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# Purpose and Scope

The Disaster Available Supplies in Hospitals (DASH) Personal Protective Equipment (PPE) Module is designed to help hospitals determine approximate minimum PPE needs for personnel providing acute care based on the pathogen of concern and several facility-specific variables. PPE estimates are included for:

- Viral hemorrhagic fever (VHF) (e.g., Ebola Virus Disease [EVD]),
- Special respiratory illnesses (e.g., Middle East Respiratory Syndrome [MERS], Severe Acute Respiratory Syndrome [SARS]), and
- Pandemic viral pathogen scenarios.

The DASH PPE Module is not proscriptive nor definitive. It is intended to serve as a starting point for facility planners to estimate the **minimum** PPE that may be needed for staff based upon the role the hospital has in the community for the pathogen of concern. It adjusts for the number and types of personnel involved in patient management, number of room entries, duration of hospital stay (or outbreak), and the types of PPE commonly used by the facility.

Users should adjust the assumptions when warranted based on their specific facility capacity, practices, and risk assessment. **Changes to the use assumptions can dramatically affect the outputs. The module outputs will be most accurate when the perspectives of the hospital's emergency management, infection prevention and control, infectious disease clinicians, supply chain, procurement, and other relevant staff are considered.**

## PPE Types Included

1. Because the role and capabilities of each hospital can differ based on the pathogen (e.g., a hospital might transfer all potential VHF cases, would provide temporary inpatient care for some special respiratory illnesses, and would need to prepare to care for all types of patients during pandemics) it is not possible to develop a single PPE cache recommendation.
2. Please pay careful attention to guidance linked in the PPE Module Instructions about PPE associated with each scenario and review the provided links for updates. Included PPE types are based on the following:
  - a. *VHF*: Centers for Disease Control and Prevention (CDC) and Occupational Safety and Health Administration (OSHA) guidance and recommendations for EVD.
  - b. *Special Respiratory Illness*: CDC, OSHA, and World Health Organization (WHO) guidance and recommendations for MERS, SARS, and novel influenza A viruses.
  - c. *Pandemic*: CDC and OSHA guidance and recommendations for pandemic influenza and COVID-19.
3. For the VHF and Special Respiratory Illness scenarios, the PPE types included are based on the PPE ensembles for caring for a symptomatic, confirmed patient. Not all types of included PPE may be needed for all patients or for the entire duration of a patient's hospital stay.
4. **The DASH PPE Module calculates the total amount of PPE needed by type, but it does not account for the need to have different sizes available.**
  - a. Hospitals should consider normal usage patterns of PPE sizes to ensure staff safety and comfort.

- b. This particularly applies to includes gloves and respirators, but considerations for gowns, coveralls, and shoe/boot covers should also be taken into account.
5. The module includes PPE by general type rather than specific models or performance characteristics due to the variety of products available and the need to make the DASH tool generalizable to all hospitals.
  6. While the module does include estimates for the hoods, tubing, and filters associated with powered air purifying respirators (PAPRs) in the VHF and special respiratory illness scenarios, users should consider what other associated PPE components may be needed.
  7. The module only includes estimates for PPE used in the settings described in the next section. Additional amounts or types of PPE (e.g., surgical masks) may be necessary to protect other hospital personnel and visitors.
    - a. The PPE required will vary based on the hospital's role, the pathogen of concern, the role and location of each staff member, each hospital's PPE requirements, and hospital/jurisdictional polices, including those related to visitor restrictions and infection prevention.
    - b. Users should consult with infection prevention and control and other relevant hospital staff to assess additional PPE needs and include them in planning considerations.
    - c. Consumption of barrier face coverings and surgical masks will increase significantly and perhaps be 10-20 times greater than usual use during a pandemic depending on users, duration of use, and visitor policies.
    - d. Planners should consider the number of staff, patients, and visitors who will require barrier face coverings or surgical masks.

