

Transmission-based precautions for the prevention and control of infections

Background

Transmission-based precautions are used in addition to *standard precautions* for patients with known or suspected infection or colonization¹ with transmissible and/or epidemiologically significant pathogens (1). The type of **transmission-based precautions** assigned to a patient depends on the transmission route of the microorganism: contact, droplet, or airborne.

Standard precautions are required for **all** patients, in **any** health care setting. The following resources should be consulted for additional information about *standard precautions*:

- Aide-memoire: *Standard precautions* (<https://apps.who.int/iris/bitstream/handle/10665/356855/WHO-UHL-IHS-IPC-2022.1-eng.pdf>)
- *Standard precautions*: Hand hygiene (<https://openwho.org/courses/IPC-HH-EN>)
- *Standard precautions*: The role of personal protective equipment (<https://openwho.org/courses/IPC-SP-PPE-EN>)
- *Standard precautions*: Waste management (<https://openwho.org/courses/IPC-WM-EN>)
- *Standard precautions*: Environmental cleaning and disinfection (<https://openwho.org/courses/IPC-EC-EN>)

Transmission-based precautions must be started as soon as a patient presents with symptoms (e.g. fever, new cough, vomiting, diarrhoea). There is no need to wait for test results.

Contact transmission is the spread of an infectious agent caused by physical contact of a susceptible host with people or objects (2).

- Direct contact transmission involves both a direct body-surface-to-body-surface contact and physical transfer of microorganisms between an infected or colonized person and a susceptible host.
- Indirect contact transmission involves contact of a susceptible host with a contaminated intermediate object (e.g., contaminated hands) that carries and transfers the microorganisms.

Examples of pathogens that can spread via contact transmission include many gastrointestinal pathogens

that cause diarrhoea, and bacteria such as *Klebsiella pneumoniae*, *Escherichia coli*, *Staphylococcus aureus* and Ebola virus (1,3).

Droplet transmission is the spread of an infectious agent caused by the dissemination of droplets. Droplets are primarily generated from an infected (source) person during coughing, sneezing and talking. Transmission occurs when these droplets that contain microorganisms are propelled (usually < 1 m) through the air and deposited on the conjunctivae, mouth, nasal, throat or pharynx mucosa of another person. Most of the volume (> 99%) comprises large droplets that travel short distances (< 1 m) and do not remain suspended in the air. Thus, special air handling and ventilation are not required to prevent droplet transmission (2).

Examples of pathogens that spread via droplet transmission include seasonal influenza virus, *Corynebacterium diphtheriae* (pharyngeal diphtheria), *Neisseria meningitidis* (meningococcal meningitis), *Yersinia pestis* (pneumonic plague), rubella virus (German measles), and *Bordetella pertussis* (pertussis) (1,3).

Airborne transmission is the spread of an infectious agent caused by the dissemination of droplet nuclei that remain infectious when suspended in air over long distances and time. Airborne transmission can be further categorized into obligate or preferential airborne transmission (2).

- Obligate airborne transmission refers to pathogens that are transmitted only by deposition of droplet nuclei under natural conditions (e.g. pulmonary tuberculosis).
- Preferential airborne transmission refers to pathogens that can initiate infection by multiple routes, but are predominantly transmitted by droplet nuclei (e.g. measles and chickenpox).
- Opportunistic airborne transmission refers to agents that naturally cause disease through other routes, but under special circumstances may be transmitted via fine particle aerosols.²

Examples of pathogens that spread via airborne transmission are *Mycobacterium tuberculosis* (tuberculosis), varicella zoster virus (Herpes zoster/shingles), rubeola virus (measles) (1,3).

1. Colonization occurs when microorganisms are present on a host individual but the individual does not show clinical symptoms or findings of an active disease. A colonized individual can transmit infectious microorganisms to other individuals.
2. Current WHO list of aerosol-generating procedures: tracheal intubation, non-invasive ventilation (e.g., BiLevel positive airway pressure, continuous positive airway pressure), tracheotomy, cardiopulmonary resuscitation, manual ventilation before intubation, bronchoscopy, sputum induction by using nebulized hypertonic saline, dentistry and autopsy procedures.



Important advice for implementation

Health policy

- Promote a safety climate.
- Develop policies which facilitate the implementation of infection prevention and control measures.
- Provide hand hygiene supplies and personal protective equipment (PPE).
- Limit the number of visitors, according to local policy.

Screening

- Screen patients on arrival for presence of signs and symptoms (e.g., fever and cough, diarrhoea) that require **transmission-based precautions**. Implement *transmission-based precautions* empirically at the time a patient develops or presents with infectious disease signs or symptoms or when an infectious disease is suspected or confirmed, so as to reduce opportunities for transmission (1,3).

Placement

Place patients according to their symptom presentation:

- Physically separate patients with infectious symptoms from others;
- Prioritize single-patient rooms for patients likely to be most infectious (e.g., coughing, diarrhoea, fever) (1,2).

Cohorting

- **Cohort patients** – place patients with similar symptoms and diagnosis in one area to confine their care and prevent contact with other patients (1,2).
- **Cohort staff** – dedicate health workers so that only a limited number of staff are interacting with patients in isolation (1).

Environment and equipment

- Provide additional environmental cleaning resources as required for isolation room and cohort areas, focusing on frequently touched surfaces (1).
- Optimize indoor air ventilation to reduce risk of droplet and airborne disease transmission (3,4). For further information, refer to [Roadmap to improve and ensure good indoor ventilation in the context of COVID-19](#) (5).

Staff education

- Provide staff with education about the components of **transmission-based precautions**, so they can implement them right away on recognition of symptoms (e.g. spatial separation, private room, PPE, additional cleaning) (4).

