Isolation Precautions: Personal Protective Equipment (Pediatric) - CE

ALERT

Don appropriate personal protective equipment (PPE) based on the patient's signs and symptoms and indications for isolation precautions.

Don a gown that is impervious to moisture when there is a risk for excess soiling.[4]

Perform hand hygiene with soap and water or use an alcohol-based hand sanitizer immediately after removing all PPE.[4]

Place patients who require airborne isolation in a negative-pressure airborne infection isolation room (AIIR).[4]

Ensure that the door to the isolation room and the anteroom is never open at the same time.

OVERVIEW

When a patient has a known or suspected source of colonization or infection, specific infection prevention and control practices can reduce the risk of cross-contamination to other patients, family, visitors, and health care team members. Bodily fluids (e.g., feces, urine, mucus, wound drainage) contain potentially infectious organisms. Isolation or barrier precautions include the appropriate use of PPE, such as a gown, mask, eye protection, and gloves. Patients should be placed in isolation based on signs and symptoms until a diagnosis is confirmed.

Standard precautions, or tier one precautions, are used based on the assumption that every patient is potentially infected or colonized with a transmissible organism. Standard precautions are primary for preventing infection transmission and apply to contact with blood, bodily fluids, nonintact skin, mucous membranes, and equipment or surfaces contaminated with potentially infectious materials.

Respiratory hygiene and cough etiquette should be used by any person entering a health care facility with signs of respiratory infection (e.g., cough, congestion, rhinorrhea, increased production of respiratory secretions). Key elements of respiratory hygiene include proper hand hygiene, covering the mouth and nose with a tissue when coughing or sneezing, coughing or sneezing into the elbow, wearing a mask, and properly discarding used tissues.

Second tier precautions include protocols based on the route of transmission (Table 1).[4] The three types of transmission-based precautions—airborne, droplet, and contact—may be combined for diseases that have multiple routes of transmission (e.g., chickenpox, coronavirus) (Table 1).[4] More stringent precautions may be applied to specific outbreaks of a virus or bacteria.

Health care team members must participate in and practice rigorous training of current PPE recommendations, which include the systematic donning and doffing of PPE. Once in the isolation room, PPE must remain in place and worn correctly. Removing or adjusting PPE while in the procedure room increases the risk of contamination. A breach may include skin exposure, a needlestick, or a tear in the PPE. The doffing process is a time of high risk, and a systematic procedure must be followed.[4]

Isolation Precautions: Personal Protective Equipment (Pediatric) - CE

EDUCATION

- Provide developmentally and culturally appropriate education based on the desire for knowledge, readiness to learn, and overall neurologic and psychosocial state.
- Explain the purpose of the isolation to the patient and family.
- Incorporate play when explaining the use of PPE to a toddler or young child (e.g., superheroes).
- Give the patient and family information on the signs and symptoms of infections that require isolation.
- Explain to the patient and family about strategies for infection prevention (e.g., hand hygiene, use of PPE).
- Emphasize to the family the importance of PPE despite exposure to the patient before admission.
- Explain to the family that both doors to the anteroom should never be open at the same time.
- Encourage questions and answer them as they arise.

ASSESSMENT AND PREPARATION

Assessment

1. Perform hand hygiene before patient contact.
2. Review the patient's medical history (if available) for possible indications for isolation, such as risk factors for tuberculosis (TB), a major draining wound, diarrhea, or a purulent productive cough.
3. Review the precautions for the specific isolation criteria, including appropriate PPE to apply (Box 1) (Table 1).
4. Review the patient's laboratory test results, if applicable.
5. Determine whether the patient has a known latex allergy.
6. Determine if the patient needs to be moved to a negative-pressure AIIR.

Preparation

1. Choose isolation precautions based on the patient's signs and symptoms and diagnosis (Box 1) (Table 1).

    a. Contact precautions: Standard precautions plus gloves and gown
    b. Droplet precautions: Standard precautions plus a mask
    c. Airborne precautions: Standard precautions plus an N95 respirator or powered air-purifying respirator (PAPR)

2. Provide proper PPE access and signage as needed.
3. Prevent extra trips in and out of the room; gather all needed equipment and supplies before entering the room.
4. Provide dedicated equipment (e.g., stethoscope, blood pressure cuff, thermometer) to be used only by the patient.[4]

PROCEDURE

1. Perform hand hygiene.
2. Don an isolation gown.

Isolation Precautions: Personal Protective Equipment (Pediatric) - CE

a. Ensure that the gown covers the torso from the neck to the knees and from the arms to the end of the wrists and that it wraps around the back.
b. Pull the sleeves of the gown down to the wrists.
c. Fasten the gown securely at the back of the neck and the waist.

