

Chapter 9

Isolation Precautions

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Key points

- Microorganisms causing healthcare associated infections (HAI) can be transmitted from infected and colonised patients to other patients and staff.
- Appropriate isolation precautions (IP) for infected and colonised patients can reduce the risk of transmission if they are applied properly.
- The objective of IP policy is to decrease the transmission of infectious agents between staff and patients to such a level that infection or colonisation does not occur.
- IP policies have several parts: hand hygiene, protective clothing, single rooms with more or less sophisticated ventilation, and restrictions for movement of patients and staff.
- Apply IP according to signs and symptoms; do not wait for laboratory results. Infectious patients include those with diarrhoea and vomiting, gross bleeding, fever and exanthema, cough and fever, and large discharging wounds.

Introduction

There are three fundamental principles for health care of patients with a transmissible infection:

1. What will IP achieve?
2. What is the route of transmission of the infectious agent?
3. Can you prevent infection between patients, or between patients and health care workers (HCW)?

IP policies are debated, internationally, nationally and locally. Some of the main areas of debate are:

- Ventilation of isolation rooms
- Nature and significance of airborne transmission
- Placement of patients and the role of screening cultures
- Importance of clothing in transmission of infection
- Hand hygiene - soap and water or alcoholic rub
- Gloves and gowns for close contact only or when entering an isolation room
- Use of masks
- Environmental disinfection at regular intervals or when needed

Evidence is sometimes difficult to find. Publications rarely provide detailed information or take into account the relative importance of a preventive measure (e.g., if hand hygiene is poor, single rooms do not help). Investigations on IP are difficult and costly and are therefore rare. Outbreak reports are numerous, but cannot be used to estimate the effects of preventive measures, as it is usually very hard to determine what actually terminated the outbreak.

Transmission of Infection

To interrupt the chain of transmission, we first need to review the routes for transmission of microorganisms. They can be categorized as follows:

Contact Transmission

- Direct contact, e.g., a surgeon with an infected wound on a finger performs a wound dressing.

- Indirect contact, e.g., secretions transferred from one patient to another via the hands of a HCW.
- Faecal-oral via food.

Bloodborne Transmission

Blood is transferred via sharps or needle stick injuries, transfusion or injection.

Droplet Transmission

Infectious droplets that are expelled, e.g., when sneezing, coughing, vomiting. The droplets are too heavy to float in the air and fall < 2 m from the source.

- Direct droplet transmission. Droplets reach mucous membranes or are inhaled.
- Droplet to contact transmission. Droplets contaminate surfaces/hands and are transmitted to another site, e.g., mucous membranes. Indirect droplet transmission is often more efficient than direct transmission. Examples are: common cold, respiratory syncytial virus.

Airborne Transmission

Small particles carrying microbes are transferred as aerosols via air currents for > 2m from the source, e.g., droplet nuclei or skin scales.

- Direct airborne transmission. Particles are inhaled (e.g., *Varicella zoster*) or contaminate wounds (e.g., *S. aureus*).

Standard Precautions

These precautions are taken with every patient, independent of any known condition (e.g., infected or colonised). Standard precautions are designed to prevent cross transmission before a diagnosis is known. Some areas use the term routine practices instead of standard precautions.

Standard precautions include

- hand disinfection with alcohol, or hand washing before and after patient care;
- disposable gloves on contact with blood and body fluids;
- protective apron or gown if there is an expectation of contact with

body fluids; and

- mask and goggles or other face protection if there is an expectation of splashing to the face.

The routes of transmission that are prevented by basic hygienic precautions are

- Contact
- Bloodborne
- Droplet

Ward Design

Wards can be designed to facilitate standard precautions. Washbasins are needed for good hand hygiene, as hands should be washed when visibly dirty. However, hand hygiene is not improved by installing >1 sink per 6 beds.¹ Dispensers for alcohol hand rubs must be placed where they are easy to reach. In high-risk wards one per bed is desirable.

Space between beds is important. Beds should be at least far enough apart that a nurse cannot touch both beds at the same time. Decreasing the distance between beds from 2.5 to 1.9 m increases transfer of MRSA 3.15 times.² Spread of MRSA can be directly related to overcrowding.³ If gowns are used, a separate gowning area may be useful.

Prevention of Airborne Transmission

Airborne transmission between patients can be prevented in several ways. Simply placing the patient in a single room (including bathroom facilities) reduces the risk of transmission.

