

Use of N95, Surgical, and Cloth Masks to Prevent COVID-19 in Health Care and Community Settings: Living Practice Points From the American College of Physicians (Version 1)

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KEY QUESTION 1

What is the effectiveness of N95 respirators versus surgical masks versus cloth masks for the prevention of coronavirus disease 2019 (COVID-19) in addition to standard precautions (gloves + handwashing) in community settings?

KEY QUESTION 2

What is the effectiveness of N95 respirators versus surgical masks versus cloth masks for the prevention of COVID-19 in addition to standard precautions (gowns + gloves + handwashing) in health care settings?

KEY QUESTION 3

What is the effectiveness for reuse or extended use of N95 respirators for prevention of COVID-19?

BACKGROUND

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) spreads among persons in close proximity through droplets, although evidence is still emerging regarding potential airborne transmission. Reducing transmission of SARS-CoV-2 infection in health care and community settings is a major priority, especially in the absence of an effective vaccine or treatment. The use of respiratory personal protective equipment (PPE) may decrease the risk for respiratory infection, although controversy exists around the appropriate types of masks and the situations in which they should be used in community and health care settings for the prevention of SARS-CoV-2 infection. The following practice points (Table 1) are intended for clinicians, patients, and the public. Data on SARS-CoV-2 are limited. These practice points are based on the best available evidence on the effectiveness of N95 respirators, surgical masks, and cloth masks in reducing transmission of in-

fection with SARS-CoV-1, Middle East respiratory syndrome coronavirus (MERS-CoV), and influenza-like or other respiratory viruses in community and health care settings. Evidence about reuse or extended use of N95 respirators in health care settings was also considered.

The American College of Physicians (ACP) based these practice points on a rapid, living systematic evidence review funded by the Agency for Healthcare Research and Quality (1, 2). See the Appendix (available at [Annals.org](https://www.annals.org)) for methods used to develop the practice points. This version of the practice points, based on an evidence review completed on 14 April 2020 with surveillance through 2 June 2020, was approved by the ACP's Executive Committee of Board of Regents on behalf of the Board of Regents on 18 May 2020, and submitted to *Annals of Internal Medicine* on 13 May 2020. Ongoing surveillance of the literature is planned for 1 year from the initial search date, and the living practice points will be updated alongside the evidence review.

RATIONALE

What is the effectiveness of N95 respirators, surgical masks, and cloth masks for the prevention of COVID-19 in addition to standard precautions (gloves + handwashing) in community settings?

The goal of using N95 respirators, surgical masks, or cloth masks is to prevent transmission of SARS-CoV-2 infection from asymptomatic or symptomatic infected persons to uninfected persons (source control). Currently, no direct evidence exists for the effectiveness or comparative effectiveness of various types of respirators or masks for preventing SARS-CoV-2 infection in community settings. Low-certainty evidence showed that mask use may reduce the risk for SARS-CoV-1 infection compared with no mask use in the community, but a major limitation of the studies is that they did not specify mask type. Low-certainty indirect evidence also found that

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Update Alerts: The authors have specified in the Background section and the Appendix (available at [Annals.org](https://www.annals.org)) the interval and stop date for updates to this Practice Points article. As *Annals* receives updates, they will appear in the Comments section of the article on [Annals.org](https://www.annals.org). Reader inquiries about updates that are not available at approximately the specified intervals should be submitted as Comments to the article.

 **Table 1. Practice Points**

Regardless of the use of respiratory PPE, other procedures to reduce the transmission of SARS-CoV-2 infection should be followed, including maintaining physical distance, self-isolation, quarantine, frequent hand hygiene (using soap and water or alcohol-based hand rub), covering coughs and sneezes by using a bent elbow or paper tissue, refraining from touching the face, and frequent disinfection of frequently touched surfaces (3, 4). Table 2 presents clinical considerations, Table 3 summarizes information on the appropriate use and disposal of respiratory PPE, and Table 4 and the Figure summarize the current evidence.

