

# Epidemic-prone & pandemic-prone acute respiratory diseases

Infection prevention & control in health-care facilities

*Summary guidance*





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## Acknowledgements

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# TABLE OF CONTENTS

<b>1.0 INTRODUCTION .....</b>	<b>3</b>
<b>2.0 EARLY RECOGNITION, ISOLATION &amp; REPORTING .....</b>	<b>6</b>
<b>3.0 STANDARD PRECAUTIONS .....</b>	<b>8</b>
3.1 Hand hygiene .....	9
3.2 Personal protective equipment (PPE) according to Standard Precautions .....	12
Gloves .....	15
Gowns & aprons .....	16
Facial mucosa protection .....	17
3.3 Respiratory hygiene & cough etiquette .....	20
3.4 Prevention of injuries from needles & other sharp instruments .....	21
3.5 Cleaning & disinfection of respiratory equipment .....	22
3.6 Cleaning the patient-care environment .....	23
3.7 Linen & waste management .....	25
<b>4.0 DROPLET PRECAUTIONS .....</b>	<b>26</b>
<b>5.0 CONTACT PRECAUTIONS .....</b>	<b>27</b>
<b>6.0 AIRBORNE PRECAUTIONS .....</b>	<b>28</b>
<b>7.0 SELECTING &amp; USING MASKS IN HEALTH CARE .....</b>	<b>30</b>
<b>8.0 PATIENT AREAS &amp; PATIENT TRANSPORTATION .....</b>	<b>32</b>
8.1 Environmental ventilation .....	34
8.2 Transport of patients .....	35
<b>9.0 MORTUARY CARE &amp; POST-MORTEM EXAMINATION .....</b>	<b>36</b>



# 1.0 INTRODUCTION

## Advice for health-care workers on infection control of acute respiratory diseases (ARDs).

The advice in this booklet is drawn from the WHO guidelines entitled “*Infection prevention and control of epidemic- and pandemic-prone acute respiratory diseases in health care. WHO Interim Guidelines*” published in 2007<sup>1</sup>. For more detailed information concerning any of the subjects covered in this booklet, readers should refer to the full Guidelines.

ARDs discussed in this booklet include those with epidemic and pandemic potential and in particular, ARDs of potential international public health concern. The latter includes: severe acute respiratory syndrome (SARS), human cases of avian influenza infection, and novel, not previously reported ARDs that can cause large-scale outbreaks with high morbidity and mortality.

Most ARDs are transmitted via droplets. However, other modes of transmission are also possible for some pathogens, such as through contact with contaminated hands or surfaces. The advice provided in this booklet on infection control is designed, therefore, to cover all reported modes of transmission.

### Key recommendations

- **Report** any suspected case of an ARD of potential concern, including SARS and human infection with avian influenza, to the relevant public health authorities immediately.
- **Isolate** any suspected case of ARD of potential concern from other patients immediately and ensure they are provided with appropriate treatment and care.

- **Apply Standard Precautions** whenever providing care to a patient, regardless of their known or suspected diagnosis. Standard Precautions are basic infection control measures in health care and should always be applied whenever providing care to a patient.

- **Apply Droplet Precautions** in addition to Standard Precautions whenever providing care to a patient with a suspected or confirmed infectious ARD. Additional protective measures may be necessary when providing care for patients infected with specific pathogens or during specific procedures such as those that may generate aerosols (see table on page 4).

- **Apply Contact and Droplet Precautions**, in addition to Standard Precautions whenever providing care to human cases of avian influenza infection and SARS patients, as well as paediatric patients with an ARD or when clinical symptoms suggest a likely diagnosis of certain viruses such as croup, parainfluenza, acute bronchiolitis and respiratory syncytial virus (RSV) occurring during peak periods.

- **Apply Airborne Precautions** when providing care to a patient infected with a pathogen that can be transmitted in the air over long distances or when performing certain procedures, such as those that may generate aerosols (see table on page 4).

- **Ventilate** the patient environment to reduce the risk of transmission of disease via respiratory aerosols.

<sup>1</sup> Available at [http://www.who.int/csr/resources/publications/WHO\\_CD\\_EPR\\_2007\\_6/en/index.html](http://www.who.int/csr/resources/publications/WHO_CD_EPR_2007_6/en/index.html)

		Pathogen						
Precaution		No pathogen identified  no risk factor for ARD of potential concern <sup>a</sup>	Bacterial ARD <sup>b</sup>	Para-influenza, RSV & adenovirus	Influenza virus with sustained human-to-human transmission <sup>c</sup>	New influenza virus with no sustained human-to-human transmission <sup>d</sup>	SARS	Novel organisms <sup>e</sup>
Hand hygiene <sup>f</sup>		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gloves		R/A <sup>g</sup>	R/A <sup>g</sup>	Yes	R/A <sup>g</sup>	Yes	Yes	Yes
Gown <sup>h</sup>		R/A <sup>g</sup>	R/A <sup>g</sup>	Yes	R/A <sup>g</sup>	Yes	Yes	Yes
Eye protection		R/A <sup>i</sup>	R/A <sup>i</sup>	R/A <sup>i</sup>	R/A <sup>i</sup>	Yes	Yes	Yes
Medical mask on HCWs and caregivers		Yes	R/A <sup>i</sup>	Yes	Yes	Yes <sup>j</sup>	Yes <sup>k</sup>	Not routinely <sup>e</sup>
Particulate respirator on HCWs and caregivers	for room entry	No	No	No	No	Not routinely <sup>j</sup>	Not routinely <sup>k</sup>	Yes
	within 1m of patient	No	No	No	No	Not routinely <sup>j</sup>	Not routinely <sup>k</sup>	Yes
	for aerosol-generating procedures <sup>l</sup>	Yes	Not routinely <sup>m</sup>	Not routinely <sup>m</sup>	Yes	Yes	Yes	Yes
Medical mask on patient when outside isolation areas <sup>n</sup>		Yes	Yes	Yes <sup>o</sup>	Yes	Yes	Yes	Yes
Single room		Yes, if available <sup>p</sup>	No	Yes, if available <sup>p</sup>	Yes, if available <sup>p</sup>	Yes	Yes	Not routinely <sup>e</sup>
Airborne Precaution room <sup>q</sup>		No	No	No	No	Not routinely <sup>r</sup>	Not routinely <sup>r</sup>	Yes
Summary of infection control precautions for routine patient care, excluding aerosol-generating procedures <sup>i</sup>		Standard + Droplet Precautions	Standard Precautions	Standard + Droplet + Contact Precautions	Standard + Droplet Precautions	Standard + Droplet + Contact Precautions	Standard + Droplet + Contact Precautions	Standard + Airborne <sup>r</sup> + Contact Precautions

