



Infection control precautions to minimise transmission of Respiratory Tract Infections (RTIs) in the healthcare setting

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Citation

Infection control precautions to minimise transmission of seasonal influenza in the healthcare setting, 2011-12. Health Protection Agency 2012

Foreword

The general information contained within section one of this document sets the scene for more specific guidance on transmission-based precautions to interrupt the transmission of Respiratory Tract Infections, with particular focus on influenza. However, where vaccines are available for a particular infection they should be used as the first line of defence. The use of influenza vaccine still remains the best protection there is and the majority of people who are given the vaccine will not get flu. The information contained within this document is for the use of clinical and public health colleagues.

Acknowledgements

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Part 1: General information

1.1 Respiratory infections as a communicable disease

A respiratory tract infection (RTI) is an infectious process affecting any part of the upper and/or lower airways. Symptoms of RTI can include any of the following: fever, rhinorrhoea (runny nose), sore throat and cough, limb or joint pain, headache, lethargy, chest pain and breathing difficulty.

Common causes of RTIs include viruses such as: rhinoviruses, coronavirus, influenza and Respiratory Syncytial Virus (RSV); and bacteria such as pneumococci (*S. pneumoniae*) and haemophilus (*H.influenzae*).

The majority of RTIs are self-limiting, viral infections of the upper respiratory tract. Although RTIs can happen at any time, they are most common from September through till March. The peak activity for RTIs due to influenza occurs during the autumn and winter seasons in temperate regions. In some tropical countries, influenza viruses circulate throughout the year with one or two peaks during rainy seasons. Worldwide, the epidemics of influenza result in about three to five million cases of severe illness, and about 250,000 to 500,000 deaths each year. Most deaths associated with influenza in industrialized countries occur among people age 65 or older.

S.pneumoniae and *H.influenzae* are components of the normal upper respiratory tract flora. Infections with these organisms are often secondary to a prior viral infection.

1.2 Routes of transmission

The pathogens that cause RTIs are spread through one or more of four main routes:

Droplet transmission:

Droplets greater than 5 microns in size may be generated from the respiratory tract during coughing, sneezing or talking. If droplets from an infected person come into contact with the mucous membranes (mouth or nose) or surface of the eye of a recipient, they can cause infection. These droplets remain in the air for a short period and travel about one metre, so closeness is required for transmission.

The airborne route during and after Aerosol Generating Procedures (AGPs):

AGPs can produce droplets <5 microns in size. These small droplets can remain in the air, travel more than one metre from the source and still be infectious, either by mucous membrane contact or inhalation.

Direct contact transmission:

Infectious agents are passed directly from an infected person (for example after coughing into their hands) to a recipient who then transfers the organism into their mouth, nose or eyes.

Indirect contact transmission:

This takes place when a recipient has contact with a contaminated object, such as bedding, furniture or equipment which is usually in the environment of an infected person. Again, the recipient transfers the organisms from the object to their mouth, nose or eyes.

1.3 Incubation period

The time between exposure to a pathogen and developing symptoms of infection by the pathogen is the incubation period. Some of the common pathogens for RTIs and their respective incubation times¹ are:

- Rhinoviruses: 1-5 days
- Pneumococcal and haemophilus infections: 1-5 days
- Influenza and parainfluenza viruses: 1-4 days
- Respiratory Syncytial viruses (RSV): 7 days
- Pertussis (whooping cough): 7-21 days

1.4 Period of communicability

Depending on the organism, the period of communicability is the time period over which an infected person can spread the infection to someone else. For RTIs this can be up to 10 days, however, for some organisms e.g. Tuberculosis (TB) this may be longer. The infectious period for influenza is 3-7 days or until patients are asymptomatic.

Immuno-compromised individuals and the seriously ill may remain infectious for a much longer period.

1.4 Persistence in the environment

Experimental studies on the survival of respiratory pathogens suggest that, depending on the organism, the type of surface and the organic material load, they can survive for a limited time in the environment. Evidence shows that infectious influenza particles can be transferred from environmental surfaces to hands, for up to 24 hours after contamination takes place. Hygiene and environmental cleaning is therefore important in helping to control spread through contact. Careful and frequent hand washing or the use of alcohol hand gel/rub is recommended as per the WHO five moments². The virus can also be deposited on and subsequently transferred from soft materials e.g. pyjamas, magazines and tissues for up to 2 hours³.

