ASPR TRACIE Technical Assistance Request

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Response Date: 22 November 2022
Type of TA Request: Complex

Request:

The requestor asked for information and guidance pertaining to the current strain on U.S. hospitals (due in part to increases in seasonal respiratory viruses and issues with available space and staffing), including specific data points and operational strategies. Specifically, the requestor asked how to assess the degree of hospital strain to help make decisions about making patient transfers and adapting to the current situation.

Response:

ASPR TRACIE requested input from members of the subject matter expert (SME) cadre. We also reviewed the following ASPR TRACIE Topic Collections for relevant resources: Hospital Surge Capacity and Immediate Bed Availability, Information Sharing, Patient Movement and Tracking, Coalition Response Operations, and Electronic Health Records. Materials gathered are provided in this document. Section I provides SME comments and Section II provides links to related resources on preventing and managing hospital strain with an emphasis on current pediatric surge conditions.

I. ASPR TRACIE Subject Matter Expert Comments

Please note: These are direct quotes or paraphrased comments from emails and other correspondence provided by ASPR TRACIE SME Cadre members in response to this specific request. They do not necessarily express the views of ASPR or ASPR TRACIE.

Key Points and Considerations

- Hospital strain is dependent on both volume and acuity of patients balanced against available space and staffing.
- Hospital throughput and discharge options (e.g., long-term care and mental health services) also affect bed availability particularly during longer-term events.
- Both subjective and objective data sharing is critical to understanding the degree of strain.
- Data definitions and passive exchange of information from electronic health records (EHRs) to the response data systems are key to available comparable and timely information.
- Mechanisms that assess regional bed availability such as Medical Operations Coordination Centers (MOCCs) should be used to help load-balance patients and coordinate patient transfer requests.

- Common understanding of response actions across the healthcare coalition (HCC)/region and adoption of strategies is essential to ensure consistency and "equal lift."
- Saturation of sub-specialty resources (e.g., pediatric critical care, burn) may be reached far more quickly than other resources and require clinically informed decisions about which patients will benefit most from those services.

Regional Strain Assessment and Mitigation

Hospitals continue to face unprecedented staffing and space challenges. The seasonal epidemic respiratory infections—which disproportionately impact pediatric resources—coupled with continued high surgical and medical demands and the continuing impacts of COVID-19 are compounding health system strain and challenging access to care.

- During periods of saturation, most jurisdictions and HCCs lack the data and systems to determine the degree of strain both across the region and on individual hospitals. Most also lack mechanisms to gather and share reports on hospitals' surge actions (e.g., opening additional surge space, redeploying staff, and altering scheduled procedures) to identify whether and to what degree the hospital or healthcare system is changing practices or limiting procedures. This should be a high regional and national priority for correction.
- Local factors must be accounted for when developing regional policies.
- Better coordination of patient care depends on recognition of hospital strain (both facility and regional) and the systems and policies to address it. Healthcare systems should be encouraged to monitor strain conditions in their facilities and to load-balance and coordinate transfers within their systems as much as possible.
- To provide consistent access to care and medical treatment we must build upon some of the voluntary cooperative transfer centers that were initiated in the last few years and push for better data taken directly from the EHR that represents both the capacity and capability challenges each hospital faces. This will provide necessary data to improve our distribution of patients and resources and should reduce some of the risk to patients of surge conditions.
- When system saturation is reached, a regional strategy such as a MOCC (additional information in the next section) should be available to bridge across multiple healthcare systems, particularly when specialty care (such as pediatric intensive care) is required. In addition to data, these centers need a mechanism for collecting patient transfer information and sharing that with a clinical expert to determine the relative need for transfer / access to specialty resources (e.g., pediatric intensive care unit [PICU], burn unit). In some cases, care may be provided safely in other environments (i.e., care in place or "PICU in the MICU").
    - For example, the Washington State MOCC embedded a pediatric critical care expert into triage decision making for critically ill children. Their expertise is essential to inform triage decisions such as which child is most appropriate for a PICU or a pediatric acute care floor (supported by a hospitalist) or neonatal intensive care unit (NICU) care (which are often not open to babies that have been

discharged from the hospital though can be an excellent resource for small infants provided appropriate isolation from neonates is possible).