R/A - Risk Assessment



- a. E.g., influenza-like illness without risk factor for ARD of potential concern.
- b. Bacterial ARD refers to common bacterial respiratory infections caused by organisms such as *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Chlamydia* spp., and *Mycoplasma pneumoniae*.
- c. E.g., seasonal influenza, pandemic influenza.
- d. E.g. avian influenza.
- e. When a novel ARD is newly identified, the mode of transmission is usually unknown. Implement the highest available level of infection control precautions, until the situation and mode of transmission is clarified.
- f. Perform hand hygiene in accordance with Standard Precautions (see section 3.1).
- g. Gloves and gowns should be worn in accordance with Standard Precautions (see section 3.0). If glove demand is likely to exceed supply, glove use should always be prioritized for contact with blood and body fluids (nonsterile gloves), and contact with sterile sites (sterile gloves).
- h. If splashing with blood or other body fluids is anticipated and gowns are not fluid-resistant, a waterproof apron should be worn over the gown.
- i. Facial protection (medical masks and eye protection) should be used in accordance with Standard Precautions by HCWs if activities are likely to generate splashes or sprays of blood, body fluids, secretions and excretions on to mucosa of eyes, nose or mouth.
- j. As of the date of this document, no sustained efficient human-to-human transmission of avian influenza A is known to have occurred, and the available evidence does not suggest airborne transmission from humans to humans. Therefore a medical mask is adequate for routine care.
- k. The current evidence suggests that SARS transmission in health care settings occurs mainly by droplet and contact routes. Therefore a medical mask is adequate for routine care.
- l. Aerosol-generating procedures associated with increase in risk of respiratory pathogen transmission: intubation, cardiopulmonary resuscitation and related procedures (e.g. manual ventilation, suction); bronchoscopy; and autopsy or surgery involving the use of high speed devices.
- m. Some aerosol-generating procedures have been associated with increased risk of transmission of SARS and tuberculosis. To date, the infectious risk associated with aerosol-generating procedures in patients with bacterial ARDs, ARDs caused by rhinovirus, parainfluenza, RSV and adenovirus is not defined. As a minimum, a tightly-fitted medical mask should be used.
- n. If medical masks are not available, use other methods for source control (e.g. handkerchiefs, tissues or hands) when coughing and sneezing.
- o. These are common pathogens in children, who may not be able to comply with this recommendation.
- p. Cohort patients with the same diagnosis.
- q. Airborne precaution rooms can be naturally or mechanically ventilated, with adequate air change rate of at least 12 ACH and controlled direction of air flow.
- r. Airborne precaution rooms, if available, should be prioritized for patients with airborne infections (e.g. pulmonary tuberculosis, chickenpox, measles) and for those with novel organisms causing ARD.

## 2.0 EARLY RECOGNITION, ISOLATION & REPORTING

**Early recognition, isolation and reporting of patients with ARDs of potential concern is key for the containment of these diseases.**

Recognizing the presence of an acute respiratory disease in a patient, and in particular what type of ARD is involved, is central to reducing the risk of spread of infection.

Patients with ARDs may present with a wide range of clinical symptoms. Some of these diseases have the potential to spread rapidly and may have serious public health implications. These diseases are referred to in this guide as “ARDs of potential concern” and include:

- severe acute respiratory syndrome (SARS);
- human cases of infection with avian influenza;
- novel, or as yet unknown or unreported ARD.

ARDs of potential concern must be recognized and reported as early as possible. Infected patients must be provided with the appropriate treatment and care and infection control measures must be put in place immediately to minimize any further transmission of the disease.

- Inform public health authorities immediately if a case of ARD of potential concern is suspected.

- Isolate any patient with suspected or confirmed infection with an ARD of potential concern in a room or separate area away from other patients.

### **Early indications to suspect an ARD of potential concern**

Although the case definition may vary according to the specific disease, there are some general epidemiological and clinical clues that should raise suspicions.

**Epidemiological clues**

*The patient's recent history (within the known or suspected incubation period) including:*

- recent travel to a geographical area where there are patients known to be suffering from an ARD of potential concern;
- recent occupational exposure, for example to animals with symptoms of avian influenza, or
- recent contact with another patient infected with an ARD of potential concern.

**Clinical clues**

Patients who present with, or who have died from, unexplained severe acute febrile respiratory illness such as fever in excess of 38 °C with cough and shortness of breath, or other severe unexplained illness such as encephalopathy or diarrhoea with an exposure history consistent with the ARD of potential concern mentioned above within the known or suspected incubation period.