Use of N95 Respirators, Surgical Masks, and Cloth Masks in Community Settings

- ACP discourages the use of N95 respirators by asymptomatic or symptomatic persons in community settings to reduce the risk for SARS-CoV-2 infection in the absence of any demonstrated benefit.
- The decision to use surgical masks or cloth masks to reduce the risk for transmission of SARS-CoV-2 infection among asymptomatic or symptomatic persons in community settings should follow community and statewide public health guidelines for mask use, which should take into account such factors as epidemiologic data (e.g., reproduction rate, daily case counts, hospitalizations, deaths) and local demographics (e.g., high-risk populations).
- Potential harms associated with mask use include self-contamination, breathing difficulties, and a false sense of security that could potentially detract from taking other precautions, such as physical distancing.

Use of N95 Respirators, Surgical Masks, and Cloth Masks in Health Care Settings

- All health care personnel in close contact* with patients suspected or known to have COVID-19 should use N95 respirators in health care settings to reduce the risk for acquiring SARS-CoV-2 infection.
- All patients with suspected or known COVID-19 should wear surgical masks in health care settings.
- All health care personnel, patients, and visitors who are not in close contact with patients with suspected or known COVID-19 should use surgical masks in a health care setting to reduce the risk for transmission of SARS-CoV-2 infection.
- Health care personnel should not use cloth masks in health care settings to reduce the risk for transmission of SARS-CoV-2 infection. Cloth masks are not considered PPE in health care settings, given the lack of evidence of their effectiveness against transmission of SARS-CoV-2 virus.

Reuse or Extended Use of N95 Respirators in Health Care Settings

No evidence is available on the effectiveness of reuse or extended use of N95 respirators in health care settings.

COVID-19 = coronavirus disease 2019; PPE = personal protective equipment; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2.

* Close contact refers to being within 6 feet of a patient with COVID-19 or having direct contact with infectious secretions of a patient with COVID-19 (5).

N95 respirators may not reduce the risk for noncoronavirus respiratory infections compared with surgical masks or no masks, and moderate-certainty indirect evidence showed that surgical masks probably do not reduce the risk compared with no masks. For surgical masks, there was moderate-certainty evidence of nonserious harms, such as discomfort and difficulty in breathing, compared with no mask use, and low-certainty evidence showed that N95 respirators may not increase discomfort compared with surgical masks. The review identified no eligible studies on the use of cloth masks in community settings.

N95 respirators should not be used in a community setting, given the absence of demonstrated benefit, the possible harm with improper use (that is, the requirement for fit testing), and the global shortage of N95 respirators. Unlike N95 respirators, surgical masks and cloth masks do not require special fitting, making their use more practical if individual fitting is infeasible. Persons should seek guidance from the local community and statewide public health guidelines for mask use in light of the absence of evidence in the community setting to reduce the risk for transmission of SARS-CoV-2 infection. Factors to consider include exposure context (number of people, whether indoors or outdoors, ventilation), epidemiologic data (such as reproduction rate, daily case counts, hospitalizations, and deaths), and local demographics (such as high-risk populations). Individual values and preferences should be taken into account when deciding on the type of mask to use (surgical or cloth mask), because the benefits and harms for surgical versus cloth masks are finely balanced. The use of cloth masks in community settings

