Section A: Overview of Transmission of Pathogens in Healthcare Settings

Overview

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

This guideline replaces the corresponding content in the “2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings,” hereafter referred to as the ‘2007 Guideline.’

Elements of the 2007 Guideline that are not directly affected by this update, including the 2007 Guideline’s Appendix A (hereafter referred to as “Appendix A [2007]”), will remain active until updated specifically.

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

Background

Factors Affecting Transmissibility

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

Significance of Transmission

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

Transmission Pathways

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

Transmission via air

Pathogens can transmit via air over short distances through direct splash or spray of the pathogen onto a part of the body (e.g., spray from a sneeze landing on a person’s eyes or mouth) or variably across ranges of distance...
and time via suspended infectious particles. Pathogens suspended in the air cause infection via inhalation and deposition along the respiratory tract, anywhere from the nasal or oral passages to the lungs.

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

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

**Transmission via touch**

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

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

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

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

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

**Approach to Transmission-Based Precaution Recommendations**

Recommendations for Transmission-Based Precautions are based on evaluation of clinical epidemiologic studies in healthcare settings. Evidence reviews in this guideline focus on clinical studies with infection outcomes because such studies compare prevention strategies in the context of feasibility, user adherence, and implementation within a hierarchy of controls (e.g., engineering, administrative, and personal protective equipment controls) available in the healthcare setting to reduce risk of infection. The methodology and evidence reviews informing recommendations in this guideline are available in this guideline’s Appendix.
Recommendations in this guideline largely address infection prevention strategies available to frontline healthcare personnel (HCP) at the point of care.
Section B: Fundamental Elements Needed to Prevent Transmission of Pathogens in Healthcare Settings

Overview

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

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

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

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

Hand Hygiene

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

Personal Protective Equipment (PPE) for Healthcare Personnel

General considerations

Recommendations:

1. HCP must be trained and demonstrate competency in the selection, putting on, use, removal, and disposal of PPE. (Standard Practice)
2. Employers in healthcare settings are required to provide readily available PPE to healthcare personnel (HCP), ideally at or near likely points of use. (Standard Practice)
3. Sizing and models should be chosen to accommodate the needs of the local workforce.\(^5,6\) (Standard Practice)

Narrative:

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

‘Reuse’ refers to the use of the same PPE item for multiple encounters with different patients, with removal of the PPE item between encounters. PPE can consist of products that are labeled for single use or as reusable.

Single use PPE is not intended to be reused. Reusable items are reprocessed between uses according to manufacturer’s instructions for use.

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

Sterile gloves, gowns and other PPE used for surgery and aseptic procedures are addressed in the CDC Surgical Site Infection guidelines.\(^7\)

The CDC PPE sequence document demonstrates one approach to appropriate technique for putting on and removing each type of PPE.\(^8\)

**Gloves**

**Recommendations:**

**Indications**

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

**Use**

2. HCP should perform hand hygiene prior to reaching into a box of non-sterile exam gloves and putting on gloves, to reduce the risk of contaminating both the remaining gloves in the box and the gloves being put on.\(^9-11\) (Expert Opinion)

3. During care of a single patient, gloves should be changed after a task or procedure if contact occurs with potentially infectious material (e.g., if moving from a dirty task to a clean task).\(^5\) (Standard Practice)

4. Remove gloves if torn or soiled, and before caring for another patient.\(^5\) (Standard Practice)

5. Hand hygiene should be performed immediately after removing gloves, because pathogens on used gloves can contaminate hands during glove removal.\(^5\) (Standard Practice)

6. HCP should not practice extended glove use in place of hand hygiene.\(^5\) (Standard Practice)

**Selection**

7. Non-sterile gloves should be available in a range of sizes so that all users will be able to select a glove that fits comfortably without excess material that could impair function.\(^12\) (Standard Practice)
Non-sterile exam gloves are worn to provide a protective barrier between hands and soiled material or surfaces, and to allow efficient removal of infectious material from hands by removing and discarding soiled gloves. Glove use is not a substitute for hand hygiene. Non-latex gloves are available for personnel with latex allergies.

