ASPR TRACIE Technical Assistance Request

Requestor:
Requestor Phone:
Requestor Email:
Request Receipt Date (by ASPR TRACIE): 4 February 2016
Response Date: 9 February 2016; updated response 10 February 2016
Type of TA Request: Standard

Request:

[redacted] asked if ASPR TRACIE had any definitions of surge as it relates to immediate bed availability (IBA) and information on calculating surge.

Response:

The ASPR TRACIE team reviewed the existing Hospital Surge Capacity and Immediate Bed Availability Topic Collection and located several applicable resources (listed alphabetically). The first section of this response provides information on general hospital surge (including definitions and related concepts). The second section includes information on immediate bed availability (concepts and sample resources). The third section provides links to online tools that can be used to calculate bed availability.

Also included is an existing, redacted response from a previous ASPR TRACIE TA request specific to a comparison of scales or methods used for qualitatively determining or predicting emergency department crowding.

Updated Response (2/10/2016):

The ASPR TRACIE team reached out to [redacted], an ASPR TRACIE Subject Matter Expert, for additional information and resources related to surge and IBA. [redacted] provided the resource below and the following information:

Hick, J.L., Barbera, J.A., Kelen, G.D. (2009). Refining Surge Capacity: Conventional, Contingency, and Crisis Capacity. (See attached document.) Disaster Medicine and Public Health Preparedness. 3(2 Suppl):S59-67.

This article proposes a taxonomy within surge capacity of conventional capacity (implemented in major mass casualty incidents and representing care as usually provided at the institution), contingency capacity (using adaptations to medical care spaces, staffing constraints, and supply shortages without significant impact on delivered medical care), and crisis capacity (implemented in catastrophic situations with a significant impact on standard of care).

[redacted] opinions are stated below:

- 'Surge capacity' is often a wastebasket term - the article that proposed the conventional/contingency/crisis framework also proposed that when we express surge capacity this is a combination of conventional/contingency but does NOT include crisis (cot-based, etc.) capacity due to the risk presented to patients and the fact that it is NOT comparable care. Because surge discharges and an average number of unoccupied but staffed beds are critical to surge capacity generation and IBA these should also be included and if not, would generate additional variability in the numbers (see Table 2 in the attached).
- Hospital Preparedness Program (HPP) staff have discussed adopting more standardized definitions for the next project period, including exercise demonstration of same, but we need to keep thinking about this and how we integrate it for consistency.
- IBA basically includes unoccupied staffed beds and surge discharge beds and could include contingency beds depending on how it is reported/ calculated by the facility.

I. Hospital Surge Overview

Einav, S., Hick, J.L., Hanfling, D., Erstad, B., Toner, E., Branson, R. Kanter, R., Kissoon, N., Dichter, J., Devereaux, A., and Christian, M.D. (2014). Surge Capacity Logistics: Care of the Critically Ill and Injured During Pandemics and Disasters: CHEST Consensus Statement. Chest. 146(4_suppl):e17S-e43S.

The authors list 22 suggestions specific to surge capacity and mass critical care under the following topics: stockpiling of equipment, supplies, and pharmaceuticals; staff preparation and organization; patient flow and distribution; deployable critical care services; and using transportation assets to support surge response.

Institute of Medicine. (2012). Crisis Standards of Care: A Systems Framework for Catastrophic Disaster Response. Washington, DC: National Academies Press.

Chapter 7 of the framework, Hospitals and Acute Care Facilities, provides a high level of detail related to implementing surge strategies, including immediate bed availability.

National Association of County and City Health Officials. (2014). Responding to Medical Surge in Rural Communities: Practices for Immediate Bed Availability. Washington, DC: The National Association of County and City Health Officials.

The focus of this report is on immediate bed availability in rural healthcare settings. The authors conducted a literature review and synthesized data collected during interviews with representatives in four areas: Mississippi, Southwest Utah, Virginia, and Southeast Texas.

U.S. Department of Health and Human Services, Office of the Assistant Secretary for Preparedness and Response. (2013). Hospital Preparedness Program (HPP) Healthcare Preparedness Capability Review National Call: Capability 10: Medical Surge and Immediate Bed Availability (IBA).