Rationale: Donning a gown properly prevents the transmission of infection and provides protection if the patient has excessive drainage or discharge.

3. Don either a surgical mask or a fitted N95 respirator around the mouth and nose.

a. Secure the ties or elastics at the middle of the head and neck or the elastic ear loops around the ears.
b. Fit the flexible band to the nose bridge.
c. Ensure that the mask fits snugly on the face and below the chin.
d. If using a PAPR, follow the manufacturer's instructions for use.

Rationale: Donning the correct mask properly reduces the risk of exposure to airborne microorganisms or exposure to microorganisms from splashing fluids.

4. Don eye protection (i.e., goggles or face shield) around the face and eyes. Adjust to fit.

Rationale: Donning eye protection properly reduces the risk of exposure to microorganisms that may occur from splashing fluids.

5. Don gloves, bringing the glove cuffs over the edge of the gown sleeves.
6. Enter the patient's room, close the door, and arrange the supplies and equipment.
7. Introduce yourself to the patient and family.
8. Verify the correct patient using two identifiers.
9. Explain the procedure to the patient and family and ensure that the patient agrees to treatment.
10. Provide care to the patient while maintaining precautions.

a. Keep hands away from own face.
b. Limit touching surfaces in the room.
c. Remove gloves when torn or heavily contaminated, perform hand hygiene, and don a clean pair of gloves.

11. Collect any ordered specimens.

a. In the presence of the patient, label the specimen per the organization's practice.[3]
b. Place the labeled specimen in a biohazard bag.

12. At the door, have another health care team member hold a biohazard bag into which the specimen is placed.

Rationale: This prevents contamination of the outside of the biohazard bag.

Isolation Precautions: Personal Protective Equipment (Pediatric) - CE

13. Discard linen, trash, and disposable items.

    At the completion of the procedure, ensure that all choking hazards (e.g., syringe caps, port caps, adhesive bandages, bits of tape, twist-off caps from saline bullets) are removed from the patient's linens and placed in the appropriate receptacle.

14. Use single bags that are sturdy and impervious to moisture to contain soiled articles. Double-bag heavily soiled linen or heavy, wet trash if necessary.

    Ensure that linens or waste are totally contained to protect health care team members from exposure to infectious organisms.

15. Tie the bags securely at the top with a knot.
16. Remove all reusable pieces of equipment and thoroughly disinfect reusable equipment brought into the room. Ensure that equipment is disinfected with an organization-approved disinfectant when it is removed from the room and before it is used on another patient.

    Rationale: Disinfecting equipment after use decreases the risk of infection transmission. Using equipment that is dedicated for use only with the patient on isolation precautions further minimizes this risk.[4]

17. After providing patient care, doff PPE in a designated area by the door or in an anteroom. If an anteroom is in use, leave the isolation room and close the door to doff PPE.

Doffing PPE Option 1: Removal of PPE, if Using a Reusable Gown

1. Remove gloves.

   If the hands become contaminated during glove removal, or any other step in the PPE doffing procedure, immediately perform hand hygiene.

   a. Using a gloved hand, grasp the palm area of the other gloved hand and peel off the first glove.
   b. Hold the removed glove in the gloved hand.
   c. Slide the fingers of the ungloved hand under the remaining glove at the wrist.
   d. Peel the second glove off over the first glove.

   Rationale: Properly removing gloves prevents contact with the contaminated gloves' outer surface.

2. Discard gloves in the proper container.
3. Remove eye protection from the back by lifting the headband or earpieces. Discard eye protection in the proper container or place it in an appropriate container for disinfection.

   Rationale: The outside of the eye protection is contaminated. Handling as described allows removal without contaminating hands.

Isolation Precautions: Personal Protective Equipment (Pediatric) - CE

4. Remove the gown.

    a. Unfasten the gown's neck ties and waist ties, taking care that the sleeves do not make contact with the body when reaching for the ties.
    b. Pull the gown away from the neck and shoulders, touching the inside of the gown only.
    c. Turn the gown inside-out and fold it into a bundle.

        Rationale: The front of the gown and sleeves are contaminated. Removing the gown as described prevents contact with the contaminated front of the gown.