**What should you do if you suspect a patient has an ARD of potential concern - including SARS or avian influenza**

- ✓ Inform public health authorities immediately if a case of ARD of potential concern is suspected.
- ✓ Place any patient with suspected or confirmed infection with an ARD of potential concern in a room or separate area away from other patients.
- ✓ Ensure that all health-care workers that are providing care to the patient are supplied with and are using appropriate PPE.

## 3.0 STANDARD PRECAUTIONS


**Standard Precautions should be applied routinely in all health-care settings whenever providing care to patients.**

When applied correctly, Standard Precautions, which are basic infection control precautions, will prevent direct unprotected contact with body fluids, blood, secretions, excretions, and minimize spread of infection associated with health care.

In health-care settings there are two main sources of infection - **people** and **contaminated objects**. Infection can be transmitted by people through various body fluids including blood, saliva, sputum, nasal discharges, wound drainage, urine and excrement. Some people may appear well even though their blood or body fluids are capable of spreading infection, and Standard Precautions should be applied whenever providing care, despite the patient's diagnosis.

The organisms that cause ARDs are most often spread through droplets. When an ARD patient coughs or sneezes, small and large droplets of secretions are expelled into the air and surrounding surfaces. The large droplets gradually settle down on surfaces around the patient (commonly within a distance of 1 metre from the patient). The surfaces can also become contaminated through contact with hands, used handkerchiefs/tissues or other material which has been in contact with the secretions. Other body fluids and excreta may also contain infective agents. Therefore, ARDs can be spread by aerosols from the respiratory tract or through contact with contaminated surfaces. For this reason, in addition to the use of specific protection against droplets (i.e. medical mask), several elements of Standard Precautions, such as

### The main elements of Standard Precautions

- 
- ✓ hand hygiene;
  - ✓ use of personal protective equipment (PPE) to avoid contact with the patient's body fluids and non-intact skin;
  - ✓ respiratory hygiene and cough etiquette;
  - ✓ prevention of injury from needles or other sharp objects;
  - ✓ waste management; and
  - ✓ cleaning and disinfection of the environment and equipment.

respiratory etiquette, hand hygiene, cleansing of the environment, and waste management, are also essential to help prevent transmission of ARDs.

Standard Precautions should always be followed in the health-care setting and are extremely important in reducing the risk of further infection when providing care to any patients, including those suspected of being infected with an ARD of potential concern.

## 3.1 HAND HYGIENE

**Hand hygiene before and after contact with every patient is among the most important means of preventing the spread of infection.**

- Wash hands with soap and running water when visibly dirty or contaminated with proteinaceous material.
- Use an alcohol-based hand product for routinely decontaminating hands, if hands are NOT visibly soiled.
- **DO NOT** use alcohol-based hand products when hands are visibly soiled.
- **DO NOT** use alcohol-based hand products after exposure of non-intact skin to blood or body fluids. In these cases, wash hands with soap and water and dry.

### **Perform hand hygiene Immediately**

- On arrival at work.

### **Before**

- Direct contact with a patient.
- Putting on gloves for performing clinical and invasive procedures (e.g. administering intravascular injections, intravenous injections).
- Medication preparation.
- Preparing, handling, serving or eating food.
- Feeding a patient.
- Leaving work.

### **Between**

- Certain procedures on the same patient where soiling of hands is likely to avoid cross-contamination of body sites.

### **After**

- Contact with patient.
- Removal of gloves.
- Removal of other personal protective equipment.

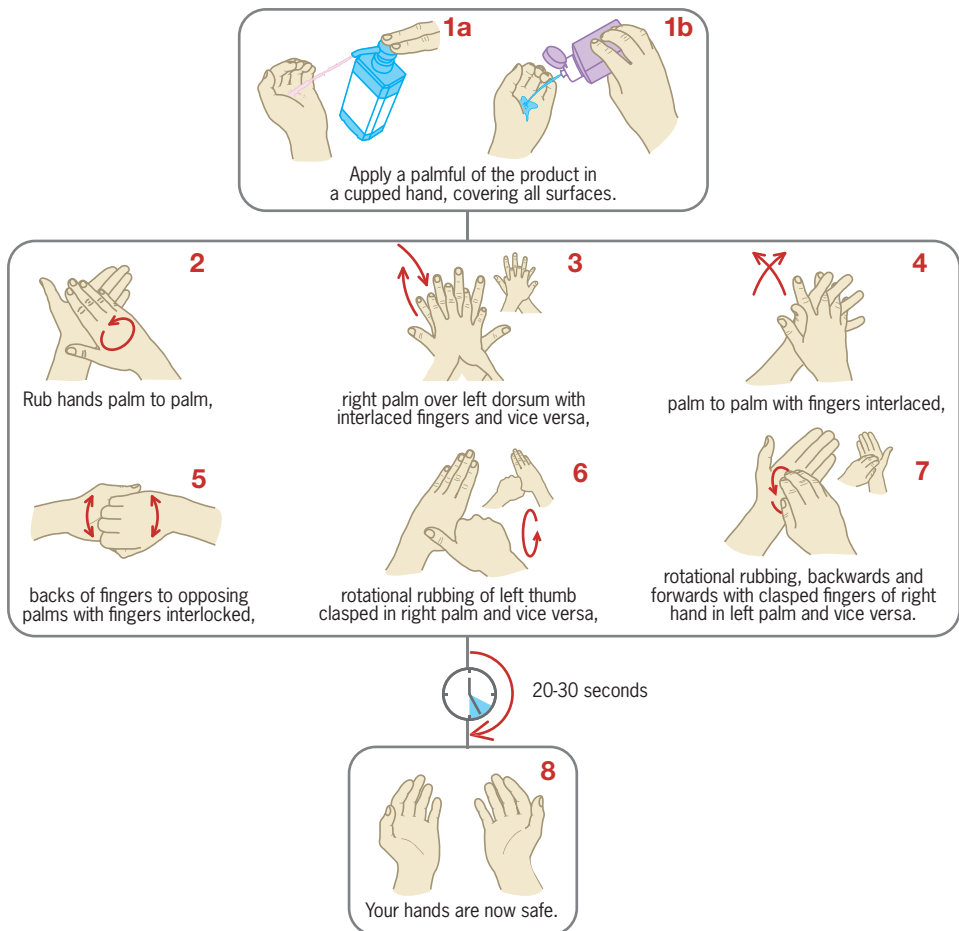
### **Points to remember when performing hand hygiene**



