these spaces may still be used on a more delayed basis, but this may require calling in supplemental staff.

Crisis

In an overwhelming incident, flat space areas such as classrooms, physical therapy areas, and lounges may be converted to non-ambulatory care areas for stable patients (i.e., they may be used as hospital-based alternate care sites). Hospitals can move appropriate patients to these areas from inpatient units, allowing sicker patients to use traditional inpatient beds. Monitored and intermediate care beds can be used for patients who require some critical care interventions but do not require ICU care. Flat space areas adjacent to the ED can be used for minor injury care. Designating these areas ahead of time allows for supply carts or bins to be created for these areas as they are activated. Temporary structures, trailers, and tenting can also be used, particularly to support triage and minor illness/injury treatment; setup time, climate control, electrical, and other issues need to be addressed in planning.

Staff

Having adequate, qualified staff can make up substantially for a lack of adequate space and significantly minimize patient risk. During a short-term incident (hours to days), adequate staff can usually be obtained by callbacks of usual staff for those units. Changes to shift structure, length, and ratios may be required. Extended incidents are more difficult. In many cases, additional staff can be obtained via mutual aid agreements with other hospitals, from state or federal teams, and from contract agencies.

From the Field

Following a major chlorine leak from a railcar, a hospital used clinic space across the street off-hours to monitor those with mild symptoms for progression since the relatively small ED was overwhelmed with severe cases.

Related Resource

ASPR TRACIE's [Mass Violence/Active Shooter Incidents: Expanding Traditional Roles to Address Patient Surge](#) offers strategies to maximize staffing following no-notice incidents.

Considerations

Alternate care areas may also be needed for large numbers of patients during an infectious disease incident. Exterior structures (e.g., outbuildings, tents) may be used to perform initial screening prior to entry of a patient into the facility. Considering what spaces could be used for dedicated testing and initial outpatient care during an epidemic or for rapid vaccination/prophylaxis can prevent the mingling of infected and non-infected patients and create fast-track processes for screening and early treatment.

Adequate staff for ED, surgical, and critical care services (if provided by the hospital) should be part of automatic callbacks when an MCI is declared to maintain critical patient care and hospital operations through the initial 30-60 minutes of an incident until the Hospital Command Center is operational. Called back personnel should report immediately to their work area leader. If they are not needed, they should check in to a pre-designated area for the labor pool. The Hospital Command Center should monitor the incident and release surplus staff promptly so that staffing for subsequent shifts is not compromised. Due to continued strain, different staffing may be needed for the OR or inpatient units; this should be a focus for the Hospital Incident Command Planning Section.

Staff should have knowledge of non-traditional roles they may be asked to fulfill in the surge plan. Orientation to the work area, training, and development of job aids and standard work can be particularly helpful, ensuring a safe transition when a surge of patients requires staff to take on additional responsibilities.

When adequate numbers of staff cannot be obtained by callbacks, staff may have to be prepared to “step up” or “step over.” Step up staffing occurs when staff (particularly nurses) are caring for patients of a higher acuity than usual. In particular, nurses on step-down units and in procedural areas should be oriented to these roles and some of the skills that may be needed (e.g., performing transfusions, running medication drips). When possible, checklists and standard work for these skills should be developed to improve efficiency and safety. Step over staffing occurs when providers apply a skill set in care areas where they do not normally practice. An example is a PACU nurse providing care for ICU patients.

Considerations

During an infectious disease incident, just-in-time education on the disease as well as PPE and its proper use and disposal (donning and doffing) should be provided to staff, particularly those who infrequently provide acute care.

In some cases, less trained staff may function as “extenders” for more specialized staff. For example, several nurses from a step-down unit might provide the majority of direct care for ICU patients while an ICU nurse monitors interventions, vitals, labs, and medications and provides support across an expanded ratio of patients compared to their normal assignment. As always, when crisis situations demand these types of adaptations, support from regional entities should be sought to obtain staff or move patients to other facilities.