5. Place the gown in a designated laundry receptacle.
6. Remove the face mask.

    a. Remove the elastic loops from the ears and pull the mask away from the face or untie the bottom ties or grasp the elastics and then the top ties or elastics and pull the mask away from the face. Discard the mask in the proper receptacle.
    b. For reuse, leave the patient care area and carefully fold the face mask, keeping the outer surface held inward and against itself to reduce contact with the outer surface during storage. Store the mask between uses in a clean, sealable paper bag or breathable container.[1]

        Do not touch the outer surface of the face mask.

        Rationale: The front of the mask is contaminated. Touching only the elastic or mask strings protects ungloved hands from contamination. Untying the bottom mask string first prevents the top part of the mask from falling down over the health care team member's uniform.

7. Perform hand hygiene.
8. Leave the room and close the door. If an anteroom is used, ensure that both doors to the anteroom are never open at the same time.

Doffing PPE Option 2: Removal of PPE, if Using a Disposable Gown

1. Remove gown and gloves.

    If the hands become contaminated during glove removal, or any other step during the PPE doffing procedure, immediately perform hand hygiene.

    a. Grasp the gown in the front and pull it away from the body so that the ties break; touch the outside of the gown only with gloved hands.
    b. While removing the gown, fold or roll it inside-out into a bundle, peeling off the gloves at the same time, touching only the inside of the gloves and gown with bare hands.

        Rationale: The front of the gown and sleeves are contaminated. Removing the gown as described prevents contact with the contaminated front of the gown.

Isolation Precautions: Personal Protective Equipment (Pediatric) - CE

2. Discard the gown and gloves in the proper receptacle.
3. Remove eye protection from the back by lifting the headband or earpieces. Discard the eye protection in the proper receptacle.

    Rationale: The outside of the eye protection is contaminated. Handling as described allows removal without contaminating hands.

4. Remove the face mask.

    a. Remove the elastic loops from the ears and pull the mask away from the face or untie the bottom ties or grasp the bottom elastics and then the top ties or elastics and pull the mask away from the face. Discard the mask in the proper receptacle.
    b. For reuse, leave the patient care area and carefully fold the face mask, keeping the outer surface held inward and against itself to reduce contact with the outer surface during storage. Store the mask between uses in a clean, sealable paper bag or breathable container.[1]

        Do not touch the outer surface of the face mask.

        Rationale: The front of the mask is contaminated. Touching only the elastic or mask strings protects ungloved hands from contamination. Untying the bottom mask string first prevents the top part of the mask from falling down over the health care team member's uniform.

5. Perform hand hygiene.
6. Leave the room and close the door. If an anteroom is used, ensure that both doors to the anteroom are never open at the same time.

Doffing the N95 Respirator or PAPR: Airborne Isolation

1. If the patient is in airborne isolation, remove the N95 respirator or PAPR after doffing all other PPE.

    a. To remove the mask, grasp the bottom ties or elastics and then the top ties or elastics and pull the mask away from the face.

        Do not touch the outer surface of the mask.

        Rationale: The front of the mask is contaminated. Touching only the elastic or mask strings protects ungloved hands from contamination. Untying the bottom mask string first prevents the top part of the mask from falling down over the health care team member's uniform.

    b. If the patient is on contact and airborne isolation, discard the N95 respirator in the proper waste container.

        Rationale: Humidity, dirt, and crushing reduce the efficiency of the mask.

Isolation Precautions: Personal Protective Equipment (Pediatric) - CE

c. Respirators are disposable, but the same individual may use them more than once. Store respirators between uses in a clean, breathable container (e.g., paper bag), in a dry place, and out of direct sunlight. Discard the respirator if it becomes wet or damaged.[2]

Rationale: Reusable storage bags keep equipment contaminant-free and should be labeled to prevent more than one person from wearing the mask. A damaged or crushed mask may not seal properly.

Use caution not to crush the mask. Do not leave the mask hanging around the neck.

d. Remove, disinfect, and store the PAPR per the manufacturer's instructions for use.
e. Perform hand hygiene.

2. Leave the anteroom and close the door.

Completing the Procedure

1. Ensure that specimens have been transported to the laboratory per the organization's practice.
2. Document the procedure in the patient's record.

MONITORING AND CARE

1. Ensure that equipment is disinfected with an organization-approved disinfectant when it is removed from the room, before use on another patient.

