

1 **2024 Guideline to Prevent Transmission of Pathogens in Healthcare Settings**

2 **Section A: Overview of Transmission of Pathogens in Healthcare Settings**

3 **Overview**

4 Section A updates the conceptual framework for pathogen transmission, providing the rationale for
5 recommended infection prevention and control interventions. This framework focuses on elements of
6 transmission that are relevant in healthcare settings.

7 This guideline replaces the corresponding content in the "[2007 Guideline for Isolation Precautions: Preventing](#)
8 [Transmission of Infectious Agents in Healthcare Settings](#)," hereafter referred to as the '2007 Guideline.'¹

9 Elements of the 2007 Guideline that are not directly affected by this update, including the 2007 Guideline's
10 Appendix A (hereafter referred to as "[Appendix A \[2007\]](#)"), will remain active until updated specifically.²

11 Pathogen-specific guidance that is currently in [Appendix A \(2007\)](#) will be updated over time and added as Part 2
12 of this guidance in the future.

13 **Background**

14 **Factors Affecting Transmissibility**

15 Transmission occurs when an at-risk person acquires a pathogen from an infectious person. Transmission is
16 determined by pathogen, environmental, and person factors at the time of event. While pathogen factors are
17 often biologically intrinsic (e.g., the ability of a pathogen to remain viable during transit), environmental and
18 person-specific factors may vary by location and over time. Environmental variables include air (e.g.,
19 temperature, humidity, ventilation) and surface (e.g., material, porosity) conditions. Factors that vary among
20 infectious persons include pathogen load and shedding rate. Factors that vary among at-risk persons include
21 host defense mechanisms that are non-immune-based (e.g., intact skin) and immune-based (e.g., pathogen-
22 specific immunity from prior infection or vaccination).

23 **Significance of Transmission**

24 Transmission can result in colonization or infection. Based on the health impact that a pathogen is expected to
25 have on an individual or the community, some pathogens are recognized as requiring intensive efforts to
26 prevent transmission, while others may not rise to that level. Less intensive effort might be indicated when
27 outcomes are not usually severe, the population has a high degree of immunity, and effective therapeutics and
28 vaccines are available. The boundaries describing those categories require risk assessment and can vary by
29 setting and population at risk.

30 **Transmission Pathways**

31 In the healthcare setting, pathogen transmission pathways can be grouped into two broad categories:
32 pathogens that spread via the air, and pathogens that spread via touch. Pathogens generally spread via a major
33 pathway, though multiple pathways might contribute to spread. Pathogen transmission epidemiology is
34 informed by observing patterns of infection spread.

35 **Transmission via air**

36 Pathogens can transmit via air over short distances through direct splash or spray of the pathogen onto a part of
37 the body (e.g., spray from a sneeze landing on a person's eyes or mouth) or variably across ranges of distance

38 and time via suspended infectious particles. Pathogens suspended in the air cause infection via inhalation and
39 deposition along the respiratory tract, anywhere from the nasal or oral passages to the lungs.

40 Historically, the infection prevention community has categorized transmission of respiratory pathogens as
41 'droplet' or 'airborne.' While these epidemiologic terms reflect observed patterns of short versus long distance
42 transmission respectively, the terms do not explicitly describe the continuum of respiratory pathogen
43 transmission through in the air.

44 Pathogens that spread via the air preferentially transmit over short distances, due to greater concentrations of
45 infectious particles in the air near an infectious person. However, each pathogen has a signature pattern of
46 observed transmission that extends variably across short-to-long distances and over time, reflecting unique
47 characteristics such as pathogen viability while suspended in the air and the required dose for causing an
48 infection in a susceptible person. Pathogens that remain infectious for a long time while suspended in the air
49 (e.g., *M. tuberculosis*, measles virus, and varicella virus) are capable of causing infections over long distances,
50 such as across a large part of a building or healthcare facility.

51 **Transmission via touch**

52 Transmission via touch occurs through physical contact with the pathogen. Transmission in healthcare settings
53 can occur via contact with intact skin, non-intact skin (including percutaneous routes such as needlestick injury),
54 or mucous membranes of the face and gastrointestinal tract.

55 Intact skin is inherently protective and resists infection by most pathogens. Some pathogens encountered in
56 healthcare settings can infect intact skin, including exoparasites, herpesviruses, and poxviruses. Potentially
57 pathogenic bacteria and fungi can cause short- or long-term colonization of intact skin, which can be a reservoir
58 for infection of the colonized person or for transmission to other individuals.

59 Percutaneous exposures, through non-intact skin or via skin trauma (e.g., by a needlestick), can deliver potential
60 pathogens to susceptible tissues normally protected by skin. Pathogens that are present in the blood and body
61 fluids of infected individuals (e.g., hepatitis B and C viruses, HIV, Ebola virus) can be transmitted by
62 percutaneous delivery of those fluids.

63 Pathogens that spread by contact with mucous membranes include organisms that target the gastrointestinal
64 tract and those that can infect any mucosal surface. Bloodborne pathogens that transmit percutaneously can
65 also transmit via mucous membrane contact.

66 Transmission by touch can involve intermediary reservoirs such as people, surfaces, or equipment that facilitate
67 spread. Potential reservoirs include healthcare personnel (e.g., transient hand carriage with pathogenic
68 bacteria), shared medical equipment (e.g., stethoscopes, blood pressure cuffs), environmental surfaces (e.g.,
69 bedrails and sink counter tops), and water systems (e.g., water supply or wastewater drainage).

70 **Approach to Transmission-Based Precaution Recommendations**

71 Recommendations for Transmission-Based Precautions are based on evaluation of clinical epidemiologic studies
72 in healthcare settings. Evidence reviews in this guideline focus on clinical studies with infection outcomes
73 because such studies compare prevention strategies in the context of feasibility, user adherence, and
74 implementation within a hierarchy of controls (e.g., engineering, administrative, and personal protective
75 equipment controls) available in the healthcare setting to reduce risk of infection. The methodology and
76 evidence reviews informing recommendations in this guideline are available in this guideline's Appendix.

77 Recommendations in this guideline largely address infection prevention strategies available to frontline
78 healthcare personnel (HCP) at the point of care.
79

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80 **Section B: Fundamental Elements Needed to Prevent Transmission of Pathogens in Healthcare** 81 **Settings**

82 **Overview**

83 Section B describes the fundamental elements of infection prevention available to frontline healthcare
84 personnel (HCP) in healthcare settings, with a focus on personal protective equipment (PPE). Other important
85 elements such as hand hygiene and environmental controls are highlighted, with details referred to other
86 existing guidelines.

