

COVID-19: MASKS AND RESPIRATORS FOR HEALTH CARE PROVIDERS



A Rapid Guidance Summary from the Penn Medicine Center for Evidence-based Practice
Last updated April 4, 2020, 10:00 pm. All sources rechecked April 2.

- Key sources: Professional Society / Government guidelines (WHO, ECDC, CDC); Major hospital system policies
- We have not differentiated between outpatient and inpatient guidance unless otherwise noted as most recommendations were similar.
- The CDC has updated information on the mode of transmission (April 3), which will likely impact decisions regarding extended use for masks and respirators.

Key questions answered in this summary

- When should healthcare workers wear a mask or respirator?
- At times of shortage, when may masks or respirators be reused?

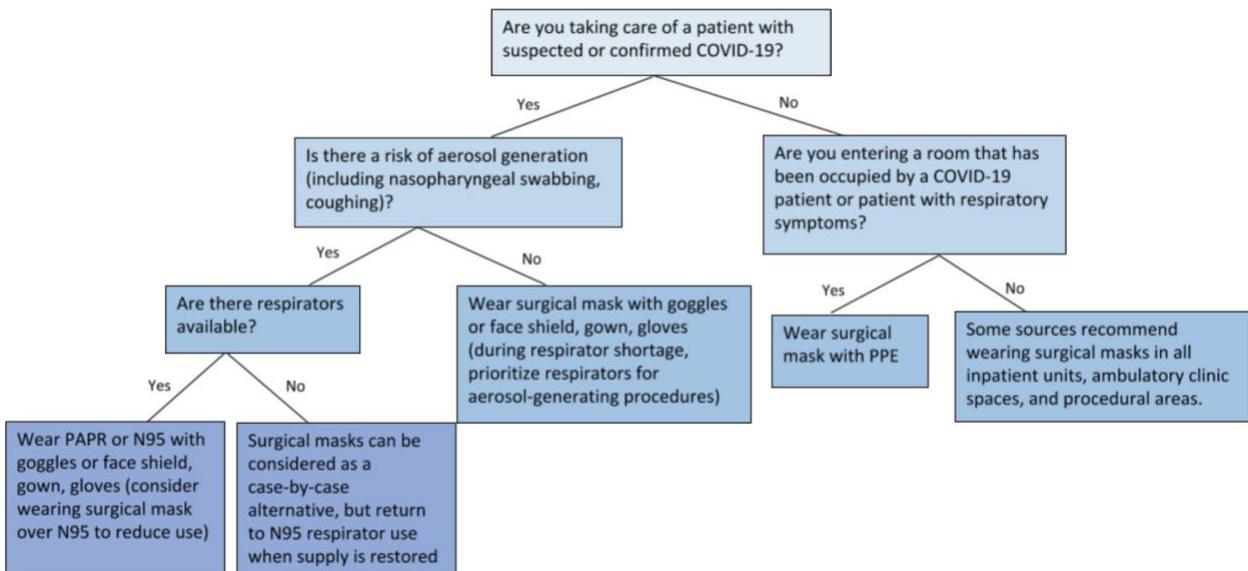
Summary and rating of major recommendations

Recommendation	Rating
Healthcare workers providing direct patient care: wear a surgical mask at all times when providing care for suspected or confirmed COVID-19 patients; N95-level respirators should be worn when performing aerosol-generating procedures.	A
During times of shortage: extended mask use and re-use of masks may be considered, particularly when caring for patients with the same diagnosis (e.g. COVID-19); respirators may be worn for an extended period of time or re-used (by a single provider) as a means of dealing with a shortage.	A
Discard masks when soiled, contaminated or wet. Discard respirators when soiled, or if appropriate fit is not maintained.	A
Consider using a surgical mask or face shield over the respirator to prevent surface contamination (especially if respirator availability is limited and a re-use policy is in effect)	B
Store respirators in an individual paper bag or other breathable container between uses (label bag and mask to prevent reuse by another provider)	B
Store masks in a clean sealable paper bag or other breathable container between uses. Some, but not all, hospital policies specify paper bag. Fold mask so the outer surface is held inward and against itself during storage.	C
Hospital policies do not agree on whether respirators should be re-used after shifts	C
Decontamination protocols, including UV light and hydrogen peroxide vapor, are not yet standardized and should only be considered in extraordinary circumstances (prioritize extended use and re-use)	C

Key: A—consistently recommended in multiple guidelines, B—recommended in a single guideline, recommended only in hospital policy documents, or recommended weakly, C—guideline recommendations lacking or inconsistent.