- In the absence of data systems if faced with strain, the HCC should have a mechanism to coordinate transfers and to maintain basic bed availability data (e.g., an electronic "bed board") and have specialty clinicians engage in making transfer decisions that are agreed upon by all hospitals. This should include some way of facilitating specialty support to the current care providers when a transfer is not possible given the available resources. This could come from local resources or from further removed specialty centers that are not as affected by the strain.
- HCCs and jurisdictions should carefully consider their load-balancing and transfer triggers and agreements because these activities may be needed in the absence of any emergency declarations or activations at the jurisdictional level (e.g., seasonal influenza overloading hospitals).
- Transfer center program duties can be established at single institutions according to regionally or state-approved protocols or can be rotated and/or shared among transfer centers in the area.
- Augmented authority and legal protections for the transfer center activities may be granted through legislative or executive action which may be statutory, regulatory, or emergency in nature.
- In general, information sharing and patient distribution management should occur across a usual patient catchment area that may cross state borders.
- Engagement of local and state public health and emergency management, HCCs, the Regional Disaster Health Response System (RDHRS – if available in the region), hospital associations, and ASPR Field Project Officers and Regional Emergency Coordinators is required to ensure common goals, assumptions, and policies.

Further Information on MOCC Operations

A MOCC may take on several different functions as described in the inter-agency MOCC toolkit and a summary of multiple states' experiences with MOCCs.

- At minimum, MOCCs need to have:
  - Real time information about available beds (data points are covered in the next section) or qualitative information about abilities to receive transfer patients when such data is not available due to an unexpected situation, downtime issues, or when a more accurate and robust system has not yet been implemented.
  - Clinical expertise to prioritize transfer requests based on available resources.
  - Prioritization mechanisms based on patient needs (e.g., burn, trauma, pediatrics, dialysis, critical care), including authority during periods of saturation to compel transfers to a center that can provide life-saving interventions when the hospital of origin does not offer them.
- Ideally, the MOCC is also connected to emergency medical systems (EMS). In many situations, EMS may have a high volume of incident-related 911 calls. The MOCC can help EMS understand the need to balance inter-facility transfers and match available

transportation with transfers. In some cases, very rapid secondary inter-facility distribution may need to occur when severely injured trauma patients self-present to a hospital with limited trauma capabilities. These transfers may be as high a priority as 911 responses depending on the situation. Regional EMS resources may be needed to augment local assets particularly when transport times are prolonged. Resources for sub-specialty transfers (e.g., children requiring specialty respiratory support enroute) may be a limiting factor and may require allocation/prioritization.

- Depending on the jurisdiction, a MOCC may be used on a daily basis for EMS destinations, diversion management, trauma referrals, and other functions. The threshold for initiating or expanding MOCC operations should be detailed by the HCC/ jurisdiction (depending on who manages the MOCC). The MOCC should be used whenever usual referral mechanisms fail due to saturation of inpatient capacity whether this is at selected facilities for specialty care or across a region due to a widespread incident or epidemic.
- MOCCs can also prioritize transfers to either hospitals with an appropriate available bed or to those that are less impacted by volume and acuity if care cannot be safely provided at the current hospital. In some cases, however, geography may be a compelling reason to transfer the patient to the closest appropriate facility.

Each region should also establish guidelines for load-balancing.

- For example, when burn or pediatric facilities are overwhelmed, community hospitals and tertiary centers should be prepared to accept either non-specialty patients or less complicated patients that need specialty care to allow the specialty hospital to unload (e.g., older pediatric patients, patients with limited burns or isolated airway injuries from inhalational smoke exposure).
- In situations where a single or few facilities are overwhelmed by an incident there should be policy on the ability of the MOCC or designated coalition or hospital leaders to review the data; when it is clear that significant discrepancies exist between hospital census relative to average and intensity of care, stakeholders will convene to discuss mitigation efforts including moving patients to selected facilities with better capacity.
- Maintaining relatively consistent loads in a given region promotes equal access to care and minimizes risk of poor outcomes.