87 The use of PPE falls within a [hierarchy of controls](#) designed to reduce risk of illness or injury for both infectious
88 and non-infectious exposures in the workplace.³ In healthcare, multiple controls are used to lower the risk of
89 transmission of pathogens that may result in infection. The hierarchy of controls, in preferred order of action
90 based on general effectiveness, has five components:

- 91 • **Elimination** (remove or prevent entry of the pathogen into a facility, e.g., using virtual instead of in-
92 person visits to manage some potentially infectious patients)
- 93 • **Substitution** (although generally not applied to infectious pathogens, refers to substituting a more
94 hazardous agent with a less hazardous form, e.g., substituting toxigenic *C. difficile* with non-toxigenic *C.*
95 *difficile*)
- 96 • **Engineering Controls** (isolate, capture, and reduce levels of pathogen in the environment, e.g.,
97 improving ventilation)
- 98 • **Administrative Controls** (work policies and procedures that prevent pathogen exposure and disease,
99 e.g., vaccination of HCP)
- 100 • **Personal Protective Equipment (PPE)** (PPE used to prevent pathogen exposure and spread)

101 PPE is last in the hierarchy because it relies on the user to determine appropriate use (e.g., time, situation) and
102 to use PPE correctly, depends on availability at the point of care, and depends on PPE to function properly.
103 Other components may be more reliable in reducing risk when applied and maintained at the facility level (e.g.,
104 ventilation).

105 **Hand Hygiene**

106 Hand hygiene is a foundational component of infection prevention and control. Routine use of alcohol-based
107 hand sanitizer — and handwashing with soap and water when hands are visibly soiled or when otherwise
108 indicated — prevents transmission of potential pathogens to patients, personnel, and environmental surfaces
109 from hands that are soiled or transiently colonized. Detailed recommendations for hand hygiene are addressed
110 in the [CDC Guideline for Hand Hygiene in Health-Care Settings](#).⁴

111 **Personal Protective Equipment (PPE) for Healthcare Personnel**

112 **General considerations**

113 Recommendations:

- 114 1. HCP must be trained and demonstrate competency in the selection, putting on, use, removal, and
115 disposal of PPE.^{5,6} (*Standard Practice*)
- 116 2. Employers in healthcare settings are required to provide readily available PPE to healthcare personnel
117 (HCP), ideally at or near likely points of use.^{5,6} (*Standard Practice*)

- 118 3. Sizing and models should be chosen to accommodate the needs of the local workforce.^{5,6} (*Standard*
119 *Practice*)

120 Narrative:

121 PPE refers to various barriers (e.g., gowns, gloves), masks, and respirators used alone or in combination to
122 interrupt transmission of pathogens by touch or air.

123 'Reuse' refers to the use of the same PPE item for multiple encounters with different patients, with removal of
124 the PPE item between encounters. PPE can consist of products that are labeled for single use or as reusable.
125 Single use PPE is not intended to be reused. Reusable items are reprocessed between uses according to
126 manufacturer's instructions for use.

127 'Extended use' refers to use of the same PPE item for encounters with different patients, without removing the
128 PPE item between patient encounters. Extended use is not considered standard practice and should be avoided
129 unless otherwise specified in recommendations (e.g., extended use of masks for source control).

130 Sterile gloves, gowns and other PPE used for surgery and aseptic procedures are addressed in the [CDC Surgical](#)
131 [Site Infection guidelines](#).⁷

132 The [CDC PPE sequence document](#) demonstrates one approach to appropriate technique for putting on and
133 removing each type of PPE.⁸

134 **Gloves**

135 Recommendations:

136 *Indications*

- 137 1. Non-sterile gloves are indicated in any of the following situations: (1) any anticipated contact with body
138 fluids or infectious material, (2) touching mucous membranes or non-intact skin, (3) handling soiled
139 items such as used wound dressings, and (4) as indicated by Transmission-Based Precautions.⁵ Activities
140 that do not meet these criteria do not require gloves. (*Standard Practice*)

141 *Use*

- 142 2. HCP should perform hand hygiene prior to reaching into a box of non-sterile exam gloves and putting on
143 gloves, to reduce the risk of contaminating both the remaining gloves in the box and the gloves being
144 put on.⁹⁻¹¹ (*Expert Opinion*)
- 145 3. During care of a single patient, gloves should be changed after a task or procedure if contact occurs with
146 potentially infectious material (e.g., if moving from a dirty task to a clean task).⁵ (*Standard Practice*)
- 147 4. Remove gloves if torn or soiled, and before caring for another patient.⁵ (*Standard Practice*)
- 148 5. Hand hygiene should be performed immediately after removing gloves, because pathogens on used
149 gloves can contaminate hands during glove removal.⁵ (*Standard Practice*)
- 150 6. HCP should not practice extended glove use in place of hand hygiene.⁵ (*Standard Practice*)

151 *Selection*

- 152 7. Non-sterile gloves should be available in a range of sizes so that all users will be able to select a glove
153 that fits comfortably without excess material that could impair function.¹² (*Standard Practice*)

154

155 Narrative:

156 Non-sterile exam gloves are worn to provide a protective barrier between hands and soiled material or surfaces,
157 and to allow efficient removal of infectious material from hands by removing and discarding soiled gloves. Glove
158 use is not a substitute for hand hygiene. Non-latex gloves are available for personnel with latex allergies.

159 Medical gloves, including non-sterile examination gloves that are used as part of Standard and Transmission-
160 based Precautions, are regulated by the United States Food and Drug Administration (FDA) to ensure that
161 performance criteria, such as leak resistance, certain physical properties, and biocompatibility, are met.^{13,14} FDA-
162 approved medical gloves are also used by HCP for routine disinfection of surfaces or medical equipment
163 contaminated with blood or body fluids. Gloves that are used for routine janitorial functions in medical facilities
164 are not regulated by FDA and might have specific requirements for chemical compatibility, thickness, and
165 durability beyond that of medical gloves.