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Quick reference: PPE decision tree



Key Definitions

Extended use: wearing the same mask or respirator for repeated encounters with several different patients, without removing it between patient encounters.

Limited Reuse: the practice of using the same facemask for multiple encounters with different patients but removing it after each encounter.

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Mask usage

Guidelines

Source	Recommendations
CDC April 1	<p>Mode of transmission: transmission most commonly happens during close exposure to a person infected with COVID-19, primarily via respiratory droplets produced when the infected person coughs, sneezes, or talks. Recent studies indicate that people who are infected but do not have symptoms likely also play a role in the spread of COVID-19.</p> <p><u>Care of patients with known or suspected COVID-19:</u> Masks are an acceptable alternative when respirators are unavailable. (April 1)</p> <p>Respirators should be prioritized for procedures that are likely to generate respiratory aerosols, which would pose the highest exposure risk to HCP. (April 1). When the supply chain is restored, facilities with a respiratory protection program should return to use of respirators for patients with known or suspected COVID-19. (April 1)</p> <p>Wear PPE including a medical mask when entering a room that has been occupied by a COVID-19 patient or a patient with respiratory symptoms. Discard masks after exiting the room or care area and closing the door. PPE is not required for activities that do not involve contact with COVID-19 patients.</p>
ECDC March 31	<p><u>Contact with a suspected or confirmed COVID-19 case:</u> wear a surgical mask or, if available an FFP2 respirator tested for fitting, eye protection (i.e. visor or goggles), a long-sleeved gown or apron, and gloves.</p> <p><u>Non-direct patient contact of suspected COVID-19 cases:</u> patient should wear a mask and healthcare worker should keep a distance of at least one meter (3 feet). A mask is unnecessary if there is a physical barrier such as glass or a plastic teller window.</p> <p><u>Aerosol generating procedures (e.g. nasopharyngeal swab):</u> this can provoke coughing and sneezing therefore leading to the production of aerosols. Wear gloves, eye protection, a gown, and a surgical mask if a respirator is not available.</p> <p><u>Drive-through or outdoor testing facilities:</u> use of a surgical mask should be sufficient.</p> <p><u>Priorities for use of surgical masks:</u> If no respirators are available, the highest priority for the use of surgical masks is those caring for COVID-19 patients. The next highest priority is for symptomatic confirmed cases of COVID-19, followed by suspected cases.</p>
WHO March 19	<p>Wear a mask when entering a room where patients with suspected or confirmed COVID-19 are admitted.</p> <p>Cloth (e.g. cotton or gauze) masks are not recommended under any circumstances.</p> <p>Individuals/patients with respiratory symptoms should wear a mask while waiting in triage or other areas and during transportation within the facility</p>
CDC/NIOSH March 14	<p>The role of facemasks is for patient source control, to prevent contamination of the surrounding area when a person coughs or sneezes. Patients with confirmed or suspected COVID-19 should wear a facemask until they are isolated in a hospital or at home</p>

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Extended use or re-use of masks