- ✓ When hands are visibly dirty or contaminated with proteinaceous material, they should be washed with soap and water.
  - ✓ If hands are NOT visibly soiled or contaminated, an alcohol-based hand product for routine decontamination of hands should be used.
  - ✓ Ensure hands are dry before starting any activity.
- Contact with blood, body fluids, secretions, excretions, exudates from wounds, and contaminated items.
  - Contact with items/surfaces known or considered likely to be contaminated with blood, body substances or excretions (bedpans, urinals, wound dressings) whether or not gloves are worn.
  - Personal body functions, such as using the toilet, wiping or blowing one's nose.

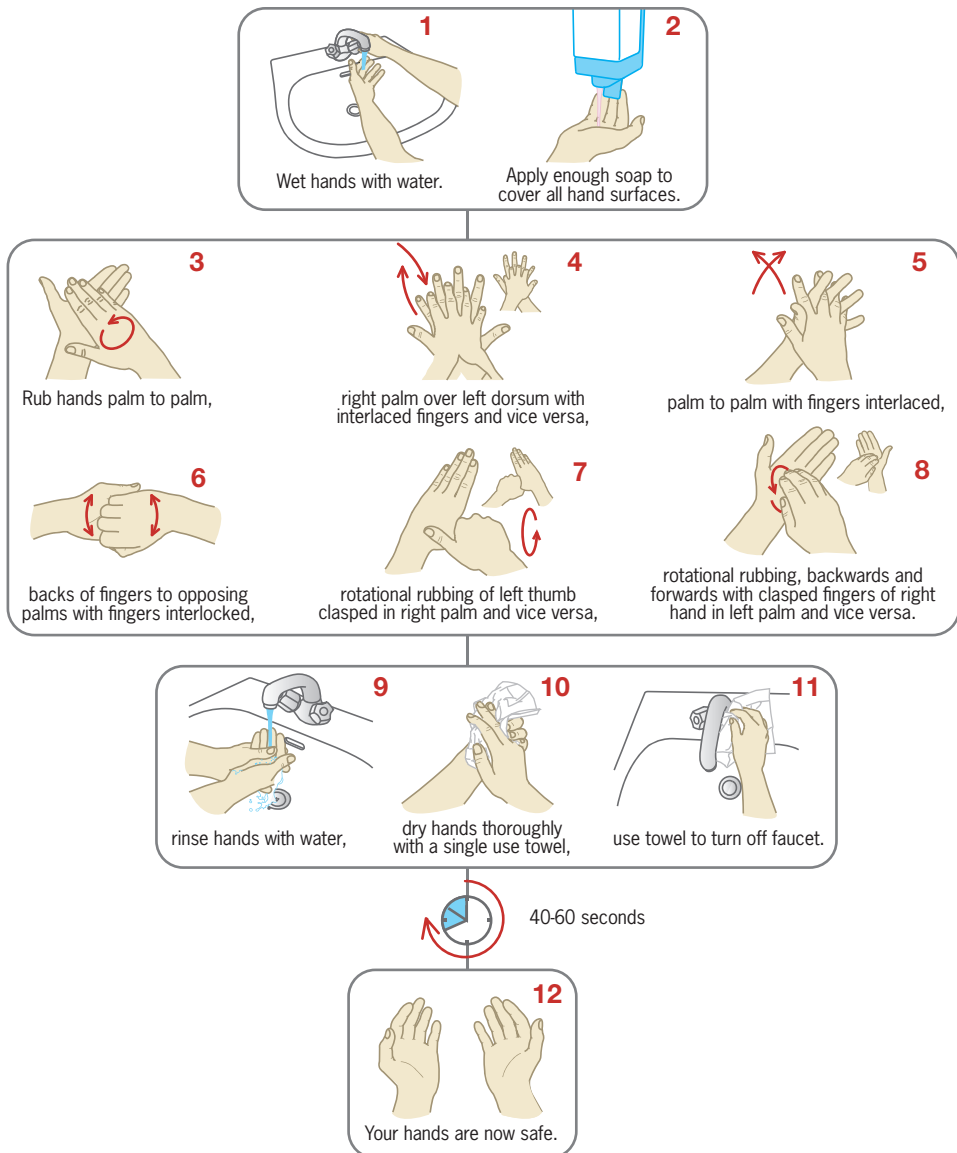
# HOW TO

## Handrub with alcohol-based formulation



## HOW TO

# Handwash with soap and water



## 3.2 PERSONAL PROTECTIVE EQUIPMENT (PPE) ACCORDING TO STANDARD PRECAUTIONS

**If the appropriate pieces of PPE are used correctly, they will protect health-care workers from being exposed to certain types of infectious diseases.**

In addition to hand hygiene - which should always be performed - health-care workers should also wear personal protective equipment that is appropriate for the procedure they are performing and the level of contact with the patient that it will entail in order to avoid contact with blood and body fluids.