166 **Gowns**

167 Recommendations:

168 *Indications*

169 1. Non-sterile gowns are indicated in any of the following situations: (1) when an activity is anticipated to
170 contaminate HCP clothing through direct touch or splash, and (2) as indicated by Transmission-Based
171 Precautions.⁵ (*Standard Practice*)

172 *Use*

173 2. Gowns should be worn to cover the individual's clothing with all fasteners secured. (*Standard Practice*)

174 Narrative:

175 Gowns used in healthcare are intended to protect HCP and patients from transfer of infectious material.
176 Infectious material can transfer from one patient or environment to another on the clothing of HCP.¹⁵⁻¹⁷ Gowns
177 also provide an easily removable layer in the event of recognized soiling (e.g., splash or spray) that would
178 otherwise require the HCP to change clothes. Gowns can be single use or reusable; reusable gowns are
179 reprocessed between uses.

180 The National Institute for Occupational Safety and Health (NIOSH) provides a detailed discussion of factors for
181 consideration when choosing gowns in [Considerations for Selecting Protective Clothing used in Healthcare for
182 Protection against Microorganisms in Blood and Body Fluids](#).¹⁸ Some factors that influence these decisions
183 include intended use, fabric strength, liquid barrier resistance, and the extent of coverage. In addition, the ease
184 of putting on and taking off gowns is an important consideration in product selection, to decrease the risk of
185 self-contamination while removing.

186 **Masks**

187 Recommendations:

188 *Indications*

189 1. Masks are indicated in any of the following situations: (1) when an activity is anticipated to create
190 splashes or spray to the face, (2) as source control, and (3) as indicated by Transmission-Based
191 Precautions.⁵ (*Standard Practice*)

192 *Use*

- 193 2. Masks should not be reused⁵ as they can serve as a reservoir of infectious material if they become soiled
194 during use.¹⁹⁻²³ (*Standard Practice*)
- 195 3. Masks should be changed when soiled, damaged, or harder to breathe through (*Standard Practice*)
- 196 4. Extended use is not practiced with masks except when used for source control, and then disposed of
197 when removed or after use when caring for a patient on Transmission-Based Precautions.^{24,25} (*Standard*
198 *Practice*)

199 *Selection*

- 200 5. A fluid resistant mask should be used in situations when splashes and sprays are anticipated.¹²
201 (*Standard Practice*)

202 *Narrative:*

203 Masks are devices worn over the nose and mouth that perform three primary functions: (1) block direct splashes
204 to the mucous membranes of the nose and mouth, (2) contain exhaled respiratory secretions (source control),
205 and (3) provide filtration of inhaled air. Masks include surgical masks, face masks (sometimes referred to as
206 procedure masks), and [enhanced barrier face coverings](#).²⁶

207 Among mask types, efficacy can vary depending on fit. Well-fitting masks refer to masks that fit closely against
208 the face with minimal gaps, especially along the edges of the mask. A loose-fitting mask may block splashes from
209 reaching the nose or mouth, but may not fully contain secretions of the wearer or efficiently filter inhaled air.
210 Well-fitting masks may include: any mask approved for use in healthcare that fits well without adjustment;
211 masks with adjustments or modifications, such as knotted ear loops or mask fitters^{27,28}; and enhanced barrier
212 face coverings.²⁶

213 **Respirators**214 *Recommendations:*215 *Indications*

- 216 1. Respirators are used as indicated by Transmission-Based Precautions. (*Standard Practice*)

217 *Use*

- 218 2. A seal check should be performed each time an HCP puts on a fit-tested respirator to ensure that the
219 respirator is properly seated on the face.²⁹ (*Standard Practice*)
- 220 3. Single use disposable respirators should not be reused⁵ as they can serve as reservoir of infectious
221 material if they become soiled during use. (*Standard Practice*)
- 222 4. Reusable respirators must be cleaned, disinfected, and dried between uses according to the
223 manufacturer's instructions for use. (*Standard Practice*)
- 224 5. Optimally, extended use is not practiced with single use respirators except when used for source control
225 and then disposed of when removed or after use when caring for a patient on Transmission-Based
226 Precautions.²⁴ (*Standard Practice*)
- 227 6. Respirators should be changed when soiled, damaged, or harder to breathe through (*Standard Practice*)

228 *Selection*

- 229 7. A fluid resistant respirator should be used in situations when splashes and sprays are anticipated.¹²
 230 (Standard Practice)

231 Narrative:

232 Respirators are devices worn over the nose and mouth that provide filtration of inhaled air. Respirators work by
 233 passing air delivered to the wearer through a filter with defined filtration efficacy. Respirators may perform two
 234 additional functions similar to masks: (1) block direct splashes to the mucous membranes of the nose and mouth
 235 (if fluid-resistant), and (2) contain exhaled respiratory secretions (source control), if the respirator is the type
 236 that filters exhaled air. In most situations, respirators can be worn in place of a mask, whenever a mask is
 237 indicated (See **Masks Recommendations: Indications**).

238 Respirators may be either disposable or reusable. Disposable filtering facepieces, such as NIOSH-approved® N95
 239 respirators, are most common in healthcare settings. Reusable powered air purifying respirators (PAPRs) are
 240 often used when HCP cannot pass fit testing (e.g., due to the presence of facial hair). Reusable elastomeric
 241 respirators are used in some circumstances (e.g., during shortages of disposable respirators).

242 It is important to limit the amount of inhaled air that comes from leaks around the respirator, because leaked air
 243 is not filtered. Filtration efficacy for fit-tested respirators is expected to be greater than that for masks. Factors
 244 that influence the decision to use a respirator instead of a mask include pathogen-associated morbidity and
 245 mortality from infection, the level of aerosols of infectious particles anticipated to be present, lack of effective
 246 treatment or vaccine, transmissibility of the pathogen, and situations in which the major mode of transmission
 247 has yet to be determined.

248 A respirator's effectiveness is reduced if it is not worn correctly for the entire duration of exposure. Respirators
 249 that are uncomfortable or those that are expected to be used for extended periods of time may provide
 250 challenges with HCP tolerability and compliance.