Guidelines

Source	Recommendations
CDC (See note)	<p><u>Extended use during limited PPE availability</u>: consider having health care workers remove only gloves and gowns (if used) and perform hand hygiene between patients with the same diagnosis (e.g., confirmed COVID-19) while continuing to wear the same eye protection and respirator or mask (i.e., extended use). Risk of transmission from eye protection and masks during extended use is expected to be very low. (April 1)</p> <p><u>General guidance during times of surge capacity</u> (March 17):</p> <p>“Contingency Capacity” situations (times of <i>expected</i> mask shortage): implement mask extended use. The facemask should be removed and discarded if soiled, damaged, or hard to breathe through. Restrict facemasks to use by HCP, rather than patients for source control.</p> <p>“Crisis Capacity” situations (times of <i>known</i> mask shortage), implement limited re-use of facemasks. Facemasks should be carefully folded so that the outer surface is held inward and against itself to reduce contact with the outer surface during storage. The folded mask can be stored between uses in a clean sealable paper bag or breathable container.</p>
ECDC March 31	<p><u>Extended use to optimize PPE</u>: staff should be assigned to carry out procedures in designated areas. For example, a dedicated area for collecting diagnostic respiratory samples can be set up. While collecting the sample, healthcare personnel can use the same respiratory protection equipment (surgical mask or respirator) for several patients for a longer period of time (up to 4-6 hours for respirators) without removing it, provided that it is not damaged or soiled, unless the manufacturer explicitly advises against this.</p> <p>The risk of the surface of surgical masks and respirators becoming contaminated by respiratory droplets is considered to be lower when they are covered with a visor. In such cases, <u>reuse of the respirator/surgical mask may be considered as a last-resort option</u> to economize on use of PPE.</p>
WHO March 19	<p>No recommendations on extended or reuse of masks.</p> <p>Current recommendations are to not re-use single-use masks. Replace masks as soon as they become damp with a new clean, dry mask. Discard single-use masks after each use and dispose of them immediately upon removal.</p>

NOTE: CDC guidelines: [Strategies for Optimizing the Supply of Facemasks](#) (March 17),
[Interim Infection Prevention and Control Recommendations](#) (April 1)

Respirator usage

Guidelines

Source	Recommendations
CDC April 1	<p><u>Mode of transmission</u>: transmission most commonly happens during close exposure to a person infected with COVID-19, primarily via respiratory droplets produced when the infected person coughs, sneezes, or talks. Recent studies indicate that people who are infected but do not have symptoms likely also play a role in the spread of COVID-19.</p> <p>Put on a respirator or facemask (if a respirator is not available) before entry into the patient room or care area. N95 respirators or respirators that offer a higher level of protection should be used instead of a facemask when performing or present for an aerosol-generating procedure, including nasopharyngeal swabbing. Procedures that are likely to induce coughing (e.g., sputum induction, open suctioning of airways) are likely to generate aerosols. Disposable respirators and face masks should be removed and discarded after exiting the patient’s room or care area and closing the door.</p> <p>During times of limited PPE, consider having health care workers remove only gloves and gowns (if used) and perform hand hygiene between patients with the same diagnosis (e.g., confirmed COVID-19) while continuing to wear the same eye protection and respirator or facemask (i.e., extended use). Risk of transmission from eye protection and facemasks during extended use is expected to be very low.</p> <p><u>Face masks are an acceptable alternative when respirators are unavailable.</u></p>

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ECDC March 31	<p>Healthcare workers in contact with a confirmed case, or a suspected case of COVID-19, should wear PPE for contact, droplet and airborne transmission of pathogens: FFP2 (N95) or FFP3 respirator tested for fitting, eye protection (i.e. goggles or face shield), long-sleeved water-resistant gown and gloves.</p> <p>Highest priority for use of respirators: health care workers should wear an FFP2 (N95)/FFP3 level mask when performing aerosol-generating procedures, including endotracheal intubation, bronchoscopy, open suctioning, administration of nebulized treatment, manual ventilation before intubation, physical prone positioning of the patient, disconnecting the patient from the ventilator, non-invasive positive pressure ventilation, tracheostomy, and cardiopulmonary resuscitation.</p> <p>In the absence of respirators, healthcare workers should use masks with the highest available filter. In enclosed spaces, healthcare workers collecting diagnostic respiratory samples should wear gloves, eye protection, a gown, and a surgical mask if a respirator is not available. For drive-through or outdoor testing facilities, the use of a surgical mask should be sufficient.</p>
WHO March 19	<p>Health care workers should wear a N95 level mask when performing aerosol-generating procedures, such as tracheal intubation, non-invasive ventilation, tracheotomy, cardiopulmonary resuscitation, manual ventilation before intubation, and bronchoscopy.</p>