PPE for Standard Precautions purposes comprises gloves, gowns, eye protection and medical masks. Additional items, such as caps to cover the hair, are not considered PPE, but can be used for the comfort of the health-care worker. Likewise, boots can also be used for practical purposes, for example when resistant closed foot wear is needed and to avoid accidents with sharp objects. When used correctly, PPE will protect the health-care worker from being exposed to certain types of infectious diseases.

### Choosing items of PPE

It is not always essential to use all the items of PPE as part of Standard Precautions. In selecting which items of PPE to use, the health-care worker should undertake an assessment of the potential risk of exposure to an infectious disease that might be associated with the intended procedure when providing routine care.

*In particular, the health-care worker should consider:*

### The procedure

- What procedures will be undertaken?
- What are the chances of contact with the patient's blood or body fluids and what type of fluids might be involved?

### The health-care worker

- Does the health-care worker have any skin abrasions?



**The equipment and facilities**

- Are all the items of PPE available to use?
- What facilities exist for putting on and taking off items of PPE?
- Is any external assistance required in putting on or taking off items of PPE?
- Where are the nearest hand-hygiene facilities located?
- Does every item of PPE fit correctly?
- Where are the waste disposal facilities located?

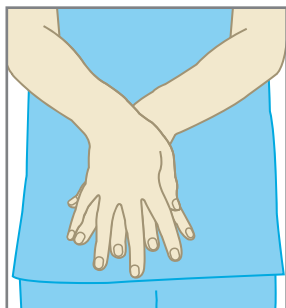
**General principles when using PPE**

Whenever items of PPE are used, there are some general principles that apply to all and should always be taken into consideration.

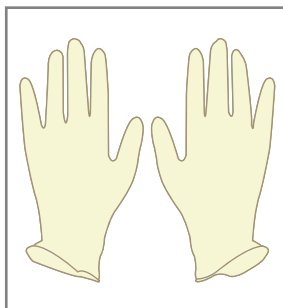
- Always perform hand hygiene before handling and putting on any item of PPE.
- Any damaged or broken pieces of re-usable PPE must be removed and replaced immediately.
- All items of PPE must be removed as soon as possible after completing the health-care procedure to avoid contaminating other surfaces.
- All single-use items of PPE must be discarded immediately after use, using the appropriate waste management facilities.
- Always perform hand hygiene immediately after removing and discarding any item of PPE.

**General PPE Guidelines**

- ✓ Hand hygiene should always be performed despite PPE use.
- ✓ Remove and replace if necessary any damaged or broken pieces of re-usable PPE as soon as you become aware that they are not in full working order.
- ✓ Remove all PPE as soon as possible after completing the care and avoid contaminating:
  - the environment outside the isolation room;
  - any other patient or worker; and
  - yourself.
- ✓ Discard all items of PPE carefully and perform hand hygiene immediately afterwards.



Hand hygiene



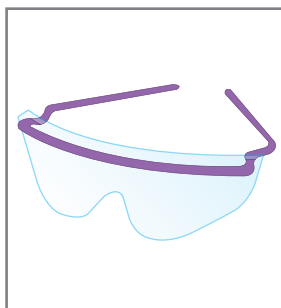
Gloves



Gown – other types and styles are also appropriate.



Medical mask – other types and styles are also appropriate.



Protective eyewear - eye visors, goggles, and face shields are examples of protective eyewear

Please note that the illustrations here are **representative examples of PPE**: Gowns, gloves, medical masks and eye/face protection may differ in style, but will perform the same protective role.

SCENARIO	HAND HYGIENE	GLOVES	GOWN	MEDICAL MASK	EYEWEAR
Always before and after patient contact, and after contaminated environment	✓				
If direct contact with blood and body fluids, secretions, excretions, mucous membranes, non-intact skin	✓	✓			
If there is risk of splashes onto the health care worker's body	✓	✓	✓		
If there is a risk of splashes onto the body and face	✓	✓	✓	✓	✓

## More information about PPE items

### Gloves

Gloves are an essential item of PPE and are used to prevent the health-care worker from being exposed to direct contact with the blood or body fluid of an infected patient.

It is very important that adequate supplies of gloves are available in all areas where patients are being cared for, and in particular at the entrance to any area where patients are being kept in isolation.

It should always be remembered that hand hygiene is always essential - even when using gloves. It is therefore a good idea to position a supply of gloves in the same location as the hand hygiene facilities.

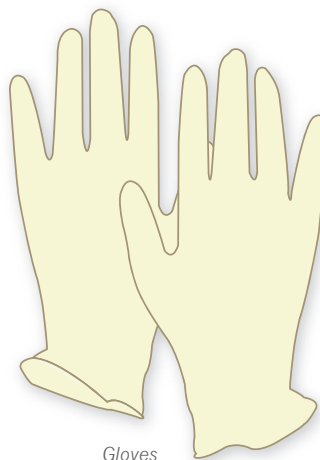
### Important issues to remember about selecting and using gloves

*Selecting the appropriate type of gloves to use is also important and should take into account the following:*

- the gloves selected should be appropriate for the procedure that is about to be performed and the risks that may be entailed of the health-care worker having direct contact with respiratory secretions or other fluids;
- the gloves should be the correct size for the wearer's hands;
- the gloves must be compatible with any chemical solutions that are being used as part of hand hygiene in the health-care setting.