251 Fit-testing requirements are specific to the model of respirator and can affect logistics and ability to use
 252 alternative models when supplies are limited. When respirators are required to be worn as PPE, they are used in
 253 the context of a Respiratory Protection Program that complies with the [standards](#) established by the
 254 Occupational Safety and Health Administration (OSHA) and include medical clearance, training, and fit testing.²⁹
 255 Additional implementation support may be found in the [Hospital Respiratory Protection Program toolkit](#).³⁰

256 **Eye/Face Protection**

257 Recommendations:

258 *Indications*

- 259 1. Eye/face protection is indicated in either of the following situations: (1) when an activity is anticipated
 260 to create splashes or spray of potentially infectious material to the face, and (2) as indicated by
 261 Transmission-Based Precautions.⁵ (Standard Practice)

262 *Use*

- 263 2. If reusable devices are used for eye and face protection, protocols must be in place for cleaning,
 264 disinfection, and drying between uses, per manufacturers' instructions for use. (Standard Practice)

265 *Selection*

- 266 3. The selection of eye and face protective equipment should consider the nature of the activity for which
267 it will be used.⁵ (*Standard Practice*)

268 Narrative:

269 Eye and face PPE are used singly or in combination with other PPE to protect the mucous membranes of the
270 eyes, nose and mouth from exposure to infectious material from patients or the environment. Splashes or
271 sprays to the face may occur during some medical procedures, as part of environmental cleaning activities such
272 as pouring out liquid waste, and during the care of patients who might not be able to effectively contain their
273 coughs using source control (e.g., children). Eye and face PPE may also be used to reduce the risk of inadvertent
274 self-inoculation (e.g., providing a barrier to prevent the wearer from rubbing their face with a soiled hand).

275 Available devices for eye and face protection include disposable face or eye shields, disposable fluid-resistant
276 masks with integral eye shields, reusable full-face shields, and reusable goggles combined with a fluid-resistant
277 mask or respirator that covers the nose and mouth. Certain combinations, such as goggles combined with a
278 fluid-resistant mask or respirator, or a reusable full-face shield, offer better protection when splashes from the
279 side are possible. General prescription eyeglasses do not provide full eye protection.

280 **Environmental Controls**

281 **Environmental Cleaning and Disinfection**

282 Environmental surfaces serve as reservoirs for some pathogens that transmit by touch. Routine and targeted
283 cleaning of environmental surfaces, as indicated by the level of patient or HCP contact and degree of soiling,
284 reduces the burden of environmental pathogens. EPA-registered disinfectants that have microbicidal activity
285 against likely pathogens on surfaces are used according to manufacturers' instructions. Refer to "[CDC Guidelines
286 for Environmental Infection Control in Health-Care Facilities](#)" and "[CDC Guideline for Disinfection and
287 Sterilization in Healthcare Facilities](#)" for details.^{31,32}

288 **Specialized Air Handling**

289 Airborne infection isolation rooms for containment of air in a designated space (AIIRs) are engineered to prevent
290 flow of air from the room to other parts of the facility (e.g., into the hallway) through use of both negative
291 pressure and 100% outside exhaust (or HEPA-filtered exhaust). In addition, these rooms often have a higher
292 number of air changes per hour compared to standard patient rooms, which may provide a higher level of
293 protection to others entering the room. Additional features of AIIRs are described in the [CDC Guidelines for
294 Environmental Infection Control in Healthcare Facilities](#). When such rooms are used for patients, the patient bed
295 is placed as near as possible to the air exhaust location (i.e., where the air leaves the room), and the functional
296 status of air handling for the room is monitored and verified.

297 Other environmental controls can be useful components of the layered approach to preventing transmission of
298 infection through air. Although full discussion would be out of scope for the current document, it is important to
299 recognize the importance of interventions such as [general ventilation](#) with sufficient delivery rates of clean air to
300 dilute pathogens in air, local exhaust ventilation to capture pathogens at their source, and removal of infective
301 pathogens from air such as by filtration through portable HEPA filters or by inactivation via ultraviolet germicidal
302 irradiation.³³ An advantage of these interventions is that they do not require individual compliance to be
303 effective.

304

305 **Section C: Precautions to Prevent Transmission of Pathogens in Healthcare Settings**

306 **Overview**

307 There are two tiers of precautions to prevent transmission of infectious agents, Standard Precautions and
308 Transmission-Based Precautions. Standard Precautions apply to the care of all patients in all healthcare settings,
309 regardless of the suspected or confirmed presence of an infectious pathogen. **Implementation of Standard
310 Precautions is the primary strategy to prevent transmission of pathogens in healthcare settings.**

311 Transmission-Based Precautions apply to the care of patients with known or suspected infectious pathogens,
312 which require additional control measures to effectively prevent transmission. Since a patient's infectious status
313 often is not known at the time of initial encounter with healthcare personnel (HCP), Transmission-Based
314 Precautions are used empirically, according to the clinical syndrome and the likely etiologic agents at the time,
315 and then modified as needed when the pathogen is identified or a transmissible infectious etiology is ruled out.

316 The specific elements of infection prevention, including personal protective equipment (PPE), are discussed in
317 Section B. Section C defines and updates the applications of Standard Precautions and Transmission-Based
318 Precautions. [Appendix A \(2007\)](#) outlines the application of Transmission-Based Precautions to specific
319 pathogens.

320 **Standard Precautions**

321 Recommendation:

- 322 1. Standard Precautions apply to the care of all patients, regardless of suspected or confirmed infection
323 status, in any setting in which healthcare is delivered, and at all times.⁵ (*Standard Practice*)

324 Narrative:

325 Standard Precautions are a group of infection prevention and control practices that are based on the principle
326 that all blood, body fluids, secretions, excretions (except sweat in most circumstances), nonintact skin, and
327 mucous membranes may contain transmissible infectious agents.

328 Components of Standard Precautions are defined in the [CDC's Core Infection Prevention and Control Practices
329 for Safe Healthcare Delivery in All Settings](#)⁵ and include:

- 330
- 331 • Hand hygiene
 - 332 • Environmental cleaning and disinfection
 - 333 • Injection and medication safety
 - 334 • Risk assessment with use of appropriate personal protective equipment (e.g., gloves, gowns, masks)
335 based on activities being performed
 - 336 • Minimizing Potential Exposures (e.g., having patients and visitors wear a mask when respiratory
337 symptoms are present)
 - 338 • Reprocessing of reusable medical equipment between each patient or when soiled

338 Standard Precautions have multi-directional benefits, protecting HCP and preventing HCP or the environment
339 from transmitting pathogens to patients. Standard Precautions apply to the care of patients at all times,
340 including when Transmission-Based Precautions are implemented or discontinued.