During this national call, speakers shared information about medical surge and how hospital staff can use immediate bed availability to operationalize Capability 10.

II. Immediate Bed Availability Literature

Cantrill, S., and Pons, P. (2009). HAvBED 2: Hospital Available Beds for Emergencies and Disasters: A Sustainable Bed Availability Reporting System. Denver, CO: Denver Health.

The authors provide an overview of the Hospital Available Beds for Emergencies and Disasters (HAvBED) reporting system, with chapters dedicated to definitions and data elements, data entry, HAvBED and the National Incident Management System, and recommendations for facilities interested in implementing the system.

Centers for Disease Control and Prevention. (2007). (Updated) In A Moment's Notice: Surge Capacity for Terrorist Bombings: Challenges and Proposed Solutions. Atlanta, GA: The Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, Division of Injury Response.

The authors synthesized comments from a series of expert panel meetings on identifying innovative strategies hospitals could adopt to address terrorism-related surge issues.

National Association of County and City Health Officials. (2014). Responding to Medical Surge in Rural Communities: Practices for Immediate Bed Availability. Washington, DC: The National Association of County and City Health Officials.

The focus of this report is on immediate bed availability in rural healthcare settings. The authors conducted a literature review and synthesized data collected during interviews with representatives in four areas: Mississippi, Southwest Utah, Virginia, and Southeast Texas.

Tadmor, B., McManus, J., and Koenig, K.L. (2006). The Art and Science Of Surge: Experience From Israel and the U.S. Military. Academic Emergency Medicine. 13(11): 1130-4.

According to the authors, the "art" of surge includes decisions, authority, and responsibility, and the "science" includes numbers and benchmarks. The authors share surge strategies used by the U.S. military and Israel that can be replicated by other healthcare systems.

U.S. Department of Health and Human Services, Office of the Assistant Secretary for Preparedness and Response. (2013). Hospital Preparedness Program (HPP) Healthcare Preparedness Capability Review National Call: Capability 10: Medical Surge and Immediate Bed Availability (IBA).

During this national call, speakers shared information about medical surge and how hospital staff can use immediate bed availability to operationalize Capability 10.

III. Surge and IBA Tools

Florida Department of Health. (2012). Hospital Mass Casualty Incident Planning Checklist.

This checklist is rooted in the "whole community approach" and provides step-by-step guidance for those planning for significant increases in demand as a result of a critical incident.

NYC Health. (2013). Patient Surge in Disasters: A Hospital Toolkit for Expanding Resources in Emergencies. Queens, NY: NYC Department of Health and Mental Hygiene.

Users can request actual plans via email on this website. They can also use this toolkit, which provides links to templates and other surge tools, to help determine their surge planning, staffing, and supply needs.

U.S. Department of Health and Human Services. (2016). HAvBED. (Users must request an account before accessing the site.)

The HAvBED system and website provides a centralized, national view of bed availability for supporting the medical response to a Federal, Regional, State or Local emergency, disaster or disaster training event.

U.S. Department of Health and Human Services. (2016). HAvBED 2011 User Guide.

This document describes how to use the HAvBED website to maintain counts of available medical beds and other hospital resources, display summary bed count reports for a geographic area (city, state, region or custom-defined area), and maintain facility details.

U.S. Department of Health and Human Services, Office of the Assistant Secretary for Preparedness and Response. (2015). Hospital Surge Evaluation Tool. U.S. Department of Health and Human Services.

This tool can be used by hospital emergency planners, administrators, and other personnel to both assess and enhance their facility's surge plans. It includes evaluation tools specific to emergency department triage and hospital incident command.

ASPR TRACIE Technical Assistance Request

Requestor:
Requestor Phone:
Requestor Email:
Request Receipt Date (by ASPR TRACIE): 27 July 2015
Type of TTA Request: Standard

Request:

XX is investigating mechanisms to establish more objective measures for their local hospitals to assess and report patient surge prior to necessity of entering into a diversion status. In doing research on systems that use objective scoring to help capture current patient volume and throughput, they came upon the National Emergency Department Overcrowding Scale (NEDOCS) system developed out of the University of New Mexico. Question: are there alternative scoring systems that are widely used to reduce the facility-to-facility variance in structure and practice when defining status?