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

**Gowns**

**Indications**

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

**Use**

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

**Narrative:**

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

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

**Masks**

**Indications**

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

2. Masks should not be reused as they can serve as a reservoir of infectious material if they become soiled during use.\(^{19-23}\) (Standard Practice)

3. Masks should be changed when soiled, damaged, or harder to breathe through (Standard Practice)

4. Extended use is not practiced with masks except when used for source control, and then disposed of when removed or after use when caring for a patient on Transmission-Based Precautions.\(^{24,25}\) (Standard Practice)

Selection

5. A fluid resistant mask should be used in situations when splashes and sprays are anticipated.\(^{12}\) (Standard Practice)

Narrative:

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

Among mask types, efficacy can vary depending on fit. Well-fitting masks refer to masks that fit closely against the face with minimal gaps, especially along the edges of the mask. A loose-fitting mask may block splashes from reaching the nose or mouth, but may not fully contain secretions of the wearer or efficiently filter inhaled air.

Well-fitting masks may include: any mask approved for use in healthcare that fits well without adjustment; masks with adjustments or modifications, such as knotted ear loops or mask fitters\(^{27,28}\); and enhanced barrier face coverings.\(^{26}\)

Respirators

Recommendations:

Indications

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

Use

2. A seal check should be performed each time an HCP puts on a fit-tested respirator to ensure that the respirator is properly seated on the face.\(^{29}\) (Standard Practice)

3. Single use disposable respirators should not be reused as they can serve as reservoir of infectious material if they become soiled during use. (Standard Practice)

4. Reusable respirators must be cleaned, disinfected, and dried between uses according to the manufacturer’s instructions for use. (Standard Practice)

5. Optimally, extended use is not practiced with single use respirators except when used for source control and then disposed of when removed or after use when caring for a patient on Transmission-Based Precautions.\(^{24}\) (Standard Practice)

6. Respirators should be changed when soiled, damaged, or harder to breathe through (Standard Practice)

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

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

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

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

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

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

**Eye/Face Protection**

**Recommendations:**

**Indications**

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

**Use**

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

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

Narrative:

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

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

Environmental Controls

Environmental Cleaning and Disinfection

Environmental surfaces serve as reservoirs for some pathogens that transmit by touch. Routine and targeted cleaning of environmental surfaces, as indicated by the level of patient or HCP contact and degree of soiling, reduces the burden of environmental pathogens. EPA-registered disinfectants that have microbiocidal activity against likely pathogens on surfaces are used according to manufacturers’ instructions. Refer to “CDC Guidelines for Environmental Infection Control in Health-Care Facilities” and “CDC Guideline for Disinfection and Sterilization in Healthcare Facilities” for details.\(^31,32\)

Specialized Air Handling

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

Other environmental controls can be useful components of the layered approach to preventing transmission of infection through air. Although full discussion would be out of scope for the current document, it is important to recognize the importance of interventions such as general ventilation with sufficient delivery rates of clean air to dilute pathogens in air, local exhaust ventilation to capture pathogens at their source, and removal of infective pathogens from air such as by filtration through portable HEPA filters or by inactivation via ultraviolet germicidal irradiation.\(^33\) An advantage of these interventions is that they do not require individual compliance to be effective.
Section C: Precautions to Prevent Transmission of Pathogens in Healthcare Settings

Overview

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

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

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

Standard Precautions

Recommendation:

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

Narrative:

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

Components of Standard Precautions are defined in the CDC’s Core Infection Prevention and Control Practices for Safe Healthcare Delivery in All Settings5 and include:

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

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

Performing a risk assessment is central to Standard Precautions; this includes assessment by HCP of their risk of exposure to potentially infectious materials for each activity being performed. Based on that assessment, HCP...
implement practices and use PPE to prevent possible exposure. For example, when planning to irrigate a wound and perform a dressing change, HCP would anticipate the potential for splashes and sprays during irrigation and the potential for contact with the wound or contaminated dressing materials. To prevent such exposures, they would put on gloves, a gown, eye protection and a mask prior to performing the activity.

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

Transmission-Based Precautions

Recommendation:

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

Narrative:
Transmission-Based Precautions are used when transmission is not completely interrupted using Standard Precautions alone. For pathogens that have multiple routes of transmission (e.g., disseminated herpes zoster virus infection), more than one Transmission-Based Precautions category will be used. Whether applied singly or in combination, Transmission-Based Precautions are used in addition to Standard Precautions. See Appendix A for recommended precautions for specific pathogens and infections. When Transmission-Based Precautions are indicated, acceptance by patients and adherence by HCP may be improved by addressing potential adverse effects on patients (e.g., anxiety, depression and other mood disturbances, perceptions of stigma, and reduced contact with clinical staff).