341 Performing a risk assessment is central to Standard Precautions; this includes assessment by HCP of their risk of
342 exposure to potentially infectious materials for each activity being performed. Based on that assessment, HCP

343 implement practices and use PPE to prevent possible exposure. For example, when planning to irrigate a wound
344 and perform a dressing change, HCP would anticipate the potential for splashes and sprays during irrigation and
345 the potential for contact with the wound or contaminated dressing materials. To prevent such exposures, they
346 would put on gloves, a gown, eye protection and a mask prior to performing the activity.

347 Performing a risk assessment can be challenging, and HCP might not anticipate all potential opportunities for
348 exposure. To reduce this risk, facilities might choose to systematically apply elements of Standard Precautions to
349 situations recognized as likely to present a risk of pathogen transmission. For example, because it can be difficult
350 to anticipate if a patient with a respiratory infection will cough or sneeze during an encounter, facilities may
351 choose to implement universal use of eye protection by HCP (in addition to the already indicated mask or
352 respirator) for the care of patients with respiratory virus infections.

353 **Transmission-Based Precautions**

354 Recommendation:

- 355 1. HCP should be trained on how and when to apply Transmission-Based Precautions, including how to put
356 on, correctly use, and remove PPE.⁵ (Standard Practice)

357 Narrative:

358 Transmission-Based Precautions are used when transmission is not completely interrupted using Standard
359 Precautions alone. For pathogens that have multiple routes of transmission (e.g., disseminated herpes zoster
360 virus infection), more than one Transmission-Based Precautions category will be used. Whether applied singly or
361 in combination, Transmission-Based Precautions are used in addition to Standard Precautions. See [Appendix A](#)
362 [\(2007\)](#) for recommended precautions for specific pathogens and infections.

363 When Transmission-Based Precautions are indicated, acceptance by patients and adherence by HCP may be
364 improved by addressing potential adverse effects on patients (e.g., anxiety, depression and other mood
365 disturbances, perceptions of stigma, and reduced contact with clinical staff).

366 **Syndromic and Empiric Applications of Transmission-Based Precautions**

367 Recommendation:

- 368 1. Use appropriate Transmission-Based Precautions at the time a patient develops symptoms or signs
369 consistent with a transmissible infection, to reduce transmission risk.⁵ (Standard Practice)

370 Narrative

371 While it is not possible to identify prospectively all patients needing Transmission-Based Precautions, certain
372 clinical syndromes and conditions carry a sufficiently high risk to warrant their use empirically while
373 confirmatory tests are pending (e.g., initiation of Contact Precautions for a patient with vomiting and diarrhea).
374 Once a diagnosis has been confirmed or ruled out, the need for Transmission-Based Precautions is reassessed.

375 **Use of Transmission-Based Precautions to Prevent Transmission by Touch**

376 Recommendations:

- 377 1. **Contact Precautions** (applies to all healthcare facilities):
 - 378 a. Patients are cared for in a dedicated space, preferably a single patient room.⁵ See Patient
379 Placement and Patient Transport sections below for more details. (Standard Practice)

- b. A gown and gloves are used for all interactions that may involve contact with the patient or the patient's environment. Gown and gloves should be put on upon entry into a patient's designated space (generally defined the patient's bedspace or room) and properly removed and disposed before exiting the designated space. (*Standard Practice*)
- c. Patient-care equipment (e.g., blood pressure cuffs, stethoscopes) is ideally dedicated to the patient and the patient's designated space. Disposable equipment may be used to minimize cross-transmission. If shared patient-care items are used, they should be cleaned and disinfected prior to use with other patients in accordance with the manufacturer's instructions for use.⁵ (*Standard Practice*)
- d. In general, clean, unopened patient care supplies should not be stored in the room but should be available near the room to allow easy access while ensuring that large amounts of supplies do not become contaminated. Any disposable supplies that are brought into the room should not be returned to the general supply; they may be sent home with the patient upon discharge if needed (e.g., for dressing changes) or discarded. For clinical areas where supplies are stored routinely within rooms (e.g., outpatient clinic rooms), supplies should be stored in covered or closed clean storage areas. (*Standard Practice*)
- e. Frequent cleaning and disinfection of room surfaces (e.g., at least daily, or prior to use by another patient in ambulatory settings) is used to reduce environmental reservoirs of infectious material, focusing on frequently touched surfaces and areas in the immediate vicinity of the patient. See [Environmental Infection Control Guidelines](#) for additional details.³¹ (*Standard Practice*)

2. **Enhanced Barrier Precautions** (applies to Skilled Nursing Facilities):

- a. Enhanced Barrier Precautions are indicated, when Contact Precautions do not otherwise apply, for nursing home residents with multidrug-resistant organism (MDRO) infection or colonization.³⁴ (*Expert Opinion*)
- b. Enhanced Barrier Precautions may be considered for residents at high risk for MDRO colonization, regardless of known MDRO status (e.g., residents with wounds and/or indwelling medical devices).³⁴⁻³⁷ (*Expert Opinion*)
- c. Use a gown and gloves for high-contact resident care activities including dressing, bathing/showering, transferring, providing hygiene, changing linens, changing briefs or assisting with toileting, device care or use (e.g., central venous catheter, urinary catheter, feeding tube, tracheostomy/ventilator management), and wound care.^{15,17,38,39} In general, gown and gloves would not be required for resident care activities other than those listed above, unless indicated per Standard Precautions. (*Expert Opinion*)
- d. Residents are not restricted to their rooms or limited from participation in group activities. Because Enhanced Barrier Precautions do not impose the same activity and room placement restrictions as Contact Precautions, they are intended to be in place for the duration of a resident's stay in the facility or until the indication for Enhanced Barrier Precaution is resolved (e.g., resolution of wound or discontinuation of the indwelling medical device). (*Expert Opinion*)

Narrative:

Contact Precautions and Enhanced Barrier Precautions are used to interrupt the route of transmission for pathogens transmitted by touch. Application of these precautions to patients/residents with suspected or

422 confirmed MDRO infection or colonization vary by facility type (for healthcare facilities except skilled nursing
 423 facilities, see **Table 1**; for skilled nursing facilities, see **Table 2**).