Adequate pre-and post-incident support for staff is critical to their resilience. Mental health support should include pre-event resilience building as well as support during and immediately

From the Field

Following the mass shooting in Las Vegas, OBGYN providers supported trauma surgeons by opening and closing abdominal incisions or applying temporary closures during surgery while the trauma surgeons performed the intra-abdominal portions. A pediatric surgeon served as a scrub nurse due to a lack of surgical nurses early in the response.

Anesthesiologists performed critical care in the PACU, re-triaged patients, and helped surgeons prioritize cases.

following the incident. Depending on the intensity and the impact of the incident, a range of additional services should be offered and are detailed in another chapter.

Surges of contaminated patients can also occur, and there should be contingencies to call in additional staff trained in decontamination to support an initial response (in addition to any mutual aid possible from public safety agencies, understanding their primary responsibility is to the scene of the incident). In some areas, contract entities may provide additional support for patient decontamination.

Considerations

During prolonged incidents, barriers to staff reporting to work (e.g., the need for child, adult, or pet care; lack of transportation; damage/safety issues at home arising from utility failures) should be addressed to the degree possible (e.g., by providing on-site care or subsidizing commutes).

Stuff (Supplies)

Adequate airway, vascular access, and wound management supplies should be stocked or immediately available in the ED to manage an MCI without contacting central supply. When an MCI is declared, staff in pharmacy, sterile supply, patient transport, and central supply should automatically mobilize supplemental resources to key locations such as the ORs and the ED in preparation for expected needs. Adequate supplies should be kept on hand for the mass casualty and specialty incidents the hospital would be expected to experience according to its hazard vulnerability analysis and based on its role in the community, size, and services. These supplies should be protected against inventory reductions associated with just-in-time supply chain activities. The location of the suppliers should also inform planning for stocks of supplies; the further away the supplier (or the higher the chance that they will not be able to deliver supplies due to flooding, traffic, or other challenges), the more stock should be on-hand.

Related Resource

The Disaster Available Supplies in Hospitals ([DASH](#)) Tool can help hospitals determine a reasonable number of supplies to have on hand in the hours after a no-notice incident.

Considerations

In some cases, a forecasted weather or planned special event may necessitate additional stocking of care supplies, linens, pharmaceuticals, and equipment. Ideally, a playbook for the specific supplies, quantity, and stocking/storage location is used. Finding additional space for these items may be challenging. After the incident, if supplies are not returned to the distributor, the facility should reduce normal orders of the items to return par levels back to baseline.

Pharmacy

When an MCI declaration occurs, pharmacy staff should immediately gather pre-determined quantities of medications that will be needed in the first 30 to 60 minutes, such as analgesics, sedatives, paralytics, sodium bicarbonate, and tranexamic acid, and have them available to the ED. Following this initial push, additional medications such as antibiotics, anti-nausea, tetanus boosters, anti-epileptics, and more analgesia, sedation, and medications needed in the subsequent hours should be gathered and brought to the ED. Depending on the volume of operative cases, the ORs and anesthesia may need additional support.

Sterile Supply

Depending on the hospital's level of trauma services, predetermined sterile trays should be available to be deployed to the ED and ORs. Although chest tube insertion or finger thoracostomy may be performed with minimal equipment, it may be helpful to have several prepackaged chest tube placement trays as this has been a common shortage in several recent incidents. Having a large number of suture trays available is also helpful. These should be moved to the ED upon declaration of an MCI. Because processing of surgical trays will take longer than the emergency procedures themselves, the hospital should determine an adequate number of major procedure/laparotomy trays to have in stock as well as vascular and other specialized trays. The number of ORs and the number of procedures that could realistically be carried out before equipment has to be reprocessed should inform the number of available trays. Most level one trauma centers should have at least fifteen trays available for laparotomy. The disposable supplies needed to support procedures are usually packaged separately in "trauma packs." Premade trauma packs should be available in quantities sufficient to support a large number of emergency surgeries. These may be stored in the OR area or with sterile supply or storeroom mass casualty materials.