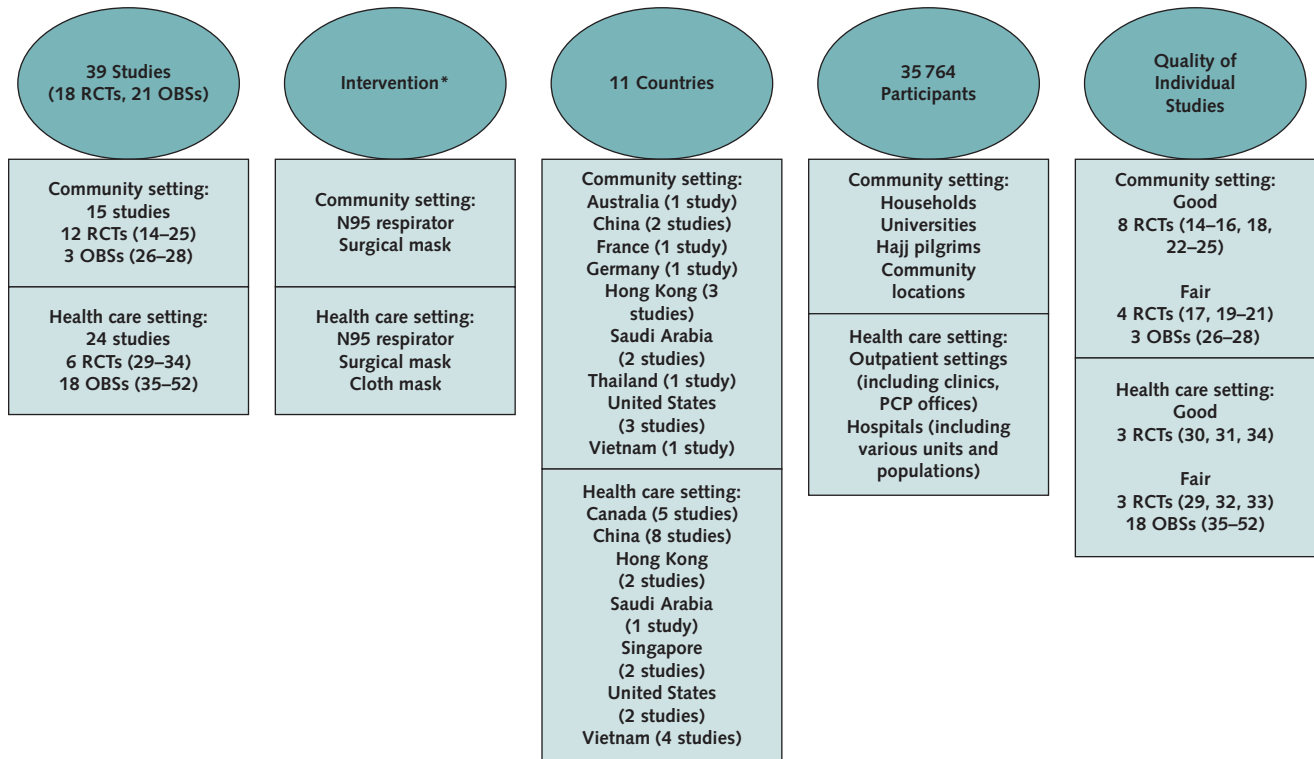
has been encouraged by the Centers for Disease Control and Prevention (CDC) (4). The World Health Organization (WHO) recommends a risk-based approach for decision makers when recommending use of nonmedical masks, such as cloth masks, in the community setting (6). The WHO notes potential risks associated with mask use, including self-contamination (via improper handling of masks), breathing difficulties, and a false sense of security that could potentially detract from taking other precautions, such as physical distancing (6). Regardless of mask type, clinicians and public health officials should educate the general public about appropriate mask use (Table 3).

Persons at highest risk for SARS-CoV-2 infection are those who are in close contact with persons who have COVID-19 (7, 8). When in close contact with others, persons experiencing symptoms and those in contact with them should wear a surgical mask or cloth mask. A person who interacts with many people (such as flight attendants, restaurant servers, grocery store workers, cab drivers, and others) may benefit from wearing a surgical or cloth mask. The use of masks is not necessary when at home, unless a household member has COVID-19.

What is the effectiveness of N95 respirators, surgical masks, and cloth masks for the prevention of COVID-19 in addition to standard precautions (gowns + gloves + handwashing) in health care settings?

The goal of using respiratory PPE is to reduce exposure and prevent SARS-CoV-2 transmission between health care personnel and patients. Currently, direct evidence on the effectiveness or comparative effectiveness of N95 respirators and surgical masks for prevent-

Figure. Evidence description.



