

Strategies for Optimizing the Supply of Personal Protective Equipment (PPE) for Health Care Facilities

Purpose: The purpose of the information below is meant to direct health care facilities on potential options for optimizing supplies of PPE when there is a limited supply in times of sudden, unexpected increases in patient volume that severely challenge or exceed the present capacity of a facility (surge capacity). These options are based on Centers for Disease Control and Prevention (CDC) guidelines for optimizing the supply of PPE ([CDC strategy for PPE](#)). These measures assume that facilities have already implemented other engineering and administrative control measures, including:

- Limit the number of patients going to hospital or outpatient setting.
- Exclude all Health Care Providers (HCP) not directly involved in patient care.
- Limit face-to-face HCP encounters with patient.
- Exclude visitors to patients with known or suspected COVID-19.
- Source control.
- Cohorting patients and HCP.
- Maximizing telemedicine.
- Use of airborne isolation rooms for known/suspected COVID-19 patients or physical barriers to separate HCP from potentially infectious patients.
- Maintain ventilation systems with appropriate air flow and filtration exchange rates.

According to updated CDC recommendations (April 2, 2020):

- All healthcare facilities should begin using PPE contingency strategies.
- Healthcare facilities experiencing PPE shortages may need to consider crisis capacity strategies, which must be carefully planned before implementation.
- As PPE becomes available, healthcare facilities should promptly resume standard practices (conventional capacity strategies).

Important Definitions:

- **Conventional Capacity** - measures consist of providing patient care without any change in daily contemporary practices.
- **Contingency Capacity** - measures may change daily standard practices but may not have significant impact on the care delivered to the patient or the safety of the HCP. These practices can be used temporarily during periods of expected PPE shortages.
- **Crisis Capacity** - strategies that are not commensurate with U.S. standards of care. These measures, or a combination of these measures, may need to be considered during periods of known PPE shortages.

Conventional Capacity Strategies for Optimizing PPE Supplies (as PPE becomes available, can return to these strategies)

Eye	Gown	Facemasks	N95 Respirators
Use eye protection according to product labeling and local, state, and federal requirements.	Use isolation gown or alternatives that offer equivalent or higher protection. Sterile surgical gowns should be prioritized for surgical or sterile procedures.	Use facemasks according to product labeling and local, state, and federal requirements.	<p>Ensure training for HCP on indications for use of N95 and proper use.</p> <p>Just-in-time fit testing to ensure fit testing for HCP who provide direct patient care.</p> <p>Limit waste of respirators during trainings. Use the same respirators for training and fit testing when able and prioritize qualitative fit testing (which reduces waste of respirators).</p> <p>Limit use of surgical N95 respirators to HCP at risk of both airborne and fluid hazards (e.g. splashes, sprays). If there are no surgical N95 respirators, face shields should be worn over standard N95 respirators during these encounters.</p> <p>Use of alternatives to N95 respirators where feasible (for example powered air purifying respirators (PAPRs), which provide equivalent or higher protection.)</p>

Contingency Capacity Strategies for Optimizing PPE Supplies

Eye	Gown	Facemasks	N95 Respirators
<p>Selectively cancel elective and non-urgent procedures and appointments for which eye protection is typically used by HCP.</p> <p>Shift eye protection supplies from disposable to reusable devices (i.e., goggles and re-usable face shields).</p> <p>Implement extended use of eye protection (CDC guidelines on extended use of eye protection).</p>	<p>Selectively cancel elective and non-urgent procedures and appointments for which a gown is typically used by HCP.</p> <p>Shift gown use towards washable cloth isolation gowns.</p> <p>Consider the use of coveralls.</p> <p>Use of expired gowns beyond the manufacturer-designated shelf life for training.</p> <p>Use gowns or coveralls conforming to international standards.</p>	<p>Selectively cancel elective and non-urgent procedures and appointments for which a facemask is typically used by HCP.</p> <p>Ensure facemasks are distributed only to HCP and symptomatic patients (e.g., place all supplies in monitored site).</p> <p>Implement extended use of facemasks (CDC guidelines for extended use of facemasks).</p> <p>Restrict facemasks to use by HCP, rather than patients for source control.</p>	<p>Decrease length of hospital stay for medically stable patients with COVID-19.</p> <p>Use of N95 respirators beyond the manufacturer-designated shelf life for training and fit testing</p> <p>Extended use of N95 respirators (CDC guidelines for extended use of N95 masks)</p> <p>Limited reuse of N95 respirators (CDC guidelines for limited reuse of N95 respirators)</p>

Crisis Capacity Strategies for Optimizing PPE Supplies

In a crisis capacity situation, can also consider excluding HCP at higher risk for severe illness from COVID-19 from contact with known or suspected COVID-19 patients and designating convalescent HCP (e.g. HCP with previous COVID-19 infection who have recovered and are cleared to return to work) for provision of care to known or suspected COVID-19 patients.