424 Enhanced Barrier Precautions are intended for the prevention of MDRO transmission in skilled nursing
 425 facilities.³⁴⁻³⁷ They refer to the use of gown and gloves during high contact resident care activities that risk
 426 potential transfer of MDROs to HCP hands and clothing.^{15,17,38,39} Preventing this transfer can then help prevent
 427 MDRO transmission when HCP perform high contact care activities on other residents.^{34,35} They also take into
 428 account the special circumstances of care in a skilled nursing facility (e.g., home-like environment) and barriers
 429 to implementing Contact Precautions for residents infected or colonized with an MDRO.⁴⁰ For example, MDRO
 430 colonization may persist for long periods (e.g., months to years^{41,42}); restriction of a resident to their room on
 431 the basis of their MDRO status, as recommended for residents on Contact Precautions, would result in
 432 prolonged isolation of the resident to the detriment of their overall health and wellbeing. The target MDROs for
 433 Enhanced Barrier Precautions may be prioritized by public health and through local risk assessment. Enhanced
 434 Barrier Precautions may be considered for other congregate settings in healthcare facilities other than skilled
 435 nursing facilities (e.g., congregate behavioral health units in acute care hospitals).

436 **Table 1: Transmission-Based Precautions to Prevent Transmission by Touch for Healthcare Facilities (Except**
 437 **Skilled Nursing Facilities)**

Category	PPE	Situation	Dedicated Medical Equipment	Single occupancy
Contact Precautions	Gown/glove for all activities	Any entry into designated patient space	Yes	Preferred; if not available, then cohort

438

439 **Table 2. Transmission-Based Precautions to Prevent Transmission by Touch for Skilled Nursing Facilities**

Category	PPE	Situation	Dedicated Medical Equipment	Single occupancy
Contact Precautions	Gown/glove for all activities	Any entry into designated patient space	Yes	Preferred; if not available, then cohort
Enhanced Barrier Precautions	Gown/glove during high contact resident care activities	When Contact Precautions do not otherwise apply: Indicated for residents with infection or colonization with an MDRO Consider for residents at high risk for MDRO colonization, regardless of known MDRO status (e.g., residents with	Not required. Clean and disinfect equipment between residents (per Standard Precautions)	Not required

		wounds or indwelling medical devices)		
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440

441 **Use of Transmission-Based Precautions to Prevent Transmission through the Air**

442 Recommendations:

443 **1. Routine Air Precautions:**

- 444 a. A mask is worn by HCP on room entry, and eye protection is used based on Standard
- 445 Precautions. *(Standard Practice)*
- 446 b. Private rooms are preferred⁵; if not available, then cohort. *(Standard Practice)*
- 447 c. Rooms should be appropriately ventilated³³, but an AIIR is not routinely needed. *(Standard*
- 448 *Practice)*
- 449 d. Source control masking should be used by the patient when they leave their room (e.g., for
- 450 transport to a procedure).⁵ *(Standard Practice)*

451 **2. Special Air Precautions:**

- 452 a. A NIOSH-approved® fit-tested N95 (or higher-level) respirator and eye protection are worn by
- 453 HCP on room entry. *(Expert Opinion)*
- 454 b. A private room is indicated.⁵ *(Expert Opinion)*
- 455 c. Rooms should be appropriately ventilated³³, but an AIIR is not routinely needed. *(Expert*
- 456 *Opinion)*
- 457 d. Source control masking is indicated for the patient when they leave their room (e.g., for
- 458 transport to a procedure).⁵ *(Expert Opinion)*

459 **3. Extended Air Precautions:**

- 460 a. A NIOSH-approved® fit-tested N95 (or higher-level) respirator is worn by HCP on room entry,
- 461 and eye protection is used based on Standard Precautions. *(Standard Practice)*
- 462 b. A private room is indicated.⁵ *(Standard Practice)*
- 463 c. An AIIR is required. *(Standard Practice)*
- 464 d. Source control masking is indicated for the patient when they leave their room.⁵ *(Standard*
- 465 *Practice)*
- 466 e. Travel outside the room should be limited (e.g., for necessary procedures and treatments).
- 467 *(Standard Practice)*

468 Narrative:

469 The previous categories of Droplet Precautions and Airborne Precautions have now been divided into three
 470 categories to better reflect the continuum of transmission for reasons described in Section A. Pathogen-specific
 471 recommendations may be found in [Appendix A \(2007\)](#), which will be updated with interim suggestions for how
 472 facilities may map existing categories to new categories of Transmissions-Based Precautions, until
 473 recommendations for all pathogens have been updated. **Table 3** summarizes baseline recommended
 474 requirements for care of patients in each precaution category for preventing transmission by air.

475 **Table 3. Transmission-Based Precautions to Prevent Transmission by Air**

Category	Mask or Respiratory Protection	Eye Protection	AIIR ^a
Routine Air Precautions	Mask	Per Standard Precautions	Not routinely recommended
Special Air Precautions	NIOSH-approved [®] N95 (or higher-level) respirator	Yes	Not routinely recommended
Extended Air Precautions	NIOSH-approved [®] N95 (or higher-level) respirator	Per Standard Precautions	Yes

476 a. AIIR = Airborne Infection Isolation Room for containment of air in a designated space

477 Routine Air Precautions are focused on reducing transmission of common, often endemic, respiratory pathogens
 478 that spread predominantly over short distances based on observed patterns of transmission, and for which
 479 individuals and their communities are likely to have some degree of immunity.

480 Special Air Precautions are applied to patients with a respiratory pathogen, typically new or emerging, that is not
 481 observed or anticipated to spread efficiently over long distances (such as through ventilation systems), for which
 482 infection generally leads to more than mild illness, and where immunity (or vaccine) and effective treatment are
 483 not available.

484 Extended Air Precautions are used when providing care to patients with pathogens that are observed to spread
 485 efficiently across long distances and over extended times, such that room air needs to be contained (e.g.,
 486 prevented from moving into the hallway where individuals are not appropriately protected).

487 While not required for Routine Air Precautions, HCP may choose voluntarily to wear a NIOSH-approved[®] N95 (or
 488 higher-level) respirator, per existing federal regulations.^{29,43} For Routine and Extended Air Precautions, eye
 489 protection may be added as required PPE based on infection control risk assessment performed by the facility
 490 for specific pathogens (e.g., implementing eye protection for care of all patients with respiratory viral infections
 491 during periods of high incidence in the community or facility). For Special Air Precautions, although an AIIR is not
 492 routinely recommended, an AIIR may be suggested for certain pathogens listed in [Appendix A \(2007\)](#), and for
 493 pathogens with uncertain transmission characteristics.

