

# PARTICULATE RESPIRATORS<sup>1</sup> AND GENERAL PPE (N95, Elastomeric, PAPR, CAPR) STRATEGIES FOR SCARCE RESOURCE SITUATIONS



<b>Conventional Capacity</b> – The spaces, staff, and supplies used are consistent with daily practices within the institution. These spaces and practices are used during a major mass casualty incident that triggers activation of the facility emergency operations plan.	<b>Contingency Capacity</b> – The spaces, staff, and supplies used are not consistent with daily practices, but provide care to a standard that is functionally equivalent to usual patient care practices. These spaces or practices may be used temporarily during a major mass casualty incident or on a more sustained basis during a disaster (when the demands of the incident exceed community resources)	<b>Crisis Capacity</b> – Adaptive spaces, staff, and supplies are not consistent with usual standards of care but provide sufficiency of care in the setting of a catastrophic disaster (i.e., provide the best possible care to patients given the circumstances and resources available). Crisis capacity activation constitutes a significant and adjustment to standards of care (Hick et al, 2009).
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<b>RECOMMENDATIONS</b>	<b>Strategy</b>	<b>Conventional</b>	<b>Contingency</b>	<b>Crisis</b>
<p><b>General Infection Control Procedures</b></p> <ol style="list-style-type: none"> <li>1. Screen all patients for symptoms specific to current situation and keep updated to any changing screening recommendations</li> <li>2. At healthcare facilities where patients have scheduled appointments, consider screening prior to arrival to limit exposure and resources</li> <li>3. Establish procedures for managing visitors and ill healthcare personnel.</li> <li>4. Establish triage procedures and separate areas for ill and well patients.</li> <li>5. Assign dedicated staff to minimize exposure.</li> <li>6. Require, when possible, or strongly encourage vaccination of primary personnel and first responders, according to vaccine schedule as recommended for existing circumstances by the CDC and the Advisory Committee for Immunization Practices (ACIP).</li> <li>7. Seriously consider creation of a registry to reflect the vaccination status of primary personnel and first responders to aid in decisions regarding service assignments.</li> <li>8. Educate and routinely train all staff regarding appropriate use and proper donning and doffing procedures of PPE and particulate respirators.</li> <li>9. Maintain good hand hygiene procedures including gloves, hand washing with soap and water and/or alcohol-based hand sanitizers depending on the current recommendations.</li> <li>10. Maintain plan for N95 Fit Testing</li> </ol> <p><b>Engineering Controls</b></p> <ol style="list-style-type: none"> <li>11. When applicable to specific institution consider designing and installing engineering controls to reduce or eliminate exposure by shielding healthcare providers and other patients from infection individuals. Examples of engineering controls include physical barriers or partitions to guide patients through triage areas, curtains between patients in shared areas, closed suctioning systems for airway suctioning for intubated patients, as well as appropriate air-handling systems (with appropriate directionality, filtration, exchange rate, etc.) that are installed and properly maintained.</li> </ol> <p><b>Cache/ Increase Supply Levels</b></p> <ol style="list-style-type: none"> <li>12. Clarify current CDC and OSHA guidelines for respirator and other PPE use; monitor for updates and recommendations.<sup>2</sup></li> <li>13. Cache additional supplies of PPE and respirators and their functional components (e.g. fit testing supplies, batteries, cartridges, filters, hoods etc.).</li> <li>14. Review vendor agreements, contingencies for delivery and production, including alternate vendors.</li> <li>15. Consider other NIOSH approved respirators in times of short supply (e.g. These include N99, N100, P95, P99, P100, R95, R99, and R100.)<sup>5</sup></li> <li>16. Review current supply of PPE and determine baseline and surge burn rates to better plan supply needs.</li> <li>17. Maintain a reserve sufficient to meet estimated needs of PPE for all infectious diseases.</li> <li>18. Review cached PPE on a regular basis for expirations dates and consider replacing/updating caches by rotating PPE into daily use</li> </ol>	<p><i>Prepare</i></p>			
<ol style="list-style-type: none"> <li>19. Obtain masks, cartridges and other PPE from alternate sources such as industrial suppliers and companies – welding, manufacturing, etc. – as indicated.</li> </ol>	<p><i>Substitute</i></p>			