## PPE Use Settings

1. Under the VHF and Special Respiratory Illness scenarios, the module only considers the PPE needed by healthcare workers entering the room of confirmed or suspected VHF or special respiratory illness patients. The only exception is the donning/doffing observer who remains outside the room of a confirmed or suspected VHF patient.
  - a. The types of PPE included in the module are based on the recommended PPE ensembles for those providing care in the patient's room.
  - b. Users should consider the PPE needed in other areas of the hospital, such as emergency department staff who may be the first to recognize a suspected case, laboratory workers who may be processing samples outside the patient room, and waste management staff.
2. Under the Pandemic Scenario, the module considers the PPE needs of emergency department and inpatient staff.

## PPE Quantities

1. The amount of PPE in the module outputs is based on the types and settings described in the previous sections.
  - a. Under the VHF and Special Respiratory Illness scenarios, quantities are determined by the staff member role, the number of rooms being managed at one time, and the number of times each staff member enters each room.
  - b. Under the Pandemic Scenario, quantities are determined by the staff member role and the daily maximum number of each staff role by shift.

2. Carefully review the assumptions against your hospital's practices and plans and adjust as necessary. Note that 12-hour shifts are assumed for all three scenarios. Because adjusting the shift length changes multiple variables, it cannot be adjusted.
3. **The calculated PPE needs should be considered minimums.** Depending on the role and size of the hospital, **estimates may need to be increased in the range of 25%.** Factors that could affect estimates include:
  - a. *Training*
    - i. Training PPE is not accounted for in the PPE Module estimates. Hospitals may want to consider setting aside PPE for staff that is stored between training and exercises and reused as possible.
    - ii. The experience level and comfort of staff with various types of PPE may influence appropriate usage.
  - b. *PPE Failure, Soilage, and Damage*
    - i. PPE should always be changed if it becomes soiled, moist, or contaminated (beyond the ability to be decontaminated according to manufacturer's instructions).
    - ii. PPE should be changed if it is damaged or fails during use (e.g., if the straps of a respirator lose their elasticity or a gown tears).
  - c. *Procedures*
    - i. Higher levels of precautions or more frequent PPE changes may be required for staff performing aerosolizing interventions such as intubation, suctioning, or other higher risk procedures.
    - ii. Users should consider how emergency policies implemented during a pandemic may affect usage rates. For example, the module cannot accurately predict PPE needs for procedures due to variability in volumes during restrictions on non-emergency procedures. Testing prior to procedures can help reduce the need for respirator use.
  - d. *Hospital Role or Policies*
    - i. Usage of certain types of PPE may be driven by hospital policies or the role of the hospital in the community.
    - ii. Hospitals engaging the services of contract staff or those deployed through mutual aid should consider the effects on usage of these temporary staff who may be accustomed to different usage policies.
    - iii. Academic health centers with training programs should account for higher usage.
  - e. *Par Levels and Preventing Unauthorized Use*
    - i. Ensure appropriate PPE par levels are available for staff daily and secure storage of PPE to prevent unauthorized use.
    - ii. There should be supervised/regulated dispensing of respirators during scarcity/pandemic situations.
4. Hospital emergency management, infectious disease, infection prevention and control, and administration should work together to determine reasonable stock levels. This includes development of extended use and limited reuse policies for a pandemic.