Syndromic and Empiric Applications of Transmission-Based Precautions

Recommendation:

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

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

Use of Transmission-Based Precautions to Prevent Transmission by Touch

Recommendations:

1. Contact Precautions (applies to all healthcare facilities):
   a. Patients are cared for in a dedicated space, preferably a single patient room. See Patient 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. (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. (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. (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). (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. 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
confirmed MDRO infection or colonization vary by facility type (for healthcare facilities except skilled nursing facilities, see Table 1; for skilled nursing facilities, see Table 2).

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

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

<table>
<thead>
<tr>
<th>Category</th>
<th>PPE</th>
<th>Situation</th>
<th>Dedicated Medical Equipment</th>
<th>Single occupancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact Precautions</td>
<td>Gown/glove for all activities</td>
<td>Any entry into designated patient space</td>
<td>Yes</td>
<td>Preferred; if not available, then cohort</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Category</th>
<th>PPE</th>
<th>Situation</th>
<th>Dedicated Medical Equipment</th>
<th>Single occupancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact Precautions</td>
<td>Gown/glove for all activities</td>
<td>Any entry into designated patient space</td>
<td>Yes</td>
<td>Preferred; if not available, then cohort</td>
</tr>
<tr>
<td>Enhanced Barrier Precautions</td>
<td>Gown/glove during high contact resident care activities</td>
<td>When Contact Precautions do not otherwise apply: <strong>Indicated for</strong> residents with infection or colonization with an MDRO <strong>Consider for</strong> 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)</td>
<td>Not required</td>
<td>Not required</td>
</tr>
</tbody>
</table>
Use of Transmission-Based Precautions to Prevent Transmission through the Air

Recommendations:

1. **Routine Air Precautions:**
   a. A mask is worn by HCP on room entry, and eye protection is used based on Standard Precautions. (Standard Practice)
   b. Private rooms are preferred; if not available, then cohort. (Standard Practice)
   c. Rooms should be appropriately ventilated, but an AIIR is not routinely needed. (Standard Practice)
   d. Source control masking should be used by the patient when they leave their room (e.g., for transport to a procedure). (Standard Practice)

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

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

Narrative:

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

<table>
<thead>
<tr>
<th>Category</th>
<th>Mask or Respiratory Protection</th>
<th>Eye Protection</th>
<th>AIIRa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Routine Air Precautions</td>
<td>Mask</td>
<td>Per Standard Precautions</td>
<td>Not routinely recommended</td>
</tr>
<tr>
<td>Special Air Precautions</td>
<td>NIOSH-approved® N95 (or higher-level) respirator</td>
<td>Yes</td>
<td>Not routinely recommended</td>
</tr>
<tr>
<td>Extended Air Precautions</td>
<td>NIOSH-approved® N95 (or higher-level) respirator</td>
<td>Per Standard Precautions</td>
<td>Yes</td>
</tr>
</tbody>
</table>

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

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

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

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

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

Special Situations

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

**Recommendations:**

1. During periods of higher levels of community respiratory virus transmission, facilities should consider implementing one of the tiers of source control:
   a. Having HCP mask when interacting with patients (e.g., on entry to the patient’s room or bedspace). *(Expert Opinion)*
   b. Having all individuals (e.g., patients, visitors, and HCP) mask upon entry to the facility or a clinical area. *(Standard Practice)*

2. Source control measures can be implemented facility-wide or targeted toward higher risk areas (e.g., emergency departments, urgent care, bone marrow transplant units, or units experiencing an outbreak) based on a facility risk assessment. *(Standard Practice)*

**Narrative:**

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

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

**Patient Placement**

**Recommendations:**

1. Single patient rooms are the preferred option for patients requiring Transmission-Based Precautions, whether to prevent transmission by touch or through the air. *(Standard Practice)*

2. In long-term and other residential settings, room placement decisions should balance risks to the infectious individual and to other patients. *(Standard Practice)* Residents in Enhanced Barrier Precautions do not require placement in a single person room. *(Expert Opinion)*

3. In ambulatory settings, patients requiring Transmission-Based Precautions should be placed in an exam room or cubicle as soon as possible rather than waiting in common areas. *(Standard Practice)*

4. If single patient rooms are not available, patients housed (cohorted) in the same room should have the same pathogen infection or colonization status to the greatest extent possible. *(Standard Practice)*

5. Any time room sharing occurs, practices need to be in place to limit potential for cross-contamination, including ready access to hand hygiene supplies, changing PPE between roommates, and dedicating patient care items or cleaning and disinfecting shared equipment after each use. *(Standard Practice)*

**Transport of Patients**

**Recommendations:**

**Patient considerations**
1. Patients under Transmission-Based Precautions (with the exception of Enhanced Barrier Precautions alone) should leave their room only when medically necessary for their evaluation or care. \textit{(Standard Practice)}