<p>20. Request Strategic National Stockpile of respirators with the knowledge that they may be from different manufacturers. They may not be functional in all situations (i.e. surgical use) and they may require additional fit testing before deployment.</p> <p>21. Do not discard unused expired PPE; submit for extension through NIOSH or local regulatory agency</p>			
<p><b>Decrease Use of PPE</b></p> <p>22. Clarify current CDC, OSHA and NIOSH guidelines for PPE use; monitor for updates and recommendations.<sup>2,3</sup></p> <p>23. Medical/surgical masks can be reused by infected patients until the masks are no longer useable due to moisture or damage.</p>	<p><i>Substitute &amp; Conserve</i></p>		
<p>24. When PPE, especially Respirators are in short supply, aerosol-generating procedures should only be performed on patients when medically necessary and cannot be postponed.</p> <p>25. Limit the number of healthcare personnel with patient contact to only those essential for patient care and support, especially during aerosol generating procedures.</p> <p>26. Consider primary use of PAPRs, CAPRs Elastomeric or other Respirators to conserve on N95 masks</p> <p>27. Ensure staff are educated and understand specific PPE requirements during current situations so as not to <i>overuse</i> PPE</p> <p>28. Develop specific protocols for PPE distribution so as to ensure PPE is being used responsibly</p> <p>29. Cohort patients with known disease to limit donning and doffing of PPE</p> <p>30. Consider limiting visitors</p> <p>31. Consider changes in staffing (i.e. unimmunized staff given assignments that would not require significant PPE use)</p>	<p><i>Conserve</i></p>		
<p><b>Respirator Extended Use<sup>6</sup></b></p> <p>32. Clarify current CDC and OSHA guidelines for respirator use; monitor for updates and recommendations.<sup>6</sup></p> <p>33. Policies and recommendations around “extended use” or “re-use” of respirators should include input from occupational health, infection control, infectious disease specialists, state and local public health and any national recommendations around the situation at hand.</p> <p>34. For N95, consider wearing a loose-fitting barrier that does not interfere with fit or seal (e.g., surgical mask, face shield) over the respirator to extend its use.</p> <p>35. In general, wearing an N95 respirator over multiple serial patient encounters (while minimizing touching) is favored over removing and re-donning between encounters (i.e. extended use is favored over re-use of N95).<sup>3</sup></p> <p>36. Cleaning and filter replacement procedures and extended use of filters and/or hoods/shields on all other mechanical respirators (i.e. elastomeric respirators, PAPRs, CAPRs etc.) should be done according to manufacturer’s protocols and guidelines.</p>	<p><i>Re-use</i></p>		
<p><b>Re-use Respirator After Removal<sup>6</sup></b></p> <p>37. Clarify current CDC and OSHA guidelines for respirator use; monitor for updates and recommendations.<sup>6</sup></p> <p>38. Review manufacturer recommendations for cleaning and re-using PAPRs and CAPR face shields when appropriate.</p> <p>39. Policies and recommendations around “extended use” or “re-use” of respirators should include input from occupational health, infection control, infectious disease specialists, state and local public health and any national recommendations around the situation at hand.</p>	<p><i>Re-use Re-allocate</i></p>		
<p>40. Use and store used respirators (hood, mask, shield) individually in such a way that the physical integrity and efficacy of the respirator will not be compromised.<sup>6</sup></p> <p>41. Label respirator with a user’s name before use to prevent inadvertent use by another individual.<sup>6</sup></p> <p>42. Practice appropriate hand hygiene before and after removal of the respirator and, if necessary and possible, appropriately disinfect the object used to store it.<sup>6</sup></p> <p>43. Respirators should be discarded if visibly damaged or contaminated.<sup>6</sup></p> <p>44. The specific number of safe reuses for N95’s is very difficult to estimate. In general check the specific N95 manufacturer recommendations. In general, five (5) is the recommended number of donning of a re-used N95-type respirator.<sup>6</sup></p> <p>45. Consider N95 decontamination with ultraviolet germicidal irradiation (UVGI), or other tested method of decontamination to extend the use of respirators.<sup>4</sup></p> <p><b>Re-allocate/ prioritize</b></p> <p>46. Respirators use should be prioritized only to those healthcare providers identified as highest risk based on epidemiology of current situation.</p> <p>47. Identify medical personnel and caregivers with documented vaccination, immunity after an illness or lower risk of complicated infection to provide direct patient contact without a respirator.</p>	<p><i>Re-use Re-allocate</i></p>		

<sup>1</sup>Refers to any device such as N95, elastomeric respirators, Powered Air Purifying respirators (PAPRs), Controlled Air Purifying Respirator (CAPRs) or equivalent. NIOSH approved particulate respirators can be found at: [https://www.cdc.gov/niosh/npptl/topics/respirators/disp\\_part/RespSource.html](https://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/RespSource.html); [https://www.cdc.gov/niosh/npptl/topics/respirators/disp\\_part/default.html](https://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/default.html)

<sup>2</sup>CDC and NIOSH overview of respirators: <https://www.cdc.gov/niosh/topics/respirators/default.html>

<sup>3</sup>OSHA eTool: <https://www.osha.gov/SLTC/etools/respiratory/index.html>

<sup>4</sup>"Extended use" is defined as wearing the same respirator for repeated close contact encounters with multiple patients without removing the respirator between patients (e.g. triage area, dedicated waiting rooms or wards, etc.). "Reuse" is defined as using the same respirator for multiple encounters but removing it after each encounter. <https://www.cdc.gov/niosh/topics/hcwcontrols/recommendedguidanceextuse.html>  
[https://www.cdc.gov/niosh/npptl/topics/respirators/disp\\_part/respsource3respreuse.html](https://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/respsource3respreuse.html)

<sup>4</sup>Current research on the decontamination of N95 Respirators: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4699414/pdf/nihms747549.pdf>, <https://academic.oup.com/annweh/article/53/8/815/154763>  
<https://academic.oup.com/annweh/article/56/1/92/166111>

<sup>5</sup> [https://www.cdc.gov/niosh/npptl/topics/respirators/disp\\_part/default.html](https://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/default.html)

<sup>6</sup><https://www.cdc.gov/niosh/topics/hcwcontrols/recommendedguidanceextuse.html>

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