494 **Special Situations**

495 Some procedures performed on patients may be more likely to generate higher concentrations of aerosols of
 496 respiratory particles than others. There is neither expert consensus, nor sufficient supporting data, to create a
 497 definitive and comprehensive list of these procedures (sometimes called “aerosol-generating procedures”) for
 498 healthcare settings. Certain procedures that involve manipulation of the patient’s airway and close proximity
 499 between the patient and the HCP may increase risk of pathogen transmission by air. Facilities may perform an
 500 infection control risk assessment to implement Special Air or Extended Air precautions for patients with certain
 501 target pathogens, or for all patients regardless of symptoms or confirmed infection, during certain higher risk
 502 procedures.

503 **Source control**

504 Recommendations:

- 505 1. During periods of higher levels of community respiratory virus transmission, facilities should consider
 506 implementing one of the tiers of source control:
- 507 a. Having HCP mask when interacting with patients (e.g., on entry to the patient's room or
 508 bedspace). (*Expert Opinion*)
 - 509 b. Having all individuals (e.g., patients, visitors, and HCP) mask upon entry to the facility or a
 510 clinical area.⁵ (*Standard Practice*)
- 511 2. Source control measures can be implemented facility-wide or targeted toward higher risk areas (e.g.,
 512 emergency departments, urgent care, bone marrow transplant units, or units experiencing an outbreak)
 513 based on a facility risk assessment.⁵ (*Standard Practice*)

514 Narrative:

515 Individuals breathing, speaking, coughing, or sneezing generate aerosols of respiratory secretions that can
 516 contain infectious organisms. The use of a mask or respirator by an infectious individual can reduce the amount
 517 of secretions released into the environment (source control) and thus reduce exposure of people in a shared
 518 space to respiratory pathogens.^{27,44,45}

519 Source control, included as part of respiratory hygiene and cough etiquette in [CDC's Core Infection Prevention
 520 and Control Practices for Safe Healthcare Delivery in All Settings](#), historically focused on use of masks by
 521 symptomatic patients (e.g., in waiting areas).⁵ Source control is now recognized to be applicable to
 522 asymptomatic individuals as well, since a proportion of such individuals may be asymptotically or pre-
 523 symptomatically infected with pathogens such as respiratory viruses.⁴⁶

524 **Patient Placement**

525 Recommendations:

- 526 1. Single patient rooms are the preferred option for patients requiring Transmission-Based Precautions,
 527 whether to prevent transmission by touch or through the air.⁵ (*Standard Practice*)
- 528 2. In long-term and other residential settings, room placement decisions should balance risks to the
 529 infectious individual and to other patients.⁵ (*Standard Practice*) Residents in Enhanced Barrier
 530 Precautions do not require placement in a single person room. (*Expert Opinion*)
- 531 3. In ambulatory settings, patients requiring Transmission-Based Precautions should be placed in an exam
 532 room or cubicle as soon as possible rather than waiting in common areas.⁵ (*Standard Practice*)
- 533 4. If single patient rooms are not available, patients housed (cohorted) in the same room should have the
 534 same pathogen infection or colonization status to the greatest extent possible. (*Standard Practice*)
- 535 5. Any time room sharing occurs, practices need to be in place to limit potential for cross-contamination,
 536 including ready access to hand hygiene supplies, changing PPE between roommates, and dedicating
 537 patient care items or cleaning and disinfecting shared equipment after each use. (*Standard Practice*)

538 **Transport of Patients**

539 Recommendations:

540 *Patient considerations*

- 541 1. Patients under Transmission-Based Precautions (with the exception of Enhanced Barrier Precautions
542 alone) should leave their room only when medically necessary for their evaluation or care. (*Standard*
543 *Practice*)
- 544 2. If the patient is being isolated for a pathogen transmitted through the air, they should use source
545 control, (i.e., wear a mask), any time they are outside of their room, unless a mask is medically
546 contraindicated or the individual is not capable of wearing a mask safely.⁵ (*Standard Practice*)
- 547 3. If the patient is cared for using Contact Precautions for a pathogen transmitted by touch, appropriate
548 barriers (e.g., clean patient gown, wrapping sheet, or impervious dressing) should be used to cover
549 affected areas of the patient's body during transport when infectious skin lesions or drainage are
550 present. (*Standard Practice*)
- 551 4. Before transport, direct communication with the HCP receiving the patient is required to ensure
552 notification regarding the nature of the infection, the type of Transmission-Based Precautions required,
553 and when the patient will arrive.⁵ (*Standard Practice*)
- 554 a. Communication at time of transport applies to within-facility transfers and between-facility
555 transfers. (*Standard Practice*)

556 *Transporter considerations*

- 557 1. HCP transporting patients should follow Standard Precautions for pathogens to avoid spreading
558 infectious material during transport.⁵ (*Standard Practice*)
- 559 a. This includes performing hand hygiene before beginning transport, ensuring that wheelchairs
560 and gurneys used for transport have been cleaned and disinfected prior to use, putting on all
561 appropriate PPE prior to contact with the patient when assisting with patient movement at the
562 destination location, and removing and discarding soiled PPE. (*Standard Practice*)
- 563 2. PPE might be recommended during transport in certain circumstances:
- 564 a. When transporting a patient with a pathogen that presents a high risk for morbidity and
565 mortality for HCP (e.g., Ebola virus), all pathogen-recommended PPE should be used. (*Expert*
566 *opinion*)
- 567 b. When transporting a patient with a pathogen transmitted through the air, the transporter
568 should carry a mask or respirator with them based on the recommended Transmission-Based
569 Precaution category. If the patient is unable to wear a mask for source control or if the patient
570 will require medical care during transport (e.g., suctioning), the transporter should put on a
571 mask or respirator prior to assisting the patient. (*Expert opinion*)
- 572 c. When transporting a patient with a pathogen transmitted by touch, gloves might be used if
573 there is a need to touch the patient during transport (e.g., a clean pair of non-sterile gloves can
574 be carried, put on prior to assisting the patient and discarded immediately afterward and
575 followed with hand hygiene). (*Expert opinion*)
- 576 3. If a patient on Special Air Precautions is unable to wear source control, or if a patient is on Extended Air
577 Precautions for a highly contagious infection (e.g., varicella or measles), the transport route and process
578 should include a selection of the time and route of travel within a facility to minimize exposure of others
579 during transport (*Expert Opinion*), and use of appropriate PPE by staff during transport and at the
580 destination location (*Standard Practice*).