Evidence search and assessment conducted by the Pacific Northwest Evidence-based Practice Center and funded by the Agency for Healthcare Research and Quality (2). Current search for evidence, completed on 14 April 2020 and updated through 2 June 2020, aimed to identify RCTs and OBSs on the use of N95 respirators, surgical masks, and cloth masks to prevent SARS-CoV-2 infection and coronaviruses (SARS-CoV-1, MERS-CoV) infections and RCTs of N95 respirators, surgical masks, and cloth masks to prevent influenza-like (influenza or other respiratory viruses) infections, as well as all studies on the reuse/extended use of N95 respirators. MERS-CoV = Middle East respiratory syndrome coronavirus; OBS = observational study; PCP = primary care physician; PPE = personal protective equipment; RCT = randomized controlled trial; SARS-CoV-2 = severe acute respiratory syndrome 2.

* Different types of respiratory PPE intervention were generally used in addition to additional PPE required for droplet precautions (e.g., gowns, gloves) and hand hygiene in health care settings.

ing SARS-CoV-2 infection in health care settings is insufficient. Given the limited direct evidence, our practice points are based on indirect evidence from studies of SARS-CoV-1, MERS-CoV, influenza or influenza-like infections, and other respiratory infections.

Low-certainty evidence showed that mask use and consistent mask use may reduce the risk for SARS-

Table 2. Clinical Considerations

- SARS-CoV-2 is thought to be transmitted between people through close contact, as droplet transmission.
- SARS-CoV-2 may be transmitted during aerosolized procedures performed in health care settings because there is a higher risk for infection.
- In the evidence reviewed, N95 respirators, surgical masks, and cloth masks were generally used in addition to other PPE required for droplet precautions (e.g., gowns, gloves) and hand hygiene in health care settings.
- In the evidence reviewed, the comparative effectiveness of cloth masks was determined for cloth masks of ≥12 layers, thus concern exists about the applicability of this evidence to commonly used cloth masks.
- In the evidence reviewed, adherence to the use of masks was identified as a possible explanation for the difference or no difference shown in the results.

PPE = personal protective equipment; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2.

Table 3. Appropriate Use and Disposal of N95 Respirators, Surgical Masks, and Cloth Masks

Appropriate use and disposal of all types of respirators and masks in community and health care settings are crucial to reduce the transmission of SARS-CoV-2 infection. The CDC and WHO recommend the following (6, 12, 13):

- Persons should clean their hands with soap and water or alcohol-based rub before putting on a mask.
- Masks should be properly fitted and should cover the mouth and nose, with no gaps between face and mask.
- All masks should be extended under the chin. Persons should avoid touching the mask and their face, and should especially avoid touching their face when wearing the mask, as well as putting it on and taking it off.
- When taking a mask off, it should be removed from behind without ever touching the front of the respirator/mask.
- Once the mask is removed, hands again should be cleaned with soap and water or alcohol-based rub.
- If using an N95 respirator with a nosepiece, it should be fitted to the nose with both hands, not bent or tented. The straps for an N95 respirator, or ties for a surgical mask, should be placed on the crown of the head (top tie) and base of the neck (bottom tie); for other masks, the loops should be hooked appropriately behind the ears.
- When a cloth mask is used, the following features should be considered: the number of layers of fabric, the breathability of the material used, water repellence/hydrophobic qualities, the shape of the mask, and the fit of the mask.






CDC = Centers for Disease Control and Prevention; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2; WHO = World Health Organization.

Table 4. Evidence Summary: What Information Does the Evidence Provide?

