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Purpose and Scope

The Disaster Available Supplies in Hospitals (DASH) Hospital Pharmacy Module (HPM) is a planning tool that allows hospitals to estimate whether they would have adequate supplies of medications in their pharmacy to meet seriously injured patient needs for 48 hours following a mass casualty incident (MCI). It is not intended for use during a disaster.

The HPM is designed to work in conjunction with other DASH modules. Users who complete the Trauma or Burn Modules will also need to complete the HPM to estimate their pharmaceutical needs during a burn or trauma MCI. Note that to avoid duplication some supplies such as fluid requirements for burn patients are calculated in the HPM and are included with general intravenous fluid requirements. Conversely, topical antibiotic requirements for burn care are calculated in the Burn Module only due to the relatively small needs for these medications in trauma care.

To enable alignment across all DASH modules, the HPM estimates minimum supplies needed based on the hospital's trauma level with consideration for other factors including the size of the emergency department (ED), the hospital's role in the community, inpatient burn beds, and the potential isolation of the facility for long periods of time by a natural disaster.

Based on the medication category and type, the HPM compares the quantity of medications available to an estimate of that needed for 48 hours per seriously injured patient and provides an assessment of surplus or deficit in each category. The hospital should plan for 2-3 times this number of patients with less serious injuries, but the majority of resources are required for the seriously injured. For example, a Level 3 trauma center should have a management plan for 20 seriously injured patients and 40-60 with minor injuries. The HPM does provide for some outpatient pain medications and antibiotics. For hospitals that indicate they may be isolated for an extended time after a disaster, the HPM provides an estimate of 96 hour needs. This module was designed to have broad applicability and thus may not meet the needs of all facilities, particularly specialty hospitals (e.g., pediatric centers). Facilities should note that additional supplies and replenishment may be needed beyond this timeframe and should have a clear understanding with their pharmacy suppliers of timelines and availability of product to support ongoing needs.

In consultation with burn and trauma subject matter experts and review of mass trauma and burn incidents the following assumptions for seriously injured casualties are applied:

Hospital Trauma Level	Default Number of Patients
Level 1 and Level 2	50 trauma patients and 15 burn patients
Level 3	20 trauma patients and 5 burn patients
Level 4, Level 5, and Not Designated hospitals	10 trauma patients and 5 burn patients

The following modifiers may be applied:

- IF the hospital declares a Level 4, 5, or undesignated trauma status BUT has 20 or more ED beds, this suggests the hospital is capable of and likely to receive more patients than the trauma designation suggests, and the hospital defaults are adjusted to Level 3 numbers.
- IF the hospital routinely transfers trauma patients to a higher level of care, the predicted needs are decreased by 50% to account for this decreased length of stay.
- IF the hospital is the only trauma receiving hospital in the area, the predicted casualties and needs are doubled.
- IF the hospital has inpatient burn beds, we consider this hospital a burn center and adjust the default burn patients to 25 (additional details are available in the Burn Module).

- IF the hospital is at high risk to be isolated by a natural disaster (e.g., flood, earthquake) and cut off from transfer capability and supply lines, the estimated duration of supplies should equal 96 hours and not 48 hours. (Note that the casualty planning numbers will double when this is selected but this represents a compensation for longer duration of care, not more patients.)

Contributions of Other Medications and Formulations

The DASH HPM includes pharmaceutical supplies most commonly found in hospitals; it is not meant to be an all-inclusive list of available pharmaceutical products. When a formulation or product is stocked in the hospital pharmacy that is not on the list, it may be tallied with the closest appropriate choice. For example, oral antibiotics may be substituted by others in the closest appropriate category. It is important to choose a dosing frequency that is comparable (i.e., a drug that is dosed four times daily will not be counted as similar in the calculation to one that is dosed once daily).

Note that some common medications are not included because while they may still be valuable during/after a disaster, their 48 hour requirement is difficult to calculate or because they may not be preferred for initial care. For example, etomidate is used for induction but not used for ongoing sedation, and dexmedetomidine is not used for initial sedation by many facilities.