Eye	Gown	Facemask	N95 Respirators
<p>Cancel all elective and non-urgent procedures and appointments for which eye protection is typically used by HCP.</p> <p>Use eye protection devices beyond the manufacturer-designated shelf life during patient care activities. Visually inspect before use and discard if concerns for degraded materials.</p> <p>Prioritize eye protection for higher risk patient care activities (e.g., aerosol generating procedures).</p> <p>Consider using safety glasses (e.g., trauma glasses) that have extensions to cover the side of the eyes.</p>	<p>Cancel all elective and non-urgent procedures and appointments for which a gown is typically used by HCP.</p> <p>Extended use of isolation gowns with cohort of COVID-19 patients in the same location.</p> <p>Reuse of cloth isolation gowns.</p> <p>Prioritize gowns for higher risk patient care activities (e.g., aerosol-generating procedures).</p> <p>Consider suspending use of gowns for endemic multi-drug resistant organisms (e.g., methicillin-resistant <i>Staphylococcus aureus</i> (MRSA), vancomycin-resistant enterococcus (VRE)).</p>	<p>Cancel all elective and non-urgent procedures and appointments for which a facemask is typically used by HCP.</p> <p>Use facemasks beyond the manufacturer-designated shelf life during patient care activities. Visually inspect before use and discard if concerns for degraded materials.</p> <p>Implement limited reuse of facemasks.</p> <p>Prioritize facemasks for higher risk patient care activities (e.g., aerosol-generating procedures) or essential surgeries/procedures.</p> <p>Use face shield that covers the entire front and sides of face with no facemask.</p>	<p>Use of N95 or equivalent alternative respirators beyond the manufacturer-designated shelf life for healthcare delivery.</p> <p>Use of respirators approved under standards used in other countries that are similar to National Institute for Occupational Safety and Health (NIOSH)-approved N95 respirators (see list on CDC website).</p> <p>Implement limited reuse of N95 respirators for COVID-19 patients per CDC guidelines (CDC Guidelines for Limited Reuse of N95 respirators).</p> <p>Consider decontamination and subsequent reuse of N95 respirators only as a crisis capacity strategy (see Appendix attached to this document for details).</p> <p>Prioritize the use of N95 respirators and facemasks by activity type. If N95 masks are so limited that they cannot be used for all HCP providing care to COVID-19 patients, then N95 use should be prioritized for HCPs completing high risk patient care activities and facemasks used in lower risk patient care activities (see table on CDC website).</p>

Eye	Gown	Facemask	N95 Respirators
	<p>When no gowns are available, consider using alternatives such as disposable laboratory coats or aprons, reusable (washable) patient gowns or laboratory coats.</p>	<p>Consider use of expedient patient isolation rooms for risk reduction (see CDC guidance for more information).</p> <p>Consider use of ventilated headboards (see CDC guidance for more information).</p> <p>Consider use of homemade masks ONLY as a last resort.*</p>	<p>Consider use of expedient patient isolation rooms for risk reduction (see CDC guidance for more information).</p> <p>Consider use of ventilated headboards (see CDC guidance for more information).</p> <p>When no N95 respirators are available, consider use of masks that have never been evaluated or approved by NIOSH or homemade mask ONLY as a last resort.*</p>

* In settings where N95 respirators are so limited that routinely practiced standards of care for wearing N95 respirators and equivalent or higher level of protection respirators are no longer possible, and surgical masks are not available, as a last resort, it may be necessary for HCP to use masks that have never been evaluated or approved by NIOSH or homemade masks. However, caution should be exercised when considering this option.^{1,2}

References

1. Dato, VM, Hostler, D, and Hahn, ME. Simple Respiratory Mask, Emerg Infect Dis. 2006;12(6):1033–1034.
2. Rengasamy S, Eimer B, and Shaffer R. Simple respiratory protection-evaluation of the filtration performance of cloth masks and common fabric materials against 20-1000 nm size, Ann Occup Hyg. 2010;54(7):789-98.

APPENDIX

Crisis Strategy Recommendations for Decontamination of Disposable N95 Respirators

On March 28, 2020, the U.S. Food and Drug Administration (FDA) issued an [Emergency Use Authorization \(EUA\) permitting the Battelle Decontamination System](#) at Battelle Memorial Institute to be authorized for use in decontaminating “compatible N95 respirators.” Consider checking the [FDA EUA website](#) to determine if other EUA for decontamination systems have been posted since the release of this document.

As per CDC, currently there are three methods for decontamination of disposable N95 respirators: 1) vaporous hydrogen peroxide, 2) ultraviolet germicidal irradiation, and 3) moist heat. These methods do not appear to break down filtration or compromise the respirator performance; however, these methods can be used only for limited number of times per mask. Respirators containing cellulose-based materials are incompatible with the Battelle Decontamination System.

Prior to considering use of any method, consult the respirator manufacturer about the impact of the method on the model of respirator. Is manufacturer or third-party guidance or procedures available for decontaminating the specific model of respirator?

Yes: Respirator after decontamination can be worn for any patient care activities.

No: Respirator after decontamination can be worn for patient care activities except when performing or present for an aerosol generating procedure.

Details on decontamination methods evaluated for select models of respirators from different manufacturers can be found at [CDC website](#).

Healthcare providers should take the following precautionary measures prior to using a decontaminated N95 respirator:

- Clean hands with soap and water or an alcohol-based hand sanitizer before and after touching or adjusting the respirator.
- Avoid touching the inside of the respirator.

- Use a pair of clean (non-sterile) gloves when donning and performing a user seal check.
- Visually inspect the respirator to determine if its integrity has been compromised.
- Check that components such as the straps, nose bridge, and nose foam material did not degrade, which can affect the quality of the fit, and seal.
- If the integrity of any part of the respirator is compromised, or if a successful [user seal check](#) cannot be performed, discard the respirator.
- Perform a [user seal check](#) immediately after donning the respirator and do not use a respirator on which you cannot perform a successful user seal check.

The following decontamination procedures are **not recommended** as crisis strategies as they may alter the performance of a N95 respirator: using an autoclave, 160°C dry heat, 70% isopropyl alcohol, ethylene oxide, soap, dry microwave irradiation, bleach, and disinfectant wipes.