Communication

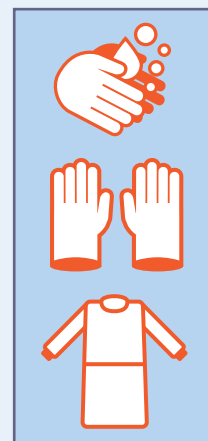
- Use signage that clearly alerts health workers to precautions that need to be taken in the care of the patient (e.g. PPE, dedicated equipment, transport of patient, hand hygiene, patient placement, ventilation requirements) (1).

Key elements

Contact precautions

Health workers should:

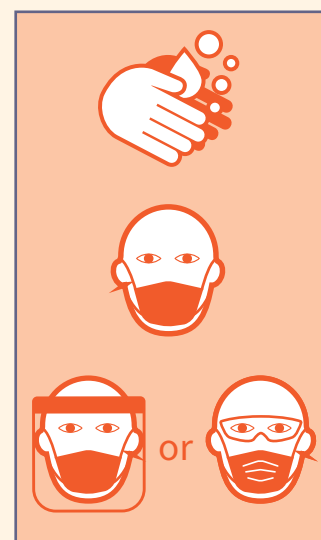
- Wear a gown to enter a patient room and remove it prior to exit (1,6)
- Put on gloves before entering a patient room and remove them prior to exit (1,6)
- Perform hand hygiene immediately after gown and glove removal, before contact with another patient (1,6)
- Place patient in a single room (1,6)
- Cohort patients with similar symptoms and diagnosis, if a single room is not available (1,6)
- Avoid having patients share a toilet, if they are in a shared room (1,6)
- Use disposable or dedicated patient-care equipment (e.g. stethoscopes) and clean and disinfect equipment before use on other patients (1,6)
- Cover any wounds or lesions on the patient's body if transport is necessary (1,6)



Droplet precautions

Health workers should:

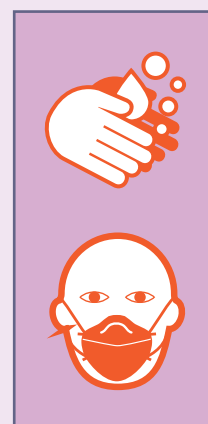
- Put on a medical mask before entering the patient room and remove it upon exit. Wear additional PPE if indicated, based on a risk assessment (1,2)
- Perform hand hygiene before and after the use of masks (1,2)
- Place patient in a single room (1,2)
- Consider the following when single-patient rooms are not available:
 1. Prioritize any single-patient rooms for patients with excessive cough and sputum production (1,2)
 2. Cohort patients with the same symptoms, suspect diagnosis and confirmed diagnosis
 3. Physically separate patients by at least 1 metre (3 feet) and draw privacy curtains
- Use disposable or dedicated patient-care equipment (e.g. stethoscopes) and clean and disinfect equipment before use on other patients (1,2)
- Instruct the patient to wear a mask and follow respiratory hygiene and cough etiquette when transport is necessary (1,2)



Airborne precautions

Health workers should:

- wear a respirator (e.g., N95, FFP2, etc.) before entering the room and remove it after exiting the room (1,2);
- perform a respirator seal-check (2);
- perform hand hygiene before and after the use of respirators (1,2);
- place the patient in an airborne infection isolation room (AIIR) (1,2) which includes:
 1. negative pressure (air flows from corridor to inside the patient room) compared to the corridor, and six to twelve air exchanges per hour;
 2. direct exhaust of air to the outside, away from places where people walk or congregate, and any air intake openings;
 3. a door kept closed when not required for entry and exit;
- place patient(s) in a well-ventilated area with doors closed, if an AIIR is not available (1,2);
- take the following actions to optimize natural ventilation:
 1. Use a room that has good cross-ventilation (two or more windows that open) to the outdoors (5,7);
 2. Use an exhaust fan in one window to assist moving room air to the outdoors, making sure the exhaust window is away from people and any air intake openings (5,7);
 3. Turn off air-conditioning and open windows to enhance ventilation if an independent air supply is not available (5,7);
 4. Keep the door to the hallway closed, except for when health workers enter and exit the room (5,7);
- use disposable or dedicated patient-care equipment (e.g. stethoscopes) and clean and disinfect equipment before use on other patients (1,2);
- instruct the patient to wear a medical mask and follow respiratory hygiene and cough etiquette when transport is necessary (1,2).



References and additional resources

1. Transmission-based precautions. In: Infection Prevention and Control [online course series]. Geneva: World Health Organization; 2021 (<https://openwho.org/channels/ipc>).
2. Infection prevention and control of epidemic- and pandemic-prone acute respiratory infections in health care. Geneva: World Health Organization; 2014 (<https://apps.who.int/iris/handle/10665/112656>).
3. Siegel JD, Rhinehart E, Jackson M, Chiarello L, and the Healthcare Infection Control Practices Advisory Committee, 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. Centres for Disease Control and Prevention. (<https://www.cdc.gov/infectioncontrol/guidelines/isolation/index.html>)
4. Minimum requirements for infection prevention and control programmes. Geneva: World Health Organization; 2019 (IRIS link: <https://apps.who.int/iris/handle/10665/330080>).
5. Roadmap to improve and ensure good indoor ventilation in the context of COVID-19. Geneva: World Health Organization; 2021 (<https://apps.who.int/iris/handle/10665/339857>).
6. Guidelines for the prevention and control of carbapenem-resistant Enterobacteriaceae, Acinetobacter baumannii and Pseudomonas aeruginosa in health care facilities. Geneva: World Health Organization; 2017 (<https://apps.who.int/iris/handle/10665/259462>).
7. Natural Ventilation for Infection Control in Healthcare Settings. Geneva: World Health Organization; 2021 (<https://apps.who.int/iris/handle/10665/44167>)