EXPECTED OUTCOMES

- Patient and family cooperate with isolation precautions.
- No evidence of breach of isolation precautions occurs.
- Health care team members are free from infection.

UNEXPECTED OUTCOMES

- Patient and family do not cooperate with precautions.
- Breach of isolation precautions occurs.
- Health care team member contracts the infection.

DOCUMENTATION

- Education
- Care provided
- Evidence of breach of isolation precautions
- Unexpected outcomes and related interventions

REFERENCES

1. Centers for Disease Control and Prevention (CDC). (2020). Coronavirus disease 2019 (COVID-19): Strategies for optimizing the supply of facemasks. Retrieved April 1, 2020, from https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/face-masks.html (Level VII)

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2. Centers for Disease Control and Prevention (CDC). (2020). Pandemic planning: Recommended guidance for extended use and limited reuse of N95 filtering facepiece respirators in healthcare settings. Retrieved April 1, 2020, from https://www.cdc.gov/niosh/topics/hcwcontrols/recommendedguidanceextuse.html (Level VII)
3. Joint Commission, The. (2020). National patient safety goals. Hospital accreditation program. Retrieved April 1, 2020, from https://www.jointcommission.org/-/media/tjc/documents/standards/national-patient-safety-goals/npsg_chapter_hap_jan2020.pdf (Level VII)
4. Siegel, J.D. and others. (2007, updated 2019). 2007 Guideline for isolation precautions: Preventing transmission of infectious agents in healthcare settings. Retrieved April 1, 2020, from https://www.cdc.gov/infectioncontrol/pdf/guidelines/isolation-guidelines-H.pdf (Level VII)

ADDITIONAL READING

Centers for Disease Control and Prevention (CDC). (n.d.). Sequence for putting on personal protective equipment (PPE). Retrieved April 1, 2020, from https://www.cdc.gov/hai/pdfs/ppe/ppe-sequence.pdf

Elsevier Skills Levels of Evidence

- Level I - Systematic review of all relevant randomized controlled trials
- Level II - At least one well-designed randomized controlled trial
- Level III - Well-designed controlled trials without randomization
- Level IV - Well-designed case-controlled or cohort studies
- Level V - Descriptive or qualitative studies
- Level VI - Single descriptive or qualitative study
- Level VII - Authority opinion or expert committee reports

Supplies

- Dedicated medical equipment (e.g., stethoscope, blood pressure cuff, thermometer) in the room
- Impervious linen bag and waste receptacles
- PPE (as needed for specific type of isolation required)
- Sign for door indicating type of isolation and required PPE

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Table 1 and Box 1 are on the following pages

Isolation Precautions: Personal Protective Equipment (Pediatric) - CE

Table 1: Centers for Disease Control and Prevention Isolation Guidelines Transmission-Based Precautions (Tier Two) for Use with Specific Types of Patients		
Category	**Infection or condition**	**Barrier protection**
Airborne precautions (droplet nuclei smaller than 5 microns)	Rubeola (measles), chickenpox, tuberculosis, coronavirus	Negative-pressure room with airflow of at least 6 to 12 exchanges per hour via HEPA filtration A fit-tested NIOSH-approved N95 or higher-level respirator Gown, gloves, and eye protection A surgical mask on the patient being transported out of isolation room
Droplet precautions (respiratory droplets larger than 5 micrometers that are generated by a patient who is coughing, sneezing or talking)	Diphtheria (pharyngeal), rubella, streptococcal pharyngitis, pneumonia, scarlet fever, pertussis, mumps, meningococcal pneumonia, or sepsis	Mask Private room Gown, gloves, and eye protection if contact is expected
Contact precautions (direct patient or environmental contact)	Colonization or infection with multidrug-resistant organisms such as VRE and MRSA, *Clostridium difficile*, *Shigella*, and other enteric pathogens; major wound infections; herpes simplex; scabies; varicella zoster (disseminated); RSV	Gown and gloves Mask and eye protection if splashing is expected Private room
Protective or reverse isolation precautions	Immunocompromised patients	Positive pressure room with airflow with 12 or more air exchanges per hour; HEPA filtration for incoming air Mask and gloves Mask to be worn by patient when in public environments

HEPA, high-efficiency particulate air; *MRSA*, methicillin-resistant *Staphylococcus aureus*; *NIOSH,* National Institute for Occupational Safety and Health; *RSV,* respiratory syncytial virus; *VRE*, vancomycin-resistant enterococcus

(Modified from Siegel, J.D. and others. [2007, updated 2019]. 2007 Guideline for isolation precautions: Preventing transmission of infectious agents in healthcare settings. Retrieved April 1, 2020, from https://www.cdc.gov/infectioncontrol/pdf/guidelines/isolation-guidelines-H.pdf)

Isolation Precautions: Personal Protective Equipment (Pediatric) - CE

Box 1 Centers for Disease Control and Prevention Isolation Guidelines
Standard Precautions (Tier One) for Use with All Patients

Standard precautions apply to blood, blood products, all bodily fluids, secretions, excretions (except sweat), nonintact skin, and mucous membranes.