## Purchasing and Stockpiling

1. The PPE Module is intended to help hospitals estimate what their PPE needs may be during three scenarios. Immediate purchasing and stockpiling of large quantities of PPE could cause shortages and should be avoided.
  - a. Under the VHF and Special Respiratory Illness scenarios, hospitals should consider these estimates relative to their usual par levels, particularly for PPE items that are not routinely used in large quantities. Users should discuss potential needs with vendors and understand lead times for resupply.
  - b. Under the Pandemic scenario, the PPE Module's estimates will far exceed any hospital's storage capacity if users follow the recommendation to use one year as their planning basis. The module should be used to calculate a reasonable estimate of what MAY be needed over a full year; users should understand that a single purchase of the estimated quantities – even if financially possible – is not a rational resource management strategy for most facilities. Hospitals should consider the estimates relative to their normal usage, explore the feasibility of increasing par levels for certain PPE types with the expectation of stock rotation, and understand other sources of PPE (e.g., healthcare coalition, state) that may be available.
2. Healthcare coalitions (HCCs) should consider managing caches of PPE at the regional level.
  - a. This may be particularly helpful to rapidly augment a frontline facility's PPE stocks for VHF suspect cases, to support hospitals caring for multiple special respiratory illness patients, or other situations where there are disproportionate effects on coalition member hospitals.
  - b. During a pandemic, these caches will not be as helpful as all facilities will have needs, though they may provide some temporary relief when supply chains are stressed.
  - c. Having pre-existing policies for request, allocation, replenishment, and logistics of accessing and moving these caches is key.
  - d. Commercial supply chain partners could be helpful managing the cache (review the ASPR TRACIE document [Partnering with the Healthcare Supply Chain During Disasters](#) for more information).
3. Federal stockpiles contain significant quantities of N95 respirators and other PPE that may be helpful in a situation where a single or few jurisdictions are affected. In a pandemic, however, these stockpiles will be insufficient.
4. States may have their own stockpiles of PPE; these will vary in size and composition.
5. Hospitals and HCCs should work with their states to understand what is available at the state and federal levels and the processes and timelines associated with activating and receiving the supplies. Federal assets will take time to activate, mobilize, and get to the bedside.

## Other Planning Considerations

While the PPE Module helps hospitals estimate their quantities of needed PPE under the scenarios described, it is meant to be considered in conjunction with other planning tools, resources, information, and facility and community-wide preparedness efforts.

1. It is intended for pre-incident planning and NOT to determine PPE supply needs during an incident.

2. **The module is designed for hospital use.** Though there may be some applicability to other settings, the assumptions were designed for the protection of personnel providing acute care in a hospital setting. **It also does not account for others (such as emergency medical services) who might depend on the hospital for PPE supplies/exchange.**
3. The PPE Module does not provide information for less virulent pathogens or for non-infectious agents.
4. The module does not include hand hygiene, disinfection, decontamination, waste management, or other related infection prevention supplies that would be needed during the three included scenarios.
5. This is a PPE planning tool only and does not imply patient care policies. The [Additional Resources](#) section includes links to other sources that provide guidelines and other information related to special pathogen patient management.
6. PPE is only effective when used properly.
  - a. Hospitals should ensure staff are regularly trained on how to properly don and doff the types of PPE used in their facilities. This includes PPE that hospitals may obtain from local, regional, state, or federal stockpiles and supply caches.
  - b. Hospitals should always refer to device manufacturer directions for use and ensure compliance with Food and Drug Administration (FDA) and OSHA requirements by PPE type.
7. The information in this module is not intended to supersede federal, state, local, or facility/healthcare system PPE requirements, such as those related to stockpiles, PPE use in facilities, or vaccination programs.

## Suggested Next Steps

The outputs of the module may be used to discuss appropriate cache levels of PPE at the facility and HCC level and to discuss potential needs with vendors in advance of an incident to ensure supply chain continuity. HCC caches could enhance interoperability of PPE used in facilities within their region and potentially reduce overall procurement and storage costs. Hospitals and vendors should discuss and have a common understanding of expected lead times to ensure replenishment of needed supplies and to avoid excess purchasing decisions.