Response:

The ASPR TRACIE team looked into various journal articles that compared scales or methods for qualitatively determining or predicting emergency department (ED) crowding. The research showed that there are six primary tools/ scales/ methods used by EDs to quantitatively determine crowding (more information on each provided in Section I below):

1. National Emergency Department Overcrowding Scale (NEDOCS)
2. Emergency Department Work Index (EDWIN)
3. Real-Time Emergency Analysis of Demand Indicators (READI)
4. Emergency Department Crowding Scale (EDCS)
5. Work Score
6. Emergency Department Occupancy Rate

A one-page comparison and calculations of these six crowding scales can be found at http://www.hindawi.com/journals/emi/2012/838610/tab1/.

Additional ED overcrowding/ saturation score tools/ scales are included in Section II.

The ASPR TRACIE team also consulted with one of our Expert Practitioners/ Subject Matter Experts (through the ASPR TRACIE SME Cadre) to provide his comments/ recommendations on this topic area. The response from [redacted], is found in Section III.

I. General Research

- In 2006, an article in the Academic Emergency Medicine Journal compared the **National Emergency Department Overcrowding Scale (NEDOCS)** with the **Emergency**

Department Work Index (EDWIN)[1] to determine which tool most accurately quantified emergency department crowding. The authors of the article noted that these were the only two scales presently available in predicting overcrowding. They concluded that while both scales had high area under the receiver operating characteristic curve (AUCs), correlated well with each other, and showed good discrimination for predicting ED overcrowding, NEDOCS was the favored scale because the data it uses is more readily available.

- Also in 2006, a study was done comparting four quantitative scales for ED crowding: **Real-Time Emergency Analysis of Demand Indicators (READI)**, EDWIN, NEDOCS, and the **Emergency Department Crowding Scale (EDCS)**[2]. The authors found that that all of the scales lack scalability and do not perform as designed in EDs where crowding is not the norm. However, NEDOCS, EDWIN, and READI's bed ratio subscale yielded good predictive power of perceived ED crowding. The authors noted that these results suggest that these scales can be used effectively after a period of site-specific celebration at EDs where crowding is a frequent occurrence.
- In 2007, a published study showed results of using EDWIN, NEDOCS, the Demand Value of READI, and the **Work Score**[3] to quantify the potential for monitoring current and near-future ED crowding. This study. The authors found that EDWIN, NEDOCS, and the Work Score show high discrimination of ED crowding, however, none of the measures provided substantial advance warning before crowding at low rates of false alarms.
- In 2008, a study compared EDWIN to the **Emergency Department Occupancy Rate** to measure crowding[4]. Results found that the both tools classified leaving without being seen and ambulance diversion hours with moderate accuracy. The authors noted that the simplicity of capturing ED occupancy rates makes the real-time assessment of crowding more feasible for facilities.

II. Other Tools/ Scales

1. **Basic Saturation Scoring Tool**- developed by EMSystems[5], this basic tool uses key inputs related to the ED to measure its total capacity, including capacity, volume, and acuity of patients in the ED. This commercially available computer program tracks the diversion status of all local hospitals. The saturation score that is calculated is a standardized score that measures the percentage of total capacity for an ED.

---

[1] Weiss SJ, Ernst AA, Nick TG. Comparison of the National Emergency Department Overcrowding Scale and the Emergency Department Work Index for quantifying emergency department crowding. Acad Emerg Med. 2006 May;13(5):513-8. Full text available at: http://onlinelibrary.wiley.com/doi/10.1197/j.aem.2005.12.009/epdf

[2] Jones SS, Allen TL, Flottemesch TJ, et al. An independent evaluation of four quantitative emergency department crowding scales. *Acad Emerg Med*. 2006;13:1204-1211. Full text available at: http://onlinelibrary.wiley.com/doi/10.1197/j.aem.2006.05.021/epdf

[3] Hoot NR, Zhou C, Jones I, Aronsky D. Measuring and forecasting emergency department crowding in real time. Ann Emerg Med. 2007 Jun;49(6):747-55. Abstract only: http://www.ncbi.nlm.nih.gov/pubmed/17391809