1.5 Persons most at risk of developing complications

Some people will be at greater risk of developing complications (typically pneumonias) from RTIs and becoming more seriously ill e.g.:

- People aged 5 to 65 years with:
 - Chronic lung disease
 - Chronic heart disease
 - Chronic kidney disease
 - Chronic liver disease
 - Chronic neurological disease
 - Immuno-suppression (whether caused by disease or treatment)
 - Diabetes mellitus
- Pregnant women
- Young children under 5 years old
- People aged 65 years and older

1.5 High risk environment

A high risk environment for transmission includes clinical settings where Aerosol Generating Procedures (AGPs) are undertaken in open or communal patient areas. High risk environments for acquisition include areas where patients with severe immuno-suppression are being cared for.

Part 2: Transmission-based precautions

This section describes the precautions that can be taken to reduce the risk of transmitting respiratory infections. These precautions should be used in conjunction with local policies and risks assessments.

Standard infection control precautions are required by all healthcare workers (HCWs) for the care of patients and patients' environments to prevent cross-transmission from recognised and unrecognised sources of infection. Transmission-based precautions are used when the route(s) of infection transmission is (are) not completely interrupted using standard infection control precautions alone.

There are three categories of transmission-based precautions:

- Droplet Precautions
- Contact (direct and indirect) Precautions
- Airborne Precautions

Interrupting transmission of a respiratory pathogen requires more than one transmission-based precautions category:

- The use of droplet and contact precautions at all times.
- The addition of airborne precautions whilst undertaking an AGP.

2.1 Droplet precautions

Droplet precautions are designed to minimise transmission of respiratory pathogens from infected patients to the mucous membranes of susceptible persons.

Patient Placement:

- Place patient in a single room.
- If a single room is not available then cohort confirmed respiratory infected patients with other patients confirmed to a RTI caused by the same pathogen, taking account of the possibility of infection with one or more pathogens at any one time.
- If single rooms are in short supply, and cohorting is not yet possible (awaiting laboratory confirmation), prioritise patients who have excessive cough and sputum production for single room placement.
- Ensure patients are physically separated (i.e. >one metre apart) from each other and draw the privacy curtains between the beds to minimise opportunities for close contact.
- Special environment controls such as negative pressure rooms are **not** necessary to prevent droplet transmission.
- Display signage to control entry into isolation/cohort areas.
- Limit transport and movement of patients outside of their room to medically-necessary purposes. If patient movement or transport is necessary, then if possible,

the patient should wear a surgical face mask to minimise the dispersal of respiratory secretions and reduce environmental contamination.

- No mask is required by HCWs transporting patients on droplet precautions.
- If an AGP is undertaken then the patient should be relocated as per the advice on airborne precautions in this guidance.

When undertaking a local risk assessment to decide the best patient placement to reduce cross-transmission, it may be reasonable to assume that patients admitted with complications of influenza, i.e. who have had symptoms for 3-4 days, and who are immunocompetent, may be less infectious than those who are admitted with new influenza-like symptoms.

Respiratory Hygiene / Cough Etiquette (Catch it, Bin it, Kill it):

Patients should be instructed to follow the recommendations for Respiratory Hygiene / Cough Etiquette:

- Use a disposable, single use tissue to cover mouth and nose when coughing, sneezing, wiping or blowing noses.
- Dispose of tissues promptly and then wash hands.
- Hands should be washed after coughing, sneezing and using tissues.
- Some patients (e.g. older people and children) may need assistance with containment of respiratory secretions.

Use of Personal Protective Equipment (PPE):

- HCWs assessing / caring for patients who are suspected (clinically diagnosed) or confirmed with a RTI are advised to wear a surgical face mask when in close contact with the patient (within 3 feet / one metre).
- When patients with RTI are cohorted in one area and multiple patients require care, it may be more practical to put on a surgical face mask on entry to the area and keep it on for the duration of all care activities or until the mask requires replacement (when it becomes moist or damaged).
- Surgical face masks do not need to be worn continuously and should not be seen as a substitute for good hand hygiene.
- Surgical face masks should be removed and disposed of inside the patient room once more than one metre from the patient(s).
- Regardless of whether staff have had, and recovered from a specific respiratory pathogen or have received vaccine for that organism, they should continue to follow the infection control precautions including PPE¹.

2.2 Contact precautions

Contact precautions are designed to prevent transmission of infection by direct or indirect contact with the patient or the patient's environment:

Hand hygiene:

- Hand hygiene is the most effective way to prevent transmission by **direct contact**. Hand washing must be performed after removing all PPE and:
 - Before touching a patient

¹ Employers are under legal obligation under COSHH to adequately control the risk of exposure to the virus where it can't be prevented. Employees have an obligation to make full and proper use of any control measures, including PPE, provided by their employer. Vaccination cannot be used as a substitution for such controls as it is not always fully effective in all cases.

- Before clean / aseptic procedure
- After body fluid exposure risk
- After touching a patient
- After touching the patient's surroundings

To decontaminate hands use alcohol handrub / gel if hands are visibly clean. Use soap and water if hands are visibly soiled.