N95 Respirators vs. Surgical Masks vs. Cloth Masks in Community Settings			
Evidence for Potential Benefits*			
Outcome/Comparison	Study Design (Patients, n)	Evidence†	Certainty of Evidence‡
Risk for SARS-CoV-2 infection			
No studies			
Risk for coronavirus infections (SARS-CoV-1, SARS-1, MERS-CoV)			
Masks (type not specified) vs. no masks	3 OBSs (2857)	Mask use may reduce the risk for SARS-1 infection compared with not using masks (26-28).	Low
Risk for noncoronavirus respiratory infections (influenza-like or other viral respiratory)			
N95 respirators or equivalent vs. surgical masks	1 RCT (290)	N95 respirators may not reduce the risk for influenza-like illness and laboratory confirmed viral respiratory illness compared with surgical masks (22).	Low
N95 respirators or equivalent vs. no masks	1 RCT (290)	N95 respirators may not reduce the risk for laboratory confirmed viral respiratory illness compared with no mask use (22).	Low
Surgical masks vs. no masks	12 RCTs (16 761)	Surgical masks probably do not reduce the risk for clinical respiratory illness (16, 21, 23), influenza-like illness (14, 15, 17-25), laboratory-confirmed viral illness (16, 17, 22, 23), and laboratory-confirmed influenza infection (14, 15, 19-21, 24, 25) compared with no mask use.	Moderate
Evidence for Potential Harms*			
Outcome/Comparison	Study Design (Patients, n)	Evidence†	Certainty of Evidence‡
N95 respirators or equivalent vs. surgical masks	1 RCT (290)	N95 respirators or equivalent may not increase the discomfort compared with surgical mask use (22).	Low
Surgical masks vs. no masks	3 RCTs (8363)	No adverse events reported with surgical masks (20). Surgical masks probably increase discomfort (16, 18), breathing difficulty (16), and feeling hot (16) compared with no mask use.	Moderate
N95 Respirators vs. Surgical Masks vs. Cloth Masks in Health Care Settings			
Evidence for Potential Benefits*			
Outcome/Comparison	Study Design (Patients, n)	Evidence†	Certainty of Evidence‡
Risk for SARS-CoV-2 infection			
N95 respirators vs. no masks	1 OBS (493)	The evidence is very uncertain about the effectiveness of N95 respirators on the risk for SARS-CoV-2 infection (50).	Insufficient
Consistent mask use (non-N95) vs. inconsistent mask use (non-N95)	1 OBS (37)	The evidence is very uncertain about the effectiveness of consistent non-N95 respirator use on the risk for SARS-CoV-2 infection compared with inconsistent use (39).	Insufficient
Risk for coronavirus infections (SARS-CoV-1, MERS-CoV)			
N95 respirators or equivalent masks vs. surgical masks	5 OBSs (1208)	N95 respirators may reduce the risk for SARS-CoV-1 infection compared with surgical masks (36, 37, 41, 42, 47).	Low
N95 respirators or surgical masks vs. cloth masks	3 OBSs (1207)	The evidence is very uncertain about the effectiveness of N95 respirators or surgical masks compared with cloth masks (≤12 layers, 12-16 layers, ≥16 layers) on the risk for SARS-CoV-1 infection (41, 43, 52).	Insufficient
N95 respirators or surgical masks vs. no masks	1 OBS (31)	The evidence is very uncertain about the effectiveness of N5 respirators or surgical masks compared with no masks (36).	Insufficient
N95 respirators vs. no masks	4 OBSs (1441)	N95 respirators may reduce the risk for SARS-CoV-1 infection compared with no masks (41, 47-49).	Low
Surgical masks vs. no masks	6 OBSs (1782)	The evidence is very uncertain about the effectiveness of surgical mask use on the risk for SARS-CoV-1 infection (41, 42, 44, 47, 48, 52).	Insufficient