*Using gloves correctly includes:*

- performing hand hygiene immediately before putting on the gloves - gloves must never be used as an alternative to hand hygiene;
- replacing gloves immediately if they are torn or punctured and disposing of the damaged gloves immediately using the correct facilities;
- removing and disposing of gloves and using new gloves between different procedures on the same patient if there is any possibility that infection could be transmitted from one part of the patient's body to another;
- removing and disposing of gloves immediately



Gloves

after contact with a patient or a potentially contaminated environmental surface and using new gloves for any subsequent contact with a different patient or environment;

- performing hand hygiene immediately after removing and disposing of gloves.

*Suggested sequence of procedures when only gloves are used:*

- perform hand hygiene
- put on gloves
- perform the task
- remove the gloves immediately after finishing the task
- dispose of gloves safely
- perform hand hygiene

### Don't forget

- *Hand hygiene is always essential - even when using gloves.*
- *Supplies of gloves should therefore be stored alongside the hand hygiene facilities.*

## Gowns & Aprons

Gowns and aprons are another important piece of PPE and are used to provide a barrier to prevent the health-care worker's clothing being exposed to blood or other body fluids. Gowns are used in addition to gloves if there is risk of fluids or blood from the patient splashing onto the health-care worker's body.

It is very important that adequate supplies of gowns and aprons are available in all areas where patients are being cared for, and in particular at the entrance to any area where patients are being kept in isolation or in cohorts.

Plastic aprons should be used in addition to gowns if the material of the gown is not fluid repellent AND the task to be performed may result in splashes onto the healthcare worker's body. Some gowns are disposable and others are re-usable. Re-usable gowns must be laundered after every use.

Supplies of gowns and aprons should be stored alongside other supplies of PPE items.

### Important issues to remember when selecting and using gowns and aprons

*The types of gowns and aprons used should be:* appropriate for the procedure that is about to be performed and the risk to the health-care worker of contact with respiratory secretions or other fluids associated with each procedure(s). This should include considering:

- the amount of secretions to which the health-care worker may become exposed as a result of the procedure;
- the type of tasks involved in the procedure which may, if particularly labour intensive, cause damage to the gown or apron. For example, some heavy duty tasks, such as cleaning, may warrant using a rubber apron in addition to the gown; and
- the size of the gown and apron to ensure coverage of any area of the wearer's body and clothes that could potentially be exposed.

*Using gowns or aprons correctly involves:*

- changing and disposing of the gowns and aprons, in either the appropriate waste disposal facilities or in the relevant laundry facilities immediately after contact with a patient or a potentially contaminated environmental surface and before contact with a different patient or environment;
- the same gown can be used when providing care to more than one patient but only those patients in a cohort area and only if the gown does not have direct contact with a patient;

*Suggested sequence of procedures when only gown and gloves are used:*

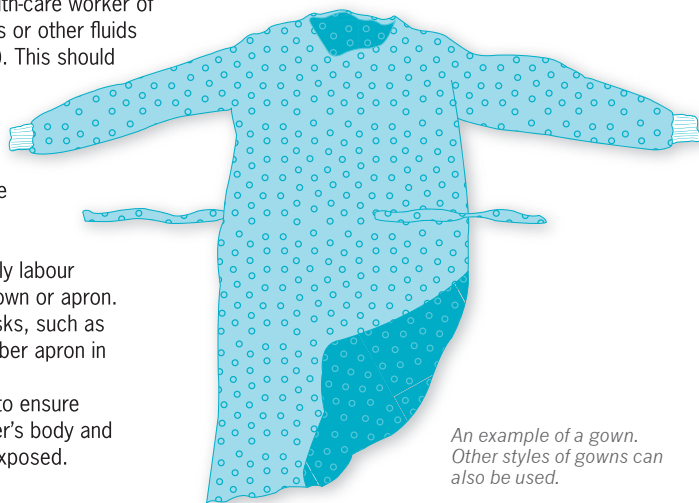
- perform hand hygiene
- put on gown
- put on gloves ensuring gown cuffs are fully covered
- perform the task
- remove the gown and gloves immediately after finishing the task

*- for disposable gowns:*

- peel off of gown and gloves together, roll inside out, and dispose of safely; and
- perform hand hygiene.

*- for re-usable gowns:*

- remove gloves, perform hand hygiene, remove and place gown in laundry facilities;
- and perform hand hygiene.



*An example of a gown. Other styles of gowns can also be used.*

## Facial Mucosa Protection

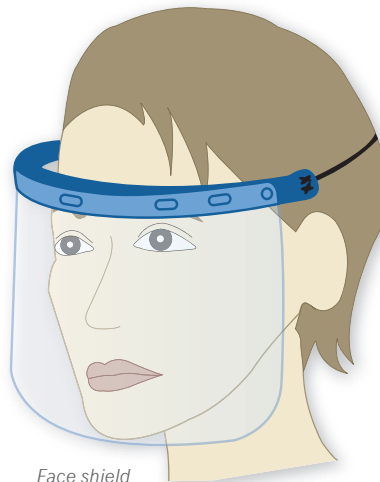
Masks, and eye protection, such as eyewear and goggles, are also important pieces of PPE and are used to protect the eyes, nose or mouth mucosa of the health-care worker from any risk of contact with a patient's respiratory secretions or splashes of blood, body fluids, secretions or excretions. Face shields cover mouth, nose and eyes, and if available, can be used instead of a mask plus eyewear.