581 **Use of Personal Protective Equipment by Visitors**

582 The use of PPE (e.g., gowns, gloves, or masks) by visitors in healthcare settings may be considered, particularly in
583 settings where they are providing hands-on care and having very close patient contact (e.g., feeding, dressing).
584 In these situations, visitors may have contact with other patients or the environment and could contribute to
585 transmission if PPE is not used. Specific recommendations may vary by facility or by unit and are determined by
586 the level of interaction and the suspected or proven infection for which Transmission-Based Precautions might
587 be recommended.

588 **Visitors as Sources of Infection**

589 Visitors, including patient family members, have been identified as the source of several types of healthcare-
590 associated infections (e.g., pertussis, *M. tuberculosis*, and respiratory viruses).^{47,48} Visitor symptom screening can
591 reduce risk of healthcare-associated infections, and may be especially important for high-risk patient care areas
592 such as oncology and neonatal intensive care units.

593 Visitor symptom screening may be *passive* (e.g., using signs that alert visitors with symptoms of infection not to
594 enter clinical areas) or *active* (e.g., asking each visitor to report current symptoms and recent exposures to
595 persons with infection or relevant travel, with subsequent review by facility staff to determine whether the
596 visitor can proceed with visitation).

597 **Discontinuation of Transmission-Based Precautions**

598 In general, Transmission-Based Precautions are intended to remain in effect for limited periods of time (i.e.,
599 while the risk for transmission of the infectious agent persists or for the duration of the illness). For most
600 infectious diseases, this duration reflects known patterns of persistence and shedding of infectious agents
601 associated with the natural history of the infectious process and its treatment. Colonization with MDROs can
602 persist for months to years.^{41,42} In acute care hospitals, Contact Precautions are often left in place throughout
603 the entire admission or may have a set duration based on repeat testing or symptom resolution. In nursing
604 homes, Enhanced Barrier Precautions are used to better accommodate the communal and residential
605 environment of the setting, and are left in place for the duration of the resident's stay or until their risk factors
606 have resolved (e.g., indwelling medical device is removed or wound is healed). Refer to [Appendix A \(2007\)](#) for
607 pathogen/disease specific recommendations.

608

609 Appendix**610 Federal Advisory Committee Guideline Update Process**

611 This document is the first in a two-part update to the 2007 Guideline for Isolation Precautions: Preventing
612 Transmission of Infectious Agents in Healthcare Settings (hereafter referred to as the *2007 Guideline*). At an
613 August 2021 public meeting of the Healthcare Infection Control Practices Advisory Committee (HICPAC), the
614 Division of Healthcare Quality Promotion (DHQP) requested input from HICPAC on an update to the 2007
615 Guideline. HICPAC responded by forming a workgroup to review and update the 2007 Guideline, and this
616 workgroup was announced at a public meeting of the committee in October 2021. This workgroup was
617 comprised of subject matter experts in infectious disease, infection prevention, occupational health, nursing,
618 healthcare epidemiology, and healthcare management. Federal technical experts from DHQP and National
619 Institute of Occupational Safety and Health (NIOSH) were present during workgroup meetings in order to
620 answer workgroup questions as they arose.

621 The workgroup reviewed the 2007 Guideline and weighed peer-reviewed literature, existing regulations and
622 guidance, and expert opinion when updating the 2007 recommendations. The workgroup provided updates on
623 the guideline update process, draft Transmission-Based Precautions categories, their supporting
624 recommendations, and contextual systematic literature reviews at HICPAC Public Meetings in June, August, and
625 November of 2022, and in June, August, and November of 2023. (Meeting Minutes are found [here](#)).⁴⁹

626 Recommendation Formulation and Categorization

627 The authors conducted a thorough review of the recommendations contained in the 2007 Guideline. This review
628 identified recommendations from the 2007 Guideline that remained relevant in 2023; these recommendations
629 were carried forward as Standard Practice and are noted as such in the 2024 update. The authors additionally
630 identified gaps in the 2007 Guideline that required the development of new recommendations.

631 New recommendations also were categorized as Standard Practice if they met any of the following criteria:

- 632 1. Are consistent with recommendations in current CDC guidelines or guidance (e.g., the [Core Infection](#)
633 [Prevention and Control Practices for Safe Healthcare Delivery in All Settings](#)⁵)
- 634 2. Are consistent with current federal regulations. Regulations include, but are not limited to:
 - 635 a. Occupational Safety and Health Administration (OSHA) Bloodborne Pathogen Standard 29 CFR
636 1910.1030(g) (2),
 - 637 b. OSHA Reparatory Protection Standard 29 CFR 1910.134, and
 - 638 c. OSHA Personal Protective Equipment Standard 29 CFR 1910.132.
- 639 3. Are consistent with manufacturer instructions for use (e.g., recommendations to follow instructions for
640 proper use or reprocessing)

641 New recommendations not categorized as Standard Practice were categorized as Expert Opinion, with
642 supporting peer-reviewed literature where available.

643 In order to provide context to the update of the 2007 Guideline's Transmission-Based Precaution categories, the
644 authors requested three systematic reviews from DHQP that answered questions on the performance of several
645 PPE items. These systematic reviews, which were not conducted to support the development of specific
646 recommendations, answered the following key questions:

- 647 1. For healthcare personnel caring for patients with respiratory infections, what is the effectiveness of N95
648 respirators compared to medical/surgical masks in preventing symptomatic illness or laboratory-
649 confirmed infection? [cite webpage]
- 650 2. For healthcare personnel caring for patients with respiratory infections, what is the effectiveness of
651 adding eye protection to routine personal protective equipment (PPE), compared to routine PPE alone,
652 in preventing symptomatic illness or laboratory-confirmed infection? [cite webpage]
- 653 3. For healthcare personnel, what is the effectiveness of risk-based use of gowns and gloves, or gloves
654 alone, to prevent transmission of pathogens? [cite webpage]

655 The detailed methods of each systematic literature review are available online in the respective documents.

656

DRAFT

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