Further Medications for Consideration

The following drugs are not included in the module or are included in limited quantity, but hospitals may want to consider having stock on hand or available in their region in collaboration with their healthcare coalition based on their community risk assessment:

1. **Antibiotics for anthrax prophylaxis and treatment**: In conjunction with regional planning and area threat analysis, the hospital should consider stocking oral antibiotics (e.g., ciprofloxacin) for staff and patient prophylaxis and for initial inpatient treatment. A reasonable goal for intravenous treatment may be 3-5 times the HPM target goals though this is highly dependent on community risk and hospital size and services. A reasonable goal for initial treatment of outpatient cases (when resources do not allow hospitalization of all suspect cases) may be 5-10 times the target number of trauma casualties. Request and integration of Strategic National Stockpile (SNS) assets is critical as these will be needed within 24-48 hours in many incidents. Prophylaxis for community members should not be provided from the hospital stock.

2. **Atropine:** Atropine may be needed to relieve symptoms from poisoning with organophosphate/ carbamate insecticides or similar compounds (i.e., “nerve agents”) used in chemical terrorism. Atropine is included in the HPM in quantities sufficient to initiate treatment of a few of these patients. However, large quantities can be needed (sometimes hundreds of milligrams), particularly for ingestion of these substances (e.g., in suicide attempts). Inhalational injury can also require double-digit doses. Atropine is provided in CHEMPACKs that may be deployed with emergency medical services (EMS) agencies and in hospitals. Usually, atropine is supplied as 1mg/10mL syringes and 0.4mg/mL vials. Neither of these is conducive to maintaining large stock levels. Given the immediate need during a chemical terrorist incident, consider stocking crystalline USP grade atropine that can be sterilely reconstituted during a disaster if CHEMPACK resources are not available.

3. **Hydroxocobalamin:** Hydroxocobalamin is highly effective for cyanide exposures, most commonly occurring in the setting of closed-space smoke inhalation when patients exhibit signs and lactic acidosis consistent with cyanide poisoning. Due to high cost and rare use, we do not have a set recommendation for stocking these kits, though all burn centers should have at least one on hand and stocking two is preferred as many patients will require two doses. We suggest Level 1 and 2 hospitals also have one kit on hand. Hospitals should understand community/regional availability of these kits and consider

stocking if there will be significant delay obtaining them. Stocking large quantities of these kits for terrorist cyanide incidents is not recommended due to cost and the relatively low likelihood of a successful cyanide gas attack.

4. **Pediatric intravenous fluids:** Infants and small children will require D5 ¼ NS. Hospitals should ensure they maintain a small stock of this fluid for maintenance. This is not included in calculations.

5. **Potassium iodide (SSKI):** SSKI may be used as prophylaxis against thyroid uptake of radioactive iodine during a radiation incident that includes those isotopes. It is available as tablets and a saturated solution. It is best given within 24 hours prior to exposure to radioactive iodine but is still effective if given soon after exposure. The efficacy of blocking radioactive iodine uptake by the thyroid after the exposure has occurred is about 80% at 2 hours post-exposure, 40% at 8 hours, and negligible at 16 hours. Due to low cost, hospitals in proximity to nuclear power plants or otherwise at risk for radiation incidents may wish to stock a few bottles of SSKI to be used by staff in case a plume is present that could affect staff when they leave the building or in other relevant circumstances. The adult dose is 0.15mL (150mg – dose of tablets 130mg), or three drops from a standard eyedropper.

6. **Pralidoxime (2-PAM):** Pralidoxime may be needed to mitigate some of the effects of poisoning with organophosphate insecticides or similar compounds (i.e., "nerve agents") used in chemical terrorism. The usual emergency adult dose is 2 grams. Pralidoxime is provided in CHEMPACKs that may be deployed with EMS agencies and in hospitals. Because of infrequent use it is difficult to maintain large stock levels. Consider keeping enough to treat a few patients with pesticide exposure (e.g., 4g). Also consider stocking crystalline USP grade pralidoxime that can be sterilely reconstituted during a disaster if CHEMPACK resources are not available.

7. **Tetanus immune globulin (TIG):** TIG is indicated when a patient has not completed their primary (three shot) tetanus vaccination series. TIG is infrequently given and thus not commonly stocked in smaller hospitals. It should be given as soon as possible after injury but is generally effective when given within 24 hours of injury. A plan should be in place to obtain TIG if it is needed when not routinely stocked by the facility.