Use of single rooms prevents transmission, but ventilated rooms with negative or positive pressure are difficult to maintain, and have not been shown to be more effective for preventing spread of tuberculosis than single rooms with the doors closed. Single rooms with ventilated anterooms (airlocks) reduce the risk of air movement between room and corridor. They are easier to maintain but costly to build. If several patients have an infection caused by the same agent, they can share the same room (cohort isolation).

Prevention of airborne transmission within a room by turbulent ventilation (dilution of aerosols) is extremely difficult. High numbers of particles are emitted from a patient with tuberculosis (TB) when coughing or sneezing. These are unlikely to be rapidly diluted by ventilation.⁴

Placement of Patients

In most cases standard precautions are sufficient; however placement of patients into different types of rooms may be useful in some circumstances. Placement of patients should be based on clinical signs and not on culture results.

When placing patients, the following should be considered:

- Single room (including bathroom) when gross contamination of the environment is likely (e.g., large wounds with heavy discharge, massive uncontrolled bleeding, diarrhoea).
- Single room, door closed when airborne to contact transfer is likely (e.g., injured skin with Gram positive infection).
- Single room ventilated to the outside when airborne transfer is likely (e.g., TB).
- Single room with airlock when massive airborne transfer is likely (e.g., varicella).

Use of a single room is not the whole solution to preventing spread of microbes. In an intensive care unit with eight single rooms observed for three years, methicillin-resistant *S. aureus* (MRSA) isolation was practiced after positive surveillance culture. Despite this, 56 patients admitted from the community with undiagnosed MRSA caused 80 healthcare-associated cases. Transmission stopped when barrier nursing of ALL patents was introduced.⁵ Surveillance cultures are costly, have a low sensitivity, usually focus on one or two infectious agents and divert attention and resources from more important areas of concern. They may, however, be helpful in an outbreak.

Staff, Equipment and Surfaces

To keep staff, equipment and surfaces clean is one of the main objectives of infection prevention and control. The Oxford English Dictionary

defines *clean* as:

- free from dirt, marks, or stains
- having been washed since last worn or used
- (of a person) attentive to personal hygiene
- free from pollutants or unpleasant substances

Hands

Hand disinfection is a most important part of patient IP – see Chapter 8.

Gloves

Where contamination is great, hand disinfection may not be enough to block contact transmission. When touching secretions, hands need protection by using clean disposable gloves. However gloves are often overused. In one study, 120 HCW were observed during 784 patient contacts. Gloves were used in 93,5% of contacts but were needed only in 58%. 82% of the contacts that should have been aseptic were performed with dirty gloves. Hand disinfection was not performed in 64% of contacts.⁶ Disinfection of gloves with alcohol is ineffective, dissolves the glove material, and should not be practised.

Clothes

Contamination of working clothes can be considerable, and can be reduced 20-100 times by wearing a protective gown.⁷ Wearing a plastic apron during nursing procedures reduced the transmission of *S. aureus* in abdominal surgery cases to the patient's bed by thirty times, as compared to wearing a uniform changed daily.⁸

Masks

Masks, goggles, and visors are protection against blood splashes. There is no evidence that an operating room mask protects staff or patients against colonisation or infection of the respiratory tract. A respirator may be used as protection against tuberculosis (especially multi- or extended-drug resistant).

Environmental Surface

Surfaces are becoming more of a problem in infection prevention and control. See Chapter 17 for information.

Family Members Providing Care to Patients in Hospitals

It is very important that family members providing care to patients in hospitals be educated by the staff to use good hygiene and appropriate IP to prevent spread of infections to themselves and to other patients. The precautions for family members should be the same as those used by the staff, excluding the use of gloves.

IP Policy

In all patient care, transfer of potentially harmful microorganisms between patients and staff must be avoided. For this reason, the following general precautions are used:

- Regard all patient blood, excretions and secretions as potentially infectious and institute standard precautions for all patients to minimise risks of transmission of infection
- Decontaminate hands between each patient contact.
- Wash hands promptly after touching infective material (blood, body fluids, secretions, or excretions).
- Use no touch technique when possible to avoid touching infective material.
- Wear gloves, if available, when in contact with blood, body fluids, secretions, excretions and contaminated items. Disinfect hands immediately after removing gloves. Change gloves between patients.
- Dispose of faeces, urine and other patient secretions via designated sinks, and clean and disinfect bedpans, urinals and other containers appropriately. (See Chapter 10)
- Clean up spills of infective material promptly. (See Chapter 10) General disinfection of floors and walls is then not necessary.
- Ensure that patient-care equipment, supplies, and linen contaminated with infective material is cleaned and/or disinfected between each patient use. (See Chapters 10 and 17)

References and Further Reading

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