Extended use or re-use of respirators

Guidelines

Source	Recommendations
WHO March 19	<p>Respirators have been used for an extended time during previous public health emergencies involving acute respiratory illness when PPE was in short supply.</p> <p>Evidence indicates that respirators maintain their protection when used for extended periods.</p> <p>Using one respirator for longer than 4 hours can lead to discomfort and should be avoided.</p> <p>No guidance for mask or respirator re-use.</p>
ECDC March 31	<p>Healthcare personnel can use the same respirator for while treating multiple patients for 4-6 hours without having to remove the respirator, as long as it is not damaged or soiled, unless the manufacturer explicitly advises against this.</p> <p>The risk of the surface of surgical masks and respirators becoming contaminated by respiratory droplets is considered to be lower when they are covered with a visor. In such cases, reuse of the respirator/surgical mask may be considered as a last-resort option to economise on use of PPE.</p>
CDC Feb. 29	<p>In “Contingency Capacity” situations, where health care providers are anticipating a shortage of respirators, extend the use of N95 respirators by wearing the same N95 for repeated close contact encounters with several different patients, without removing the respirator.</p> <p>In “Crisis Capacity” situations when N95 supplies are running low, implement limited reuse of N95 respirators for patients with COVID-19, measles, and varicella.</p> <p><u>When no respirators are available, use masks not evaluated or approved by NIOSH or homemade masks as a last resort.</u></p>
NIOSH March 2018	<p>Extended use alone is unlikely to degrade respiratory protection. If extended use of N95 respirators is permitted, respiratory protection program administrators should ensure adherence to administrative and engineering controls to limit potential N95 respirator surface contamination.</p> <p>There is no way of determining the maximum possible number of safe reuses for an N95 respirator as a generic number to be applied in all cases.</p> <p>Discard N95 respirators following use during aerosol generating procedures. Discard N95 respirators contaminated with blood, respiratory or nasal secretions, or other bodily fluids from patients. Discard N95 respirators following close contact with, or exit from, the care area of any patient co-infected with an infectious disease requiring contact precautions.</p>

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	<p>Consider use of a cleanable face shield over an N95 respirator and/or other steps (e.g., masking patients, use of engineering controls) to reduce surface contamination of the respirator.</p> <p>Hang used respirators in a designated storage area or keep them in a clean, breathable container such as a paper bag between uses. To minimize potential cross-contamination, store respirators so that they do not touch each other and the person using the respirator is clearly identified. Storage containers should be disposed of or cleaned regularly.</p>
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Other guidance for times of respirator shortage

Source	Recommendations
ECDC March 31	<p>In times of shortages, alternatives to N95s should be considered, including other classes of FFRs, elastomeric half-mask and full facepiece air purifying respirators, and powered air purifying respirators (PAPRs) where feasible. Special care should be taken to ensure that respirators are reserved for situations where respiratory protection is most important, such as performance of aerosol-generating procedures on suspected or confirmed COVID-19 patients or provision of care to patients with other infections for which respiratory protection is strongly indicated (e.g., tuberculosis, measles, varicella).</p> <p>Research groups and healthcare facilities are looking into possible methods for decontaminating and sterilising masks, including steam, hydrogen peroxide vapor, gamma irradiation, and ultraviolet germicidal irradiation. These methods are not standardized and should be considered an extraordinary last resort in the event of PPE shortage.</p>