The MOCC, the HCC/local jurisdiction, and the state can use information to better assign available staff and resources.

- For example, incoming ventilators can be assigned as a percentage of those currently operating.
- Available staff through state contracts, coalition or regional staff sharing agreements, or from federal teams may be allocated based on load, acuity, and staffing and space adaptations as previously described. This is far preferable to a subjective interpretation by a hospital of the “crisis” they are in, which cannot be compared effectively to other hospitals.

- Additional available resources such as medications may also be allocated in proportion to patients being cared for in the hospitals. As objective an approach as possible should be taken to ensure that resources allotted do not further imbalances within the system, inadvertently promoting inequity of access to care.

Priority Data for Strain Recognition and Mitigation

In addition to hospital location and other general information, the coalition and other regional coordination entities should have common knowledge of the baseline hospital trauma, infectious disease, pediatric, burn, and specialty care that can be provided, as well as other characteristics such as operating beds, on-site outpatient care facilities, and on-site long-term care capabilities.

To understand the relative capacity/census of an area vs. baseline when an incident or surge situation occurs, a certain amount of daily data is required to be collected and shared. This allows both immediate assessment of the regional capacity when a surge occurs and helps understand regional hospital strain compared to average and prior surges. Additional data points help to illustrate the level of care being provided over time, which is as important as overall census when determining facility strain. Finally, some data is collected during an incident or when certain trigger points are reached based on local agreements to assess other indicators of strain that are not as easily accessed via passive data submission. Collecting and sharing the following data points could help regions better assess and prevent hospital strain:

First priority data

1. Total inpatient census (daily)
2. ICU census (daily) - (number of critical care patients – baseline census in the ICU is helpful but also need to track use of critical care interventions to reflect total critical care)
3. Empty, staffed ICU beds (hourly) (may need to assume staffed unless an inactive category is agreed to – this is a critical data point for transfer coordination and should reflect pediatric ICU and adult ICU)
4. Emergency department (ED) total visits (daily)
5. Admit order without bed assigned (e.g., boarding)
6. Total operating room (OR) cases or proxy such as anesthesia billing codes. This reflects a general number of emergency and non-emergency procedures that are more likely to require inpatient beds vs. colonoscopies and other procedures and, during incidents, this data provides visibility on relative numbers of surgical procedures.
7. Ventilators in use (based on respiratory therapist orders – usually excluding NICU)

Second priority data

1. Empty, staffed floor or monitored beds (hourly)
2. Total orders for vasopressor agents
3. Total orders for high flow nasal cannula, bi-level positive airway pressure
4. Total orders for oxygen
5. Total orders for dialysis
6. Influenza illness/influenza like illness (ILI) ICD-9s

7. Total psychiatric inpatients
8. Total pediatric inpatients
9. Total NICU ventilators in use

Incident data – note that these may require manual entry

1. Total number of patients/target diagnosis
2. Use of temporary care areas Y/N
3. Use of non-traditional staffing Y/N
4. Changes to nursing care ratios Y/N
5. Providing critical care outside ICU Y/N
6. Limiting non-emergency procedures Y/N
    - Note: this may require additional distinctions as some hospitals and healthcare systems take very different approaches. A standardized regional set of "tiers" may be needed. For example, a hospital in tier 1 might be restricting procedures that could safely wait less than 1 week.
7. Operating on generator power Y/N
    - Note: this may not be relevant if the facility has access to public utility/outage mapping.
8. Other event specific resource/supply information
    - Note: the system should have the flexibility to add questions and queries as appropriate to the incident.