## Questions and Comments

We welcome questions about the PPE Module methodology and suggestions to improve its utility at [askasprtracie@hhs.gov](mailto: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

Portions of this module are based on the CDC Hospital Ebola PPE Calculator (<https://www.cdc.gov/vhf/ebola/healthcare-us/ppe/calculator.html>), which was developed in 2015 to assist hospitals in estimating their PPE needs when managing a patient with or under investigation for Ebola virus disease. In 2018, ASPR TRACIE expanded upon the CDC Hospital Ebola PPE Calculator with additional variables and scenarios to provide healthcare facilities a broader Hospital PPE Planning Tool. ASPR TRACIE and Healthcare Ready collaborated with the Region VII Disaster Health Response Ecosystem and the Health Industry Distributors Association to build upon the Hospital PPE Planning Tool and develop the DASH PPE Module 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.

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## Additional Resources

3M. (2017). [Cleaning Reusable Respirators and Powered Air Purifying Respirator Assemblies](#).

The process for cleaning and disinfecting respirators is model-specific. This link provides cleaning and disinfection guidelines for commonly used 3M respirators as an example. Users should review the specific guidelines for the models of respirators used in their hospital and reach out to the device manufacturer as needed.

ASPR. (2018). [HPP Funds Regional Treatment Network for Ebola and Other Special Pathogens](#). U.S. Department of Health and Human Services.

This page provides information on the regional network established to help healthcare providers and facilities prepare to identify, isolate, transport, and treat patients suspected or known to be infected with emerging special pathogens.

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. (2017). [Infectious Diseases Resource Page](#). U.S. Department of Health and Human Services.

This page highlights resources ASPR TRACIE developed to address current and emerging infectious disease threats.

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.

Food and Drug Administration. (2020). [Personal Protective Equipment for Infection Control](#). U.S. Department of Health and Human Services.

This webpage provides information on PPE, describes FDA's regulatory role, and includes links to additional sources of information on PPE for infection control.

Halyard. (2018). [10 Questions to Ask Before You Stockpile](#).

This fact sheet guides decision-making by healthcare facilities considering stockpiling. It includes information on planning for special pathogens and pandemics as well as seasonal influenza.

National Emerging Special Pathogens Training and Education Center (NETEC). (2017). [Personal Protective Equipment: Developing a Train-the-Trainer Program](#).

This PowerPoint presentation provides an overview of key PPE concepts, clarifies competency, and discusses strategies for developing PPE courses and maintaining ongoing PPE competency.



NETEC. (2018). PPE 201: [Critically Thinking about PPE](#).

This online course helps users identify and select PPE for management of special pathogen patients, develop standard operating procedures for PPE donning and doffing, and assess strengths and weaknesses of PPE standard operation procedures.

NETEC. (2020). [Preserving PPE Supply – How Some Facilities are Conserving Their Stockpiles](#).

This page provides examples of how NETEC facilities have preserved their PPE supplies.

National Institute for Occupational Safety and Health. (2021). [NIOSH Personal Protective Equipment Information \(PPE-Info\)](#). U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.

This website compiles standards information for PPE from the U.S. government, American National Standards Institute-accredited standard development organizations, and the International Organization for Standardization. Users can search the database by fields including the category of PPE, hazard type, standard type, and standard organization.

New York City Health + Hospitals. (2019). [Frontline Hospital Planning Guide: Special Pathogens](#).

This planning guide from New York City Health + Hospitals provides high-level planning information for frontline hospital multidisciplinary teams to support planning and training for the initial care of suspected special pathogen patients while determining whether and when they will be transferred to another facility for further assessment and treatment.

Occupational Safety and Health Administration. (n.d.). [Infectious Diseases](#). U.S. Department of Labor.

This webpage provides information on healthcare worker safety for those who may be exposed to infectious diseases. It includes links to PPE standards, precautions for specific diseases, and other useful information to assist healthcare facility planning.

Szalajda, J., Stull, J., and Brosseau, L. (2021). [Overview of the ASTM F3502-21 Barrier Face Covering Standard](#). U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.

This blog post describes the consensus standard developed to help consumers compare filtration efficiency, breathability, re-use potential, and leakage of barrier face coverings, which are not covered by federal performance standards in place for respirators and surgical masks.