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Table 4—Continued

N95 Respirators vs. Surgical Masks vs. Cloth Masks in Health Care Settings			
 Evidence for Potential Benefits*			
Outcome/Comparison	Study Design (Patients, n)	Evidence†	Certainty of Evidence‡
Cloth masks vs. no masks	3 OBSs (1177)	The evidence is very uncertain about the effectiveness of cloth masks (defined as cotton mask, double 12-layer cotton [surgical] mask, or ≥12-layer mask) compared with no masks on the risk for SARS-CoV-1 infection (41, 46, 52).	Insufficient
Masks (type not specified) vs. no masks	5 OBSs (1167)	Mask use may reduce the risk for SARS-CoV-1 infection compared with no masks (43, 45, 48, 51, 52).	Low
Consistent mask use (type not specified) vs. inconsistent use	4 OBSs (626)	More consistent mask use may reduce the risk for SARS-CoV-1 and MERS-CoV infection compared with nonconsistent mask use (35, 40, 42, 45).	Low
Risk for noncoronavirus respiratory infections (influenza-like or other viral respiratory)			
N95 respirators vs. surgical masks in higher-risk settings	3 RCTs (3532)	N95 respirators probably do not reduce the risk for clinical respiratory illness, influenza-like illness, and laboratory-confirmed viral infections compared with surgical masks in high-risk settings (31–33).	Moderate
N95 respirators vs. surgical masks in lower-risk settings	1 RCT (2862)	N95 respirators probably do not reduce the risk for clinical respiratory illness, influenza-like illness, laboratory-confirmed viral respiratory illness, and laboratory-confirmed influenza compared with surgical masks in low-risk settings (34).	Moderate
Surgical masks vs. cloth masks in higher-risk settings	1 RCT (1868)	Surgical masks may reduce the risk for clinical respiratory illness, laboratory-confirmed viral infections, and influenza-like illness compared with cloth masks in high-risk settings (30).	Low
 Evidence for Potential Harms*			
Outcome/Comparison	Study Design (Patients, n)	Evidence†	Certainty of Evidence‡
N95 respirators or equivalent mask vs. surgical masks	4 RCTs (6394)	No (serious) adverse events reported with N95 or equivalent respirators in RCTs (31, 34). N95 respirators may increase discomfort, breathing difficulty, and headache compared with surgical masks (32, 33).	Low
Surgical masks vs. cloth masks	1 RCT (1868)	Use of surgical masks probably does not increase adverse events (e.g., discomfort, breathing problems, headache) compared with cloth masks (30).	Moderate
Evidence on Reuse or Extended Use of N95 Respirators			
 Evidence for Potential Benefits*			
No studies			
 Evidence for Potential Harms*			
No studies			
 Evidence Gaps			
<ul style="list-style-type: none"> • Comparative efficacy and safety of different types of respiratory PPE for preventing SARS-CoV-2 infection in community settings [no evidence]. • Comparative efficacy and safety of different types of respiratory PPE for preventing SARS-CoV-2 infection in health care settings [insufficient evidence]. • Efficacy and safety of the reuse or extended use of N95 respirators [no evidence]. • Safety of all types of respiratory PPE [insufficient evidence]. • An urgent need exists for high-quality trials and observational studies to better understand the benefits and harms of using various types of respiratory PPE and cloth masks, and of mask characteristics (e.g., use of filters, types of filters), in community settings. 			

CoV = coronavirus; MERS = Middle East respiratory syndrome; OBS = observational study; PPE = personal protective equipment; RCT = randomized controlled trial; SARS = severe acute respiratory syndrome.

* N95: close facial fit, blocking 95% of 0.3- μ m particles. Surgical/medical masks are loose fitting, blocking larger particles and splashes or spatter. Cloth masks are nonmedical, unstandardized face coverings and vary depending on type of cloth, number of layers, and tightness of fit.

† Evidence search and assessment conducted by the Pacific Northwest Evidence-based Practice Center and funded by the Agency for Healthcare Research and Quality (1). See the **Supplement** (available at [Annals.org](https://annals.org)) for data estimates.

‡ Certainty: *insufficient*—confidence is inadequate to accurately assess the net benefit (benefit minus harm) of an intervention or its impact on a health outcome; *low*—confidence in the effect is limited because the true effect may be substantially different from the estimated effect; *moderate*—confidence in the effect is moderate because the true effect is likely close to the estimated effect, but there is a sizable possibility that it is substantially different; *high*—confidence that the true effect is close to the estimated effect (53).