Accountability to provide data into the system is critical. Transparency of facility-specific data may depend on the circumstances and purposes for which it is used (additional information is provided in the Information Sharing section). Additional data points such as transfer requests refused may also provide helpful contextual information on disruption of usual systems of care and should be considered on a regional basis.

Challenges Associated with Information Sharing

In the absence of a standard set of essential elements of information or a system for managing healthcare emergency response data at the federal level, a variety of state and local solutions have been developed.

- These are usually based on manual input of information which is time-consuming and typically not submitted in the absence of a disaster.
- The current data submission requirements related to COVID-19 will help to understand usual capacity but still require manual entry.
- Manually entered data may be helpful for tracking trends but is not accurate enough to be useful for real-time patient bed placement or understanding impacts of a rapidly evolving incident.
- Qualitative representations that are updated frequently but not continuously (e.g., red/yellow/green status regarding ability to accept transfers or about capacity constraints) may be useful potential alternatives to real-time integrated data systems in helping

identify available resources during the surge particularly when a system needs to implement transfer management without the benefit of real-time data.

Information such as inpatient and outpatient census data would be extremely helpful to coalitions and regions striving to understand real-time capacity relative to averages.

- This information is considered proprietary by most hospitals, making data use agreements critical to the success of ongoing information sharing.
- This can be addressed by, for example, having an agreement that specifies daily data collection but sharing of only aggregate numbers/system status until either a disaster is declared, a MOCC is activated, or other trigger points are reached.
- Bed availability data may be more routinely shared and used daily by transfer centers and other entities.

The present lack of sharing of daily and historical data means that we do not have benchmarks to compare current (strained) hospital and regional capacity to the normal operating state. This limits:

- The understanding of differences in seasonal and disaster impacts on healthcare between states/regions (and therefore determining where national resources may be best utilized).
- Load-balancing to ensure hospitals are not disproportionately impacted in a region.
- The ability to direct resources to the facilities that need it most based on metrics, not on subjective data (e.g., the language of the request or perception of the facility).
- Placement of patient transfers at the state/regional level based on knowledge of available capacity.
- Understanding of the relative acuity of patients in the hospitals.
    - When some hospitals are continuing conventional ICU admission practices and others are not, this leads to major differences in the acuity of patients in these ICUs. For example, during the height of the COVID-19 pandemic, one major city hospital had nearly 100% of ICU patients on ventilators and another had 30%. This was due in part to case mix but also continued high volumes of non-emergency cardiac procedures at the hospital with lower rates of ventilated patients.
- Understanding of how much hospitals are decreasing surgical volumes that contribute to bed utilization vs. their baseline.
- The ability to predict evacuation support needs of hospitals in natural disasters (e.g., how many ventilated patients/ICU patients, how many total patients) and understand how current inpatient census compares to usual census when hospitals are moving patients in anticipation of an incident (e.g., hurricane, flooding).
- The ability of HCCs/regional, state, and federal partners to rapidly interpret hospital capacity during a no-notice incident based on initial casualty estimates whether there is capacity in the region or whether federal /regional assistance is likely to be needed for patient re-distribution.

Current EHR information is deposited by most healthcare systems into health information exchanges or "digital lakes." Some hospital systems use this information flow from multiple vendors to create dashboards that demonstrate capacity and the previously mentioned metrics automatically based on EHR data. What is lacking is consistent data definitions, data systems and the connection to EHRs, and data use agreements to support information sharing and use.

Role of Healthcare Coalitions in Information Sharing

HCCs can act as a neutral convener of healthcare facilities to share information.

- HCCs can lead the development and commitment to regional data and patient transfer policies in many areas during the planning phase as well as response (e.g., via a memorandum of understanding/memorandum of agreement).
- HCCs can assist with sharing incident specific adaptive strategies that may be adopted by others as well as strain information (space and staffing contingencies) that are not easily captured by data. Healthcare facilities may have specific needs and asks that they are willing to share between partners but are reluctant to share with state agencies that may have oversight/enforcement obligations. Relationships built prior to and during an incident are often effectively leveraged to obtain support that would not be possible with simple form submission/requests.
- Several communication groups may need to be set up to ensure proper information sharing. This could include a group for hospital administrative leaders, one for bed managers/house supervisors, and one for clinical subject matter experts (e.g., critical care or pediatrics) depending on the incident duration and needs.