Summary of hospital policies on mask and respirator use and reuse

Policy	Beth Israel	Mt. Sinai	Nebraska	UCSF	Washington
Wear a mask at all times in inpatient units, ambulatory clinic spaces, and procedural areas	✓	✓	✓	✓	Optional
Extended use of masks	✓	✓	✓	✓	✓
Re-use of masks	✓	Not specified	✓	✓	✓
Discard mask at end of work shift	✓	NOTE 1	✓	X	✓
Wear N95 respirator when performing aerosol-generating procedures.	✓	✓	✓	✓	✓
Wear N95 respirator with a face shield to provide eye-protection and reduce the risk of surface contamination.	✓	✓	✓	✓	✓
Extended use of respirators	✓	✓	✓	✓	✓
Re-use of respirators	✓	✓	NOTE 2	✓	✓
Store mask or respirator being re-used in an individually-labeled paper bag	✓	✓	✓	NOTE 3	NOTE 3
Discard respirator at end of work shift	X	X	NOTE 4	X	X
Discard mask and N95 respirator if damaged, soiled, or moist	✓	✓	✓	✓	✓

NOTE 1—policy is unclear about re-use, but masks should not be taken home

NOTE 2—yes, but this is not a preferred option

NOTE 3—store in a clean, dry location

NOTE 4—do not discard, follow decontamination protocol

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UCSF PPE guidelines for healthcare providers

		Airborne transmitted infections ² (e.g. TB, measles, varicella)		COVID-19 suspect (PUI) or confirmed positive COVID-19 (novel respiratory isolation OR respiratory illness isolation)		Droplet transmitted infections ² (e.g. influenza, adenovirus) excluding RSV, rhinovirus, parainfluenza, human metapneumovirus		No Concern for Aerosol Transmission ⁴
		PPE	Room criteria	PPE ³	Room criteria ³	PPE	Room criteria	PPE
Type of Procedure	High Risk Aerosol Generating Procedure	PAPR with goggles or face shield, gown, gloves	Airborne Isolation room	PAPR or N95 with goggles or face shield, gown, gloves	Airborne Isolation room for ongoing or continuous HRAGP ⁵	PAPR or N95 with goggles or face shield, gown, gloves	Private patient room preferred	Standard Precautions and refer to isolation table as applicable
	Not aerosol generating procedure	PAPR or N95	Airborne Isolation room	Surgical mask with goggles or face shield, gown, gloves	Private patient room with door closed preferred	Surgical mask with goggles or face shield, gown, gloves	Private patient room preferred	

APPENDIX: Hospital guidance - specifics and protocols

Hospital policies on mask extended use or re-use

Source	Policy
UCSE March 31	Extended use: For specialty respiratory care units: wear a face shield with mask/respirator for extended use For all other locations: wear a facemask at all times in clinical buildings
Nebraska March 28	No specific recommended for extended limited re-use A disposable facemask can be worn for several hours if not wet or distorted, and not touched while delivering patient care. If the facemask is not visibly contaminated or distorted, carefully store in the paper bag to avoid destroying the shape of the mask. The facemask should be stored in a dedicated, well-ventilated container (i.e., paper bag with handles) with user name & date.
Mt. Sinai March 27	Based on the current situation and recommendations, in both the inpatient and outpatient setting, when providing direct patient care we recommend a surgical mask should be worn. Extended use: Wear a mask for the duration of the work shift unless it becomes soiled or wet, in which case it should be changed. Discard your surgical mask before you leave work.
Beth Israel March 26	Extended use: Reuse of single masks is approved for a single provider for one shift and for multiple patients on a unit. Optimally leave mask on for as long as tolerated. Most important steps are hand hygiene and use of clean gloves. Covers all inpatient care and emergency departments.
Cleveland March 24	Extended use for face masks: One mask per shift. Change face mask with contamination with respiratory secretions, or obvious soilage or damage. Used mask handled by ear loops only. Never touch the front of the mask. Perform hand hygiene after handling used mask. Do not reapply a used mask.