It is very important that adequate supplies of masks and eye protection are available in all areas where patients are being cared for, and in particular at the entrance to any area where patients are being kept in isolation or in cohorts.

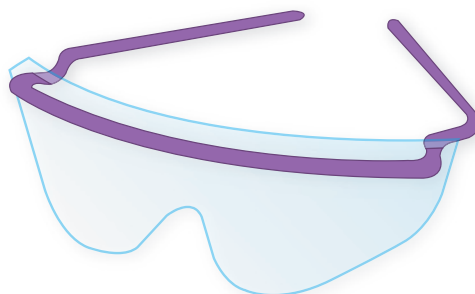
The health-care worker should not touch the front of the mask or the eye protection when removing these items and should remember that it is essential that hand hygiene is performed immediately following their removal.

## Different kinds of eye/face protection

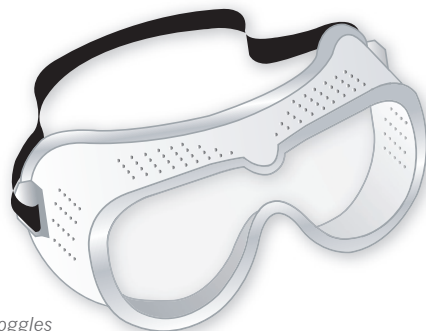
Illustrated are three different kinds of protective eyewear: face shield, eye visor and goggles.



Face shield



Eye visor



Goggles

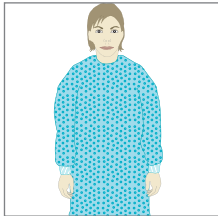
## HOW TO

# Put on Personal Protective Equipment (when all PPE items are needed)



### Step 1

- Identify hazards & manage risk. Gather the necessary PPE.
- Plan where to put on & take off PPE.
- Do you have a friend? Mirror?
- Do you know how you will deal with waste?



### Step 2

- Put on a gown.



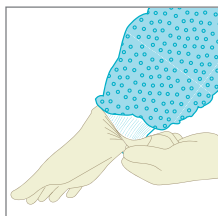
### Step 3

- Put on mask.



### Step 4

- Put on eye protection e.g. visor, face shield, goggles (consider anti-fog drops or fog-resistant goggles). Caps are optional: if worn, put on after eye protection.

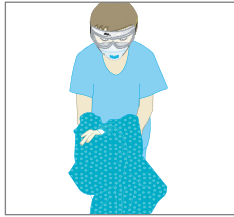


### Step 5

- Put on gloves (over cuff).

## HOW TO

# Take off Personal Protective Equipment

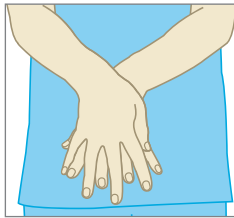


### Step 1

- Avoid contamination of self, others & environment
- Remove the most heavily contaminated items first

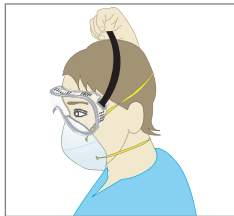
*Remove gloves & gown*

- Peel off gown & gloves and roll inside-out
- Dispose of gloves and gown safely



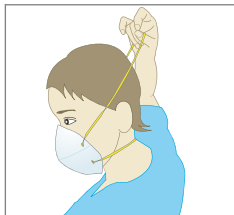
### Step 2

- Perform hand hygiene



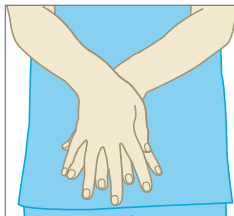
### Step 3

- Remove cap (if worn)
- Remove eye protection from behind;
- Put eye protection in a separate container for reprocessing



### Step 4

- Remove mask from behind



### Step 5

- Perform hand hygiene

## 3.3 RESPIRATORY HYGIENE & COUGH ETIQUETTE

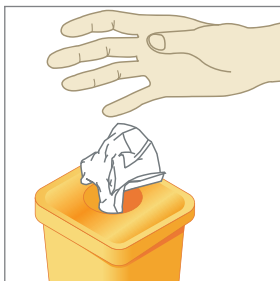
**Respiratory hygiene and cough etiquette are two key ways in which the spread of infection can be controlled at the source.**

All patients, visitors and health-care workers should be encouraged to adhere to cough etiquette and respiratory hygiene at all times to contain respiratory secretions.

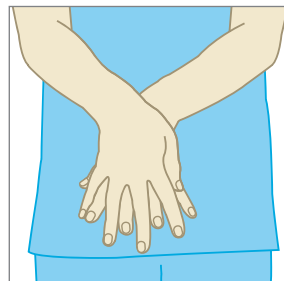
### When you cough or sneeze



**Cover your nose and mouth**

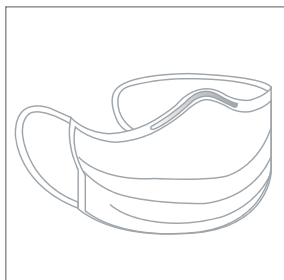


**Throw the used tissue away straight after**



**Perform hand hygiene**

### In health-care facilities



**If you are coughing consider using a medical mask**

*Cough etiquette and respiratory hygiene should be followed in all parts of the hospital, in community settings and even in the home.*

**It's always the right time to take these important measures to control the source of potential infection.**



## 3.4 PREVENTION OF INJURIES FROM NEEDLES & OTHER SHARP INSTRUMENTS

**Prevention of needle stick or other injuries from sharp instruments is another component of Standard Precautions.**

Although it is not the primary means of preventing and controlling ARDs, it is an important factor in reducing and eliminating the transmission of bloodborne pathogens from infected patients to health-care workers, other patients, and any other persons by means of injury with sharp objects.