Use of PPE:

Plastic apron and gloves should be worn in accordance with standard infection control precautions, that is:

- Wear a plastic apron if soiling of clothes / uniform with a patient's respiratory secretions is anticipated; in reality this would apply to most situations.
- Wear gloves if hand contact with respiratory or potentially contaminated surfaces is anticipated.
- Change plastic apron and gloves and perform hand hygiene between contacts with patients (even when they are in the same room).

Patient care equipment:

- Equipment should as far as possible be allocated to the individual patient or cohort of patients.
- Reusable equipment must be decontaminated after patient use and between each patient. No additional decontamination is required for this equipment; follow local decontamination policy and equipment specific manufacturers' instructions.
- Avoid use of fans that re-circulate the air.

Environmental measures:

- Ensure that the rooms of patients with infection are prioritised for frequent cleaning (at least daily) with a focus on frequently-touched surfaces (e.g. over-bed tables, lockers, lavatory surfaces in patient bathrooms, door knobs) and equipment in the immediate vicinity of the patient. These frequently touched surfaces must be decontaminated throughout the day and immediately if visibly contaminated.
- In addition, it is essential that all frequently-touched surfaces should be decontaminated after any AGP.
- Keep environment clean and clutter free.
- Use disposable cloths and detergent solution no additional disinfection required.
- Terminal clean of all isolation / cohort rooms as per local infection control team policy. Additional disinfection is not required.

Linen:

- Treat as used; bag linen as per local policy for handling used linen safely.

2.3 Airborne precautions

Airborne precautions are designed to prevent transmission of infectious agents that remain infectious when suspended in the air and can travel over long distances.

Unless an AGP is performed this mode of transmission is not considered important in the transmission of respiratory pathogens causing RTIs.

The evidence necessary to establish which AGPs are associated with transmission of respiratory pathogens is poorly established and mostly anecdotal. Studies are of

variable quality and rigour⁴. From the available literature and incorporating UK expert opinion, the following procedures are considered likely to generate aerosols capable of transmitting respiratory pathogens when undertaken on patients with a RTI.

- Intubation, extubation and related procedures, for example manual ventilation and open suctioning
- Cardiopulmonary resuscitation
- Bronchoscopy
- Surgery and post mortem procedures in which high-speed devices are used
- Non Invasive Ventilation (NIV) e.g. Bilevel Positive Airway Pressure Ventilation (BiPAP) and Continuous Positive Airway Pressure Ventilation (CPAP)
- High Frequency Oscillatory Ventilation (HFOV)
- Induction of sputum

Certain other procedures/equipment may generate an aerosol from material other than patients' secretions but are **NOT** considered to represent a significant infectious risk. Procedures in this category include:

- Administration of pressurised humidified O₂
- Administration of medication via nebulisation

During nebulisation, the aerosol derives from a non-patient source (the fluid in the nebuliser chamber) and does not carry patient-derived viral particles. If a particle in the aerosol coalesces with a contaminated mucous membrane, it will cease to be airborne and therefore will not be part of an aerosol.

Use of PPE:

- For all AGPs, an FFP3 respirator (EN149:2001), fluid repellent gown, gloves and eye protection e.g. goggles or full face visor should be worn.
- Any HCW required to wear an FFP3 respirator should have undertaken FFP3 respirator fit testing prior to using it⁵.
- In the event of a breach in infection control procedures e.g. incorrectly worn FFP3 respirator during an AGP, staff should be reviewed by Occupational Health.
- AGPs procedures should only be carried out when essential. Where possible, these procedures should be carried out in well-ventilated single rooms with the doors shut. Only those healthcare workers who are needed to undertake the procedure should be present. A gown, gloves, eye protection and an FFP3 respirator should be worn by those undertaking these procedures and by those in the same room. In post-mortem examinations where high-speed devices are used, the use of a powered respirator can be considered as an alternative to a FFP3 respirator.
- Where feasible, environmental cleaning should be performed when it is considered appropriate to enter without an FFP3 respirator.
- Visitors to patients ventilated with NIV or HFOV may be exposed to potentially infectious aerosols. The number of such visitors should be limited where possible. Visitors should be made aware of the risks and be offered PPE as recommended for staff.

2.4 Duration for the requirement of transmission-based precautions

In the main the duration of isolation precautions for hospitalised patients should be continued for 24 hours after the resolution of fever and respiratory symptoms. For prolonged illness with complications i.e. pneumonia, control measures should be used during the duration of acute illness i.e. until the patient has improved clinically.

Immuno-suppressed patients may remain infectious for a longer time period and are also at risk for development of antiviral-resistant virus. The decision to discontinue isolation should be based on assessment of the patient's clinical condition and agreement with the ICT.

References

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