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Hospital policies on respirator extended use or re-use

Source	Policy
<p>UCSF March 31</p>	<p><u>Extended use guidelines</u> Wear a face shield with mask/respirator for extended use (face shield will partially cover the mask) Clean hands each time prior to and after touching mask/respirator Extended use masks and/or respirators can be reused after being doffed per reuse guidance</p> <p><u>Re-use guidelines</u> Use your mask/respirator for a full shift or longer if it does not meet discard guidance (see below); do not share with other providers Wear a face shield with mask/respirator Clean hands each time prior to and after touching mask/respirator; avoid touching the front/inside of the mask/respirator (clean hands immediately after touching front of the respirator for fit check upon re-use) Between use - store in a clean, dry location that is labeled</p> <p><u>Discard if</u> Contaminated hands have touched inside Wet, soiled, or damaged Appropriate fit is not maintained</p>
<p>Beth Israel March 24-26</p>	<p>Reuse of a single N95 respirator is approved for a single provider for multiple patients on a unit over multiple shifts.</p> <p><u>Re-use procedure</u> <i>Donning (1st use)</i> - follow standard procedure Prepare clean storage bag (single use paper bag), label bag and inside edge of new N95 with name to prevent reuse by another individual</p> <p><i>Remove/store</i> - Perform hand hygiene and don new gloves, Remove mask without touching inside of the respirator; place N95 in labeled paper bag (careful not to deform mask) Remove gloves and perform hand hygiene; store in designated area</p> <p><i>Donning for reuse</i> Prepare new storage bag as above Hand hygiene + new gloves Remove N95 from original bag by the straps and check integrity, follow standard donning procedure; perform <u>seal check</u> and dispose single use bag in regular trash</p> <p>Notes: most important steps are hand hygiene and use of clean gloves, N95 should be discarded at any time if deformed, moist, or does not produce adequate seal</p>
<p>Mt. Sinai March 25</p>	<p><u>Extended use procedure</u> The same N95 respirator may be worn without removal between patient encounters.</p> <p><u>Limited re-use procedure</u> Use face shield to reduce surface contamination of the respirator Use non-bleach germicidal wipe on face shield and allow to dry, then store face shield in an individual paper bag. Don clean gloves before removing respirator Store N95 respirator in an individual paper bag. Discard the respirator and face shield when patient care is complete or at the end of a shift.</p>

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<p>Nebraska March 21</p>	<p>Extended use is preferred over re-use on the assumption that it is safer for the employee to leave their mask and eye protection in place, to reduce the risk of self-contamination through frequent donning and doffing of the same equipment.</p> <p>Disposable N95 respirators worn for COVID-19 patient encounters may be re-used or worn for extended use as long as they are able to seal, were not worn during an aerosol generating procedure or have reached the end of their use by being soiled, damaged or moist from sweat or insensible fluid loss through breathing.</p> <p>Label the N95 respirator and paper storage bag with the user's name before using to prevent reuse by another individual. Write name on mask where straps are attachment or on elastic straps of N95 mask. Write dates and times used on the bag to track overall use.</p> <p>NOTE: Nebraska has published a protocol for ultraviolet decontamination of used N95 respirators: See https://www.nebraskamed.com/for-providers/covid19</p>
<p>Washington March 13</p>	<p><u>Re-use N95 respirators to conserve supply</u></p> <p>N-95 respirators must only be used by a single user</p> <p>Use a full face shield or a surgical mask over an N95 respirator to reduce surface contamination of the respirator.</p> <p>Keep used respirators in a clean breathable container between uses.</p> <p>Store respirators so that they do not touch each other.</p> <p>Storage containers should be disposed of or cleaned each time mask is removed.</p> <p><u>Discard N95 respirators (do not re-use) if</u></p> <p>Contaminated with blood, respiratory or nasal secretions, or other bodily fluids from patients.</p> <p>The straps are stretched out so they no longer provide enough tension for the respirator to seal to the face or if the nosepiece or other fit enhancements are broken</p> <p>The respirator that is obviously damaged or becomes hard to breathe through.</p> <p>The respirator has been used more than 5 times, or has been used continuously for >8 hours.</p>

About this report

A Rapid Guidance Summary is a focused synopsis of recommendations from selected guideline issuers and health care systems, intended to provide guidance to Penn Medicine providers and administrators during times when latest guidance is urgently needed. It is not based on a complete systematic review of the evidence. Please see the CEP web site for further details on the methods for developing these reports.

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