[4] McCarthy ML, Aronsky D, et al. The emergency department occupancy rate: a simple measure of emergency department crowding? Ann Emerg Med. 2008 Jan;51(1):15-24. Full text available at: http://californiaacep.org/wp-content/uploads/The_Emergency_Department_Occupancy_Rate_A-Simple_Measure_of_.pdf

[5] EMSsystems. Saturation Scoring. https://emresource.emsystem.com/resource/onlinehelp/Setup/StatusesAdmin/Saturation_Scoring.htm#ScaleB. Accessed 31 July 2015.

- To calculate a score, the system asks for responses to eight queries (number of ED beds occupied, patients in lobby, ambulance patients en route or waiting, general admits, ICU admits, patients requiring 1:1 care, RNs short staffed, ED beds assigned, and reasonable lobby capacity). The system will then provide a saturation score for each hospital in the region.
- Scale is as follows: 0% saturation scale- ED is unoccupied; 50% saturation score- ED is running at about half of its total capacity; 100% saturation score- ED is running at capacity; >100% saturation score- ED is running above capacity.
- Tool is described and show here: https://emresource.emsystem.com/resource/onlinehelp/Setup/StatusesAdmin/Saturation_Scoring.htm#ScaleB
- Local uses of the tool can be found in the following links:
  - Florida: http://www.floridahealth.gov/programs-and-services/emergency-preparedness-and-response/healthcare-system-preparedness/em-systems-patient-tracking/_documents/saturation-scoring-help.pdf
  - Phoenix: http://www.jenonline.org/article/S0099-1767(02)00038-7/fulltext

2. **CALDOCs**- a computer based program that calculates resource saturation in the ED using length of stay, lobby waiting, throughput, and other variables. It tracks and trends crowding causes, solutions and results of actions taken. A full description of this tool and how it was implemented at Dignity Health (San Francisco), including implementation, timeline, cost/ benefit analysis, lessons learned, and administrative policies and guidelines: https://smhs.gwu.edu/urgentmatters/sites/urgentmatters/files/CALDOC.DignityHealth.pdfhttps://smhs.gwu.edu/urgentmatters/sites/urgentmatters/files/CALDOC.DignityHealth.pdf
3. **ForecastED**[6]**-** tool developed that provides a discrete event simulation that uses patient flow to predict near-future ED operational measures. The developers of the tool believe that it may be used to forecast the values of various ED crowding measurements at points in the near future. They found that the discriminatory power for ambulance diversion remained consistently high up to 8 hours into the future.
   - First published in 2008: http://www.researchgate.net/publication/5464248_Forecasting_Emergency_Department_Crowding_A_Discrete_Event_Simulation
   - A follow-up report[7] was published in 2009 that discusses the tool being deployed: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2732235/

III. ASPR TRACIE Expert Practitioner Comments

Diversion is a complex issue with few good solutions. Patients, EMS, and hospitals all dislike diversion for different reasons, but it persists in many forms in many EMS systems. Metrics can help recognize the need for system changes and document and compare conditions when

[6] Hoot N, LeBlanc LJ, et al. Forecasting emergency department crowding: a discrete event simulation. Annals of emergency medicine 05/2008; 52(2):116-25.
[7] Hoot N, LeBlanc LJ, et al. Forecasting emergency department crowding: A prospective, real-time evaluation. J Am Med Inform Assoc. 2009 May-Jun; 16(3): 338–345.

diversion is declared. NEDOCS is one of the best validated scores that may help an EMS system provide quantitative data as to the conditions that exist when hospitals declare diversion status. Also, hospitals may find NEDOCS and other scoring systems helpful in declaring 'internal capacity alerts' or similar conditions that may prompt changes in staffing and admissions processes. Hospitals and EMS systems are encouraged to examine the goals for a formal system, what the utility of the data will be (i.e., what changes or actions will be prompted by the data analysis), who will use the data and for what means, and what the burden of the data collection will be versus the return on that investment of time. Choosing a simple and commonly used system is probably the most important component in developing a useful process.