Storeroom

Just-in-time inventory management used by many hospitals significantly impairs the ability to maintain adequate stocks of supplies for a disaster. The storeroom may maintain a cart or carts with wound care, chest tubes, splinting, and other materials for disaster use. Some of these may be packed and designated for specific alternate care triage and inpatient care areas with inventory reflecting the needs of the specific area. Others may have specialty supplies for pediatric patients or burn incidents. Designated carts/supplies for the initial response should be immediately moved to the ED when an MCI is declared. Intravenous (IV) fluids and support materials for IV fluid and medication administration should be part of the stored supplies. In particular, the number of chest tubes and chest tube suction sets should be vetted against calculators such as the [DASH Tool](#) as several hospitals have reported running low or depleting them following mass shooting

From the Field

Many major trauma centers have carts dedicated to chest tube placement trays (e.g., 25 trays with chest tubes and suction/drainage sets) following recent mass shooting incidents that rapidly depleted these supplies.

incidents.¹ The storeroom should work with biomedical and respiratory care to make sure that needs for additional disposable supplies such as ventilator circuits, oxygen masks, and IV pump tubing are addressed.

Biomedical

Biomedical should maintain portable monitors capable of vital sign and cardiac monitoring for deployment in a surge situation. IV pumps should be available in a quantity sufficient to support a significant surge (and providers should also be trained to monitor IV fluids and medication administered by drips or buretrols to avoid dependence on IV pumps). Additional blood warmers and rapid fluid infusers should be available to support multiple patients in the ED or OR. Agreements should be in place with vendors to supplement critical biomedical equipment during emergencies and the timeframe for delivery should be understood.

Considerations

Hospitals should determine what amounts of PPE they will have available for an infectious disease incident. Calculators such as the [DASH Tool](#) can help staff work through these calculations and determine what is reasonable. Many hospitals elected to maintain at least three months of PPE in stock based on their “burn rates” during previous periods of constrained supply. Consideration should also be given to re-usable respirators, including powered and elastomeric versions as well as re-usable (launderable) isolation gowns that can drastically reduce the consumption rate of products during a surge incident. Providers must be fit-tested for the respirators they will be using and oriented to the proper doffing and donning of their PPE for the specific pathogen.

Respiratory Therapy

Transport ventilators with basic alarm features should be available to reduce dependence on manual bag valve equipment, which requires dedicated personnel and high oxygen flow rates. Ideally, enough transport ventilators should be available to ensure a ventilator for each planned surge ICU bed. However, regional and federal supplies may be needed to augment hospital equipment to this level. If hospitals plan to use regional or federal equipment, ideally,

Considerations

Hospitals should strongly consider having additional non-invasive respiratory support equipment such as bilevel positive airway pressure (BiPAP) and high-flow nasal cannula (HFNC) systems for epidemic, pandemic, chemical, and inhalational (e.g., chemical or carbon monoxide) incidents.

¹ <https://files.asprtracie.hhs.gov/documents/aspr-tracie-no-notice-incident-las-vegas-webinar-ppt-508.pdf> and <https://files.asprtracie.hhs.gov/documents/aspr-tracie-lessons-learned-from-the-pulse-nightclub-shooting-508.pdf>

personnel should complete pre-incident training to become familiar with the equipment in addition to just-in-time refresher training when the incident occurs.

Systems

Clinical care is dependent on multiple support systems for success. It is important that information technology, registration, respiratory therapy, sterile processing, storeroom, pharmacy, radiology, laboratory, and blood bank personnel are included on the initial notification and callback lists so they can rapidly augment services.

Registration and IT

A rapid disaster registration process must be in place, including for unidentified patients. The unidentified patient or disaster numbering system must be distinct enough that it minimizes mixing up patients. Hospitals should not expect to keep up with registration following a no-notice incident and should have a temporary system. Ideally, this temporary system can integrate as soon as practical with the electronic health record (EHR) as delays doing so may risk patient safety and compromise patient tracking and documentation. A process for merging the temporary identification with the patient's medical record should be well-understood and, ideally, correspond to daily practices.

Tags or other systems may be used prior to registration to track basic information such as vital signs, injuries, and medications administered. A convention for indicating the patient is associated with the incident is ideal. IT staff should be prepared to support additional access, query/search, and database needs in the aftermath of an incident. It is also important to recognize the use of a temporary disaster naming plan will impact providing timely patient tracking and reunification. Hence, conversion to conventional naming should be restored as soon as practical.