- Perform hand hygiene before direct contact with patients and after direct contact with a patient's skin.
- Perform hand hygiene after contact with blood, bodily fluids, mucous membranes, nonintact skin, secretions, excretions, or wound dressings; after contact with inanimate surfaces or medical equipment in the immediate vicinity of the patient; and immediately after removing gloves.
- When hands are visibly soiled or contaminated with blood or bodily fluids, wash hands with either a nonantimicrobial soap and water or an antimicrobial soap and water.
- When hands are not visibly soiled or contaminated with blood or bodily fluids, use an alcohol-based hand rub to decontaminate the hands or wash hands with an antimicrobial soap and water.
- Wash hands with nonantimicrobial soap and water or an antimicrobial soap and water if contact with spores (e.g., *Clostridium difficile*) is likely to have occurred. Alcohols, chlorhexidine, iodophors, and other antiseptic agents have poor activity against spores.
- Do not wear artificial fingernails or extenders if duties include direct contact with patients at high risk for infection and associated adverse outcomes (e.g., ICU, OR settings).
- Wear gloves when it is likely that contact with blood, bodily fluids, secretions, excretions, nonintact skin, mucous membranes, or contaminated intact skin (e.g., patient incontinent of stool or urine) or items or surfaces is likely. Remove gloves and perform hand hygiene between patient care encounters and when going from a contaminated to a clean body site (e.g., face).
- Wear a gown when it is likely that contact with blood, bodily fluids, secretions, excretions, nonintact skin, mucous membranes, or contaminated intact skin or items or surfaces could occur.
- Remove gown and perform hand hygiene between patient care encounters. Do not reuse gowns, even for repeated contacts with the same patient.
- Routine donning of gowns upon entrance into high risk units is not indicated.
- Wear mouth, nose, and eye protection when the anticipated patient care activities are likely to generate splashes or sprays of blood or bodily fluids, secretions, and excretions.
- Select masks, goggles, face shields, and combinations of each based on the task performed and the agent the patient is suspected of being infected with (e.g., *M. tuberculosis*, SARS, or hemorrhagic fever viruses).
- Respiratory hygiene and cough etiquette—have patients and accompanying individuals:
    - Cover the nose and mouth, or both when coughing or sneezing.
    - Use tissues to contain respiratory secretions and dispose in nearest no-touch waste container.
    - Perform hand hygiene after contacting respiratory secretions and contaminated objects or materials.
    - Contain respiratory secretions with procedure mask for coughing or other symptomatic patients.
    - Sit at least 91.4 cm (3 ft) away from others if coughing.

Box 1 is continued on the next page

Isolation Precautions: Personal Protective Equipment (Pediatric) - CE

Box 1 continued from the previous page

- Wear PPE (e.g., gloves, gown), according to the level of anticipated contamination, when handling patient care equipment and instruments or devices that are visibly soiled or may have been in contact with blood or bodily fluids.
- Discard all contaminated sharp instruments and needles in a puncture-resistant container. Health care facilities must make needleless devices available. Any needles should be disposed of uncapped, or a mechanical safety device must be activated for recapping.
- Infection control practices for special lumbar puncture procedures: Wear a procedure mask when placing a catheter or injecting material into the spinal canal or subdural space (i.e., during myelograms, lumbar puncture, and spinal or epidural anesthesia).

ICU, intensive care unit; *OR,* operating room; *PPE,* personal protective equipment; *SARS,* severe acute respiratory syndrome

(Modified from Siegel, J.D. and others. [2007, updated 2019]. 2007 Guideline for isolation precautions: Preventing transmission of infectious agents in healthcare settings. Retrieved April 1, 2020, from https://www.cdc.gov/infectioncontrol/pdf/guidelines/isolation-guidelines-H.pdf)