2. If the patient is being isolated for a pathogen transmitted through the air, they should use source control, (i.e., wear a mask), any time they are outside of their room, unless a mask is medically contraindicated or the individual is not capable of wearing a mask safely.\textsuperscript{5} \textit{(Standard Practice)}

3. If the patient is cared for using Contact Precautions for a pathogen transmitted by touch, appropriate barriers (e.g., clean patient gown, wrapping sheet, or impervious dressing) should be used to cover affected areas of the patient’s body during transport when infectious skin lesions or drainage are present. \textit{(Standard Practice)}

4. Before transport, direct communication with the HCP receiving the patient is required to ensure notification regarding the nature of the infection, the type of Transmission-Based Precautions required, and when the patient will arrive.\textsuperscript{5} \textit{(Standard Practice)}

   a. Communication at time of transport applies to within-facility transfers and between-facility transfers. \textit{(Standard Practice)}

\textit{Transporter considerations}

1. HCP transporting patients should follow Standard Precautions for pathogens to avoid spreading infectious material during transport.\textsuperscript{5} \textit{(Standard Practice)}

   a. This includes performing hand hygiene before beginning transport, ensuring that wheelchairs and gurneys used for transport have been cleaned and disinfected prior to use, putting on all appropriate PPE prior to contact with the patient when assisting with patient movement at the destination location, and removing and discarding soiled PPE. \textit{(Standard Practice)}

2. PPE might be recommended during transport in certain circumstances:

   a. When transporting a patient with a pathogen that presents a high risk for morbidity and mortality for HCP (e.g., Ebola virus), all pathogen-recommended PPE should be used. \textit{(Expert opinion)}

   b. When transporting a patient with a pathogen transmitted through the air, the transporter should carry a mask or respirator with them based on the recommended Transmission-Based Precaution category. If the patient is unable to wear a mask for source control or if the patient will require medical care during transport (e.g., suctioning), the transporter should put on a mask or respirator prior to assisting the patient. \textit{(Expert opinion)}

   c. When transporting a patient with a pathogen transmitted by touch, gloves might be used if there is a need to touch the patient during transport (e.g., a clean pair of non-sterile gloves can be carried, put on prior to assisting the patient and discarded immediately afterward and followed with hand hygiene). \textit{(Expert opinion)}

3. If a patient on Special Air Precautions is unable to wear source control, or if a patient is on Extended Air Precautions for a highly contagious infection (e.g., varicella or measles), the transport route and process should include a selection of the time and route of travel within a facility to minimize exposure of others during transport \textit{(Expert Opinion)}, and use of appropriate PPE by staff during transport and at the destination location \textit{(Standard Practice)}.

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

**Visitors as Sources of Infection**

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

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

**Discontinuation of Transmission-Based Precautions**

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

Federal Advisory Committee Guideline Update Process

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

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

Recommendation Formulation and Categorization

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

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

1. Are consistent with recommendations in current CDC guidelines or guidance (e.g., the Core Infection Prevention and Control Practices for Safe Healthcare Delivery in All Settings5)

2. Are consistent with current federal regulations. Regulations include, but are not limited to:
   a. Occupational Safety and Health Administration (OSHA) Bloodborne Pathogen Standard 29 CFR 1910.1030(g) (2),
   b. OSHA Reparatory Protection Standard 29 CFR 1910.134, and

3. Are consistent with manufacturer instructions for use (e.g., recommendations to follow instructions for proper use or reprocessing)

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

In order to provide context to the update of the 2007 Guideline’s Transmission-Based Precaution categories, the authors requested three systematic reviews from DHQP that answered questions on the performance of several PPE items. These systematic reviews, which were not conducted to support the development of specific recommendations, answered the following key questions:
1. For healthcare personnel caring for patients with respiratory infections, what is the effectiveness of N95 respirators compared to medical/surgical masks in preventing symptomatic illness or laboratory-confirmed infection? [cite webpage]

2. For healthcare personnel caring for patients with respiratory infections, what is the effectiveness of adding eye protection to routine personal protective equipment (PPE), compared to routine PPE alone, in preventing symptomatic illness or laboratory-confirmed infection? [cite webpage]

3. For healthcare personnel, what is the effectiveness of risk-based use of gowns and gloves, or gloves alone, to prevent transmission of pathogens? [cite webpage]

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


Disclaimer: The findings and conclusions herein are draft and have not been formally disseminated by the Centers for Disease Control and Prevention and should not be construed to represent any agency determination or policy.