Radiology

Radiology, particularly computed tomography (CT) scanning, is often a key bottleneck in mass casualty response. Making sure adequate personnel are available to operate both plain film and advanced imaging equipment as well as radiologists to rapidly provide rapid image interpretation ("wet reads") helps to ensure rapid acquisition and interpretation of images. It is important to have unidentified patient naming and labeling/banding conventions that easily allow radiology reads to be tied to the appropriate patient and prevent confusion. In large-scale incidents, it may be helpful to use paper forms that stay with the patient for rapid initial reads. Adequate flow through the ED depends on patients being assigned a disposition from the CT scanner (e.g., to the OR or an inpatient unit) rather than being sent back into the ED so those beds may be made available for incoming patients. Finally, it may help to standardize radiology orders during disasters with all patients receiving a "pan scan" (whole-body CT scan) or

From the Field

One hospital used transfusion (Typenex) numbers as its naming convention for unidentified patients. However, these numbers were sequential and easy to confuse when getting test results. The hospital changed to a "Color, Unidentified, State" naming convention with thousands of potential combinations for both daily and disaster unidentified patients.

otherwise limiting ordering options to streamline the process. Hospitals should anticipate that patients may deteriorate during their time in radiology and may need clinical care/interventions there.

Laboratory

Clinical laboratory may be overwhelmed during an MCI. Standard trauma labs may include tests that could be added later and cannot be bundled on a run or result in increased work/specimen preparation. A standard, concise disaster laboratory panel may be considered, which could provide initial tests such as electrolyte panel, hemoglobin, lactic acid, and international

normalized ratio on all patients with other tests added later as required. The ability to expand point-of-care testing may significantly reduce the burden on central laboratory services and

adequate equipment and reagent packs to accommodate disaster demands should be considered. A plan for reporting critical values when the patient is not registered in the EHR will also be important.

Blood Bank

Demands on the blood bank may be extreme, particularly in penetrating trauma incidents. If a type and screen is standard on all trauma laboratory panels, this should be reconsidered during disasters. Though a blood bank tube may be drawn on all patients, the typing and screening process should only be performed when transfusion is indicated. Procedures should be in place to support multiple concurrent massive transfusion protocols. It is critical to have agreements with the regional blood provider to move significant quantities of blood product to the hospital if needed. Many trauma centers do not have adequate blood products to address the needs of a large mass shooting or blast injury incident. Hospitals should understand the timeframe for additional product delivery and what mutual aid may be possible from other blood suppliers in the area, if any.

From the Field

During the Aurora, CO mass shooting, more than 300 units of packed red blood cells were used at The Medical Center of Aurora. Trauma centers in Orlando and Las Vegas reported using over 500 units of blood products following mass shootings in their cities.

Considerations

During an infectious disease incident, large quantities of tests may need to be run for screening purposes. The laboratory should have a plan to surge testing capacity and may determine that a dedicated space is needed or that certain labs should be sent out to regional clinical laboratories to unload the hospital laboratory. Additionally, some hospital laboratories can run tests on high consequence pathogens while others need to send those out. The process for running or shipping these samples should be trained on and standard work and job aids developed to facilitate safe handling. Clinical samples from suspected high consequence infectious disease patients should always be hand-carried to the laboratory.

Conclusion

Surge capacity planning is perhaps one of the most important and time-consuming tasks in hospital emergency management. Having integrated plans to expand capacity and making sure personnel understand the plans and their roles takes significant effort. This includes planning by department, creating job aids and organizing supplies, educating providers on the plan and the specifics of their roles, and exercising the plans with robust scenarios that challenge the healthcare team. This should include highlighting how daily practices (e.g., triage, the trauma workup) change during disasters.

The mission of surge capacity planning is to expand the window of contingency care; that is, increasing the number of victims a hospital can take between conventional practices and the point at which patient safety is jeopardized due to demand (crisis). The challenge to increasing (or even preserving) capacity is the tendency in healthcare to maintain the minimum necessary resources. Emergency managers and medical directors should place a high priority on assessing, testing, and revising surge plans each year to close existing gaps and identify new ones.

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