Means to share subjective information and provide support may include:

- Text groups for administrative, medical, or specialty care leaders within the coalition/region
- E-mail groups among coalition members
- Online incident management software for alerting, information sharing, and incident action plan posting
- Conference calls/virtual meetings – cadence defined by impact and issues to be addressed
- In-person meetings

Assessing Strain

Different sized hospitals in different areas have different operating conditions. This is why baseline data is so important.

- Strain is different for a hospital that routinely boards more than 20 patients in their emergency department versus one that almost never has boarders. In a region, this should be reflected in the number of boarding patients mapped as a curve over time.
- Over time, thresholds can be set based on standard deviations from mean census and other variables.
- In the short term, day-to-day comparisons between and among facilities can provide helpful information about resources and strain. Daily census, boarding data, ventilators in

use, and ICU beds in use can provide a quick snapshot of load (both quantity and intensity) for a given hospital and region that can also be used to compare hospital strain, particularly when displayed over time. Day to day comparisons may need to include data specific to the type of surge occurring. For instance, during a pediatric respiratory epidemic, data on NICU, PICU, and acute care subcategories would need to be reported out for comparison among facilities.

A region may wish to obtain more granular information about staffing such as the ratio of nurses to patients in the ICU and on the floor. Though the line between contingency and crisis (where patients are placed at risk of a poor outcome based on the strategies utilized) is blurred, the region may come to an agreement that, for example, certain nurse-to-patient ratios represent crisis conditions. Changing nurse-to-patient ratios more than 150% has been suggested as a threshold for crisis conditions (though more as a trigger to adopt proactive surge management and staff management strategies to *prevent* this threshold from being crossed).[1]

Mitigation of Strain – Facility and Community

Successful community mitigation of a surge or strain conditions begins with effective response at the hospital level. There are many resources and strategies that support hospital surge planning:

- The ASPR TRACIE Hospital Surge Capacity and Immediate Bed Availability Topic Collection.
- A scaled plan to expand space used for patient care and deploy staff in ways that maximize coverage while minimizing risk to patients should be coupled with "surge discharge" protocols including discharge holding areas (if not used daily).
- Resources should be on hand to support initial disaster needs (the ASPR TRACIE Disaster Available Supplies in Hospitals Tool can help hospital emergency planners calculate what facilities should have on hand).
- Triaging those with more minor illnesses or injuries away from the ED to clinics, telehealth, and other care providers can help preserve capacity as can risk communication to the public and preventative strategies such as vaccination or prophylaxis. Outreach to local community-based clinical practices should be made in conjunction with the recognition of a surge in demand for care, serving to both alert ambulatory practices to the impending challenges, as well as to gain broad acceptance for the need to maximize home-based and clinic-based care prior to sending patients to the hospital.

Transparency is critical to the success of any effort to provide regionally consistent access to medical care. The data mentioned in this document can provide a clear picture of the loads that

[1] National Academies of Sciences, Engineering, and Medicine. (2020). Rapid Expert Consultation on Crisis Standards of Care for the COVID-19 Pandemic.

hospitals are facing, and the systems described can assure ethical and equitable distribution of resources and access to care within a geographic region.

II. Related Resources

Abbasi, J. (2022). "This Is Our COVID"—What Physicians Need to Know About the Pediatric RSV Surge. Medical News & Perspectives, JAMA.

The author explains what makes the 2022 RSV outbreak different, why so many children are becoming infected, how the surge is affecting the healthcare system, and what the plans are to manage the surge and develop a vaccine.