Suggested Next Steps

Once the module is complete, the hospital can determine reasonable stock levels for the medications in common use. Hospitals may choose to have stock (par) levels for certain medications in excess of recommended amounts based on the ability to rotate stock. Prior to an anticipated incident (e.g., predicted hurricane, special event/mass gathering), the hospital may wish to use the medication list as a quick resource to predict needs based on the incident type and demand and proactively place medication orders (this is separate from an automatic vendor pull). At the healthcare coalition level, the HPM may be used to ensure a standard level of pharmacy stock for disasters and at least a degree of parity of preparedness across the participating facilities. The HPM results should be considered in light of the hospital location relative to their vendor. If the warehouse is within an hour, and the access is not prone to disruption from floods, earthquake, or other disasters, it may not make sense to maintain a full 48-hour inventory if those stock levels cannot be rotated. At the same time, the further a facility is from a vendor, the more consideration that distance should be given for planning to increase stock. Finally, the provided medication list can serve as a valuable template to use with the vendor to create a disaster list of medications that can rapidly be pulled by the vendor and delivered to the hospital to replenish and augment supplies when the hospital requests.

Questions and Comments

We welcome questions about the HPM methodology and suggestions to improve its utility at askasprtracie@hhs.gov. Please note that due to the limitations of Tableau, it is not possible to add certain functions to the DASH tool.

Acknowledgements

The DASH HPM is based on the Hospital Pharmacy Disaster Calculator, an Excel tool ASPR TRACIE developed in 2019. ASPR TRACIE and Healthcare Ready collaborated with the Region VII Disaster Health Response Ecosystem and the Health Industry Distributors Association to build upon that calculator and develop the DASH HPM along with input from ASPR staff, ASPR Regional Disaster Health Response System (RDHRS) sites in Regions I, IV, and VIII, and other subject matter experts based on lessons learned during COVID-19 and other disasters.

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Additional Resources

Advanced Regenerative Manufacturing Institute's Next Foundry for American Biotechnology. (2022).

Essential Medicines Supply Chain and Manufacturing Resilience Assessment. U.S. Department of Health and Human Services Administration for Strategic Preparedness and Response.

This action plan highlights challenges and strategies for addressing pharmaceutical supply chain vulnerabilities with a focus on the critical medicines identified in the U.S. Food and Drug Administration's "Essential Medicines List."

American Society of Health-System Pharmacists. (2022). Drug Shortages Resource Page.

This webpage provides real-time information on known drug shortages, a link to report a shortage, and various resources related to drug shortages.

American Society of Health-System Pharmacists. (2022). Emergency and Disaster Resources.

This webpage provides information to help pharmacists prepare for and respond to emergencies that affect health systems and other acute and ambulatory centers.

ASPR. (2021). CHEMPACK. U.S. Department of Health and Human Services.

This page provides an overview of the CHEMPACK program.

ASPR. (2021). Strategic National Stockpile U.S. Department of Health and Human Services.

This page provides an overview of the Strategic National Stockpile, including information on its history, products, request procedures, and training and exercise resources.

ASPR TRACIE. (2022). Drug Shortages and Scarce Resources. U.S. Department of Health and Human Services.

This page highlights resources ASPR TRACIE developed to help stakeholders prepare for and manage drug shortages and the allocation of scarce resources.

ASPR TRACIE. (2019). Partnering with the Healthcare Supply Chain During Disasters. U.S. Department of Health and Human Services.

This document provides an overview of the emergency planning and response considerations of healthcare supply chain owners, operators, and end users, as well as insights for healthcare coalitions working with healthcare supply chain partners on preparedness, response, and recovery. It aims to capture key changes during serious or catastrophic events, compared to normal supply chain operations, as well as planning and response contingencies.

ASPR TRACIE. (2015). Pharmacy Topic Collection. U.S. Department of Health and Human Services.

The resources in the Topic Collection can help healthcare providers prepare for and respond to shortages and other pharmaceutical-related challenges that may arise during and after a disaster.

ASPR TRACIE and ASTHO. (2017). Clinicians and Coalitions: A Conversation about Finding Solutions for Medication Shortages.

The speakers in this webinar: provided an overview of the medication shortages and their clinical impact; described coping strategies for scarce resources; and discussed the decision-making strategies states, coalitions, and healthcare facilities have used based on crisis standards of care principles.

Center for Infectious Disease Research and Policy. (2022). Resilient Drug Supply Project.

This resource page tracks the latest news related to the pharmaceutical supply chain, maintains a list a critical acute care drugs and whether they are in shortage, and offers a newsletter sign-up option to receive updates.

U.S. Food and Drug Administration. (2022). Drug Shortages. U.S. Department of Health and Human Services.

This webpage provides information on FDA's efforts to prevent or reduce drug shortages and includes a link to a regularly updated drug shortages database.