CoV-1 infection compared with no mask use and inconsistent mask use in health care settings, but studies did not specify mask type. Low-certainty indirect evidence showed that N95 respirators may reduce the risk for SARS-CoV-1 infection compared with surgical masks or no masks. Indirect evidence from studies reporting on the risk for noncoronavirus respiratory infections showed that N95 respirators probably do not reduce the risk for noncoronavirus respiratory infections compared with surgical masks (moderate certainty) and that surgical masks may reduce the risk for clinical respiratory illness, laboratory-confirmed viral infections, and influenza-like illness compared with cloth masks (low certainty). Indirect evidence was insufficient about the effect of N95 respirators or surgical masks compared with cloth masks, and surgical masks and cloth masks compared with no masks, on the risk for SARS-CoV-1 infection. Low-certainty evidence showed that N95 respirators may increase some nonserious harms, such as discomfort, breathing difficulties, and headache, compared with surgical masks and moderate-certainty indirect evidence that those harms probably do not increase with the use of surgical masks compared with cloth masks.

Uncertainty about airborne transmission of SARS-CoV-2 continues (9). Health care workers are at an increased risk for infection, because they are more likely to be in close contact with patients who are confirmed or suspected to have COVID-19. The CDC does not consider cloth masks as PPE in health care settings, given the lack of evidence of their effectiveness against transmission of SARS-CoV-2 (10).

Health care personnel should not be exposed to patients suspected or known to have COVID-19 without proper PPE. It is essential to strictly follow all other infection prevention and control measures (such as hand hygiene, physical distancing, and others) along with appropriate use of other PPE (such as gowns, gloves, and goggles) in health care settings.

What is the effectiveness for reuse or extended use of N95 respirators for prevention of COVID-19?

Extended use is defined as wearing the same N95 respirator without removal between patient encounters (5). Reuse is defined as using the same N95 respirator for several encounters with patients but removing it after each encounter (5). Currently, no evidence is available about the effectiveness of extended use or reuse of N95 respirators in health care settings. However, on the basis of an assessment of nonclinical outcomes (such as measures of filtration, contamination, and mask failure), a previous review comparing extended use and reuse of N95 respirators concluded that extended use of N95 respirators is preferable to reuse of N95 respirators because it involves less touching of the respirator, thus less risk for contact transmission (11).

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Note: The Practice Points are developed by the Scientific Medical Policy Committee of the American College of Physicians. The Practice Points are “guides” only and may not apply to all patients and all clinical situations. All Practice Points are considered automatically withdrawn or invalid 5 years after publication, or once an update has been issued.

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APPENDIX: PRACTICE POINTS DEVELOPMENT PROCESS

The Scientific Medical Policy Committee (SMPC), in collaboration with staff from ACP's Department of Clinical Policy, developed these practice points on the basis of a rapid systematic evidence review conducted by the Pacific Northwest Evidence-based Practice Center and funded by the Agency for Healthcare Research and Quality (1, 2). The SMPC comprises 11 internal medicine physicians representing various clinical areas of expertise and 1 public (nonclinician) member, and includes members with expertise in epidemiology, healthy policy, and evidence synthesis. In addition to contributing clinical, scientific, and methodological expertise, Clinical Policy staff provided administrative support and liaised between the SMPC, evidence review funding entity and evidence team, and journal. Clinical Policy staff and the SMPC reviewed and prioritized potential topic suggestions from ACP members, SMPC members, and ACP governance. A committee subgroup, including the chair of the SMPC, worked with staff to draft the key questions and lead the development of the practice points. Clinical Policy staff worked with the subgroup and an independent evidence review team to refine the key questions and determine appropriate evidence synthesis methods for each key question. Via conference calls and e-mail, Clinical Policy staff worked with the committee subgroup to draft the practice points on the basis of the results of the rapid systematic evidence review. The full SMPC reviewed and approved the final practice points. Before journal submission, ACP's Executive Committee of the Board of Regents also reviewed and approved the practice points on behalf of the ACP Board of Regents. The evidence review will be continually updated by the evidence review team. American College of Physicians will update the practice points on the basis of the evidence review by using the same process as the Version 1 (described above).