ASPR TRACIE. (2018). Essential Elements of Information.
This ASPR TRACIE TA response includes comments and examples from subject matter experts on Essential Elements of Information (EEI) that HCCs can use in exercises or real-world events. In particular, the National Healthcare Response Network's *Regional Healthcare System Emergency Response Plan Annex: Regional Healthcare Situational Awareness Procedure*, identifies the situational awareness procedures for HCCs.

ASPR TRACIE. (2021). Medical Operations Coordination Cells Toolkit (Second Edition; MOCC 2.0).

This toolkit offers flexible and modifiable guidance, developed by the U.S. government, aimed to assist regional, state, local, tribal and territorial governments to ensure load-balancing across healthcare facilities and systems so that the highest possible level of care can be provided to each patient during the COVID-19 pandemic.

ASPR TRACIE. (2022). Medical Operations Coordination Centers (MOCC)/Patient Load-Balancing: Summary of Lessons Learned during COVID-19.

In Spring 2022, ASPR TRACIE reviewed lessons learned from 10 states that utilized a MOCC or similar patient load-balancing structure during the COVID-19 pandemic. This document provides a summary of key findings from select MOCCs established prior to and during the COVID-19 pandemic and highlights challenges, and gaps and potential opportunities/considerations for other jurisdictions establishing MOCCs in the future.

COVID-19 Healthcare Resilience Working Group. (2020). Considerations for Assessing Regional Patient Load-Balancing Effects during COVID-19.

Surges of COVID-19 cases have overwhelmed hospitals in many areas of the United States. Often, severe patient loads are concentrated on a few facilities in a region. This document describes load-balancing and the Medical Operations Coordination Cell as options for managing patient surge.

COVID-19 Healthcare Resilience Working Group. (2020). Critical Care Load-Balancing Operational Template.

This template provides a framework for indicators and triggers that may assist states that are implementing Medical Operations Coordination Cells (MOCC) to address patient surge related to COVID-19.

Dichter, J., Deveraux, A., Sprung, C., et al. (2021). Mass Critical Care Surge Response during COVID-19: A Preliminary Report of Findings from the Task Force for Mass Critical Care. Chest. 161(2):429-447.

This article presents ten new suggestions from the Task Force for Mass Critical Care based on the response to COVID-19 to help hospitals and communities operationalize strategies to avoid crisis standards of care. These suggestions focus on staffing, load-balancing, communications, and technology.

King, M., Matos, R., Hamle, M., et al. (2022). PICU in the MICU: How Adult ICUs Can Support Pediatric Care in Public Health Emergencies. Chest. 161(5):1297-1305.

In the early waves of the COVID-19 pandemic, pediatric intensive care units (PICU) were converted to treat adults in some hospitals. PICU capacity is traditionally lower than adult ICU, however, making it critical for young patients to be receive treatment in adult ICUs during public health emergencies. The authors share strategies for maximizing patient care in these situations (e.g., patients must be 12 years of age and "have conditions common in children and adults alike").

Mitchell, S., Rigler, J., and Baum, K. (2022). Regional Transfer Coordination and Hospital Load Balancing During COVID-19 Surges. JAMA Health Forum. 3(2):e215048.

The three authors describe statewide initiatives in their respective states to load balance patients during the COVID-19 pandemic.

National Academies of Sciences, Engineering, and Medicine. (2020). Rapid Expert Consultation on Crisis Standards of Care for the COVID-19 Pandemic. The National Academies Press.

This rapid expert consultation articulates guiding principles, key elements, and core messages undergirding crisis standards of care decision making. The document is also available to read or download at https://www.nap.edu/catalog/25765/rapid-expert-consultation-on-crisis-standards-of-care-for-the-covid-19-pandemic.

Twitter. (2022). Bed Availability Tweetorial.

This Twitter thread is cohosted by several healthcare professionals and discusses how to start a Medical Operations Coordination Cell (MOCC) during a COVID-19 surge. It also provides ten tips on how to ensure that "no patient is left behind."