Care must be taken to prevent any injuries to the health-care workers or the patients when using, cleaning or disposing of needles, scalpels or other sharp instruments or devices.

More detailed recommendations concerning the use of safe use of needles are available from the Safe Injection Global Network (SIGN) Alliance.<sup>2</sup>

### General needle stick and sharp object guidelines



- ✓ Never recap used needles.
- ✓ Never direct the point of a needle towards any part of the body except prior to injection.
- ✓ Do not remove used needles from disposable syringes by hand, and do not bend, break, or otherwise manipulate used needles by hand.
- ✓ Dispose of syringes, needles, scalpel blades, and other sharp items in appropriate puncture-resistant containers, which should be located as close as practical to the area in which the items were used.
- ✓ Avoid the use of re-usable syringes.
- ✓ Do not re-use needles.

<sup>2</sup> [http://www.who.int/injection\\_safety/sign/en/](http://www.who.int/injection_safety/sign/en/)

## 3.5 CLEANING & DISINFECTION OF RESPIRATORY EQUIPMENT

**Any piece of equipment used in providing patient care must be handled with care, as it may be contaminated and have the potential to spread infection.**

### General principles to remember when handling contaminated (used) patient care equipment

- It is important to avoid any contact between a used piece of equipment and the skin, mucosa or clothing of the health-care worker, including any handles of the equipment.
- The process of cleaning and disinfecting respiratory equipment frequently results in splashes which could potentially be contaminated.

*When cleaning and disinfecting respiratory equipment the health-care worker should wear:*

- rubber gloves,
  - a gown and a rubber apron,
  - face protection, such as a full face shield or an eye protection, such as a visor or goggles, plus a face mask.
- Re-usable equipment must be cleaned with soap or detergent and water until all visible signs of soiling are removed and must then be appropriately disinfected before the equipment can be used on another patient.
  - Appropriate reprocessing always includes thorough cleaning and may also include disinfection or sterilization depending on the nature and intended use of the device or equipment.
  - Any item designed for single use must be disposed of in an appropriate container or waste receptacle immediately after use. This is essential to prevent any accidental contamination of either another person or the environment.

### Essential points for cleaning & disinfecting equipment



- ✓ Clean and disinfect all respiratory equipment between uses.
- ✓ Thoroughly clean respiratory and re-usable equipment prior to disinfection.
- ✓ Health-care workers must use PPE for cleaning and disinfection of respiratory equipment.
- ✓ Keep clean and disinfected items dry and in individual packages.

### Disinfectant use

The disinfectants available may vary from country to country. In disinfecting re-usable respiratory therapy equipment a high-level of disinfection is required. Generally, bleach<sup>3</sup> provides a reasonable level of chemical disinfection. The use of a chemical germicide, such as bleach or a physical method such as autoclaving is usually sufficient. Cleaning should precede any high-level disinfection activity.

<sup>3</sup> Immersion of items in bleach preparation containing 0.1% sodium hypochlorite for at least 30 minutes.

**When selecting the best method to conduct high-level disinfection, the following factors should be taken into consideration:**

- the piece of equipment to be disinfected;
- the composition of the piece of equipment and its intended use;
- the level of disinfection required; and
- the availability and capacity of services, physical facilities, organizational resources and personnel.


**The stages involved in reprocessing re-usable equipment are as follows:**

1. Wash the piece of equipment with soap or detergent and water
2. Rinse
3. Disinfect
4. Rinse again if using chemicals to disinfect
5. Dry
6. Store.

## 3.6 CLEANING THE PATIENT-CARE ENVIRONMENT

**Environmental cleaning refers to the process of removing all or a significant amount of the pathogens from contaminated surfaces and items.**

### Key issues about cleaning and disinfection

- 
- ✓ The environment used by the patient **MUST** be regularly cleaned.
  - ✓ Cleaning should use proper techniques to avoid aerosolization of dust.
  - ✓ Only surfaces that enter in contact with the patient's skin/mucosa and surfaces frequently touched by health-care workers require disinfection after cleaning.
  - ✓ Health-care workers **MUST** use PPE for cleaning and disinfection of respiratory equipment and hand hygiene must be performed after PPE removal.

Cleaning the surfaces of the patient's environment is very important as the infectious agents that can cause ARDs are capable of surviving in the environment for many hours or even days. Cleaning can be done with water and neutral detergents.

### Disinfection

Standard hospital disinfectants, prepared in the recommended dilutions and applied in accordance with the manufacturer's instructions can reduce the level of environmental surface contamination. Any process of disinfection must be preceded by cleaning.

Only items and surfaces that have had contact with the patient's skin or mucosa or have been frequently touched by health-care workers require disinfection after cleaning. The type of disinfectant used in a health-care facility will depend on local availability and regulations.

Some of the disinfectants that are suitable for this use include:

- sodium hypochlorite – to be used on non-metal surfaces or equipment;
- alcohol – for use on smaller surfaces;
- phenolic compounds;
- quaternary ammonium compounds; and/ or
- peroxygen compounds.

### Key principles of environmental cleaning

- All horizontal surfaces in areas where care is being provided to a patient must be cleaned every day and whenever visibly soiled. It must also be cleaned whenever a patient is discharged and before a new patient arrives.
- If the surface has had direct contact with patients, such as an examination table or other equipment, the surface must be cleaned and disinfected between different patients.
- All cloths used must be dampened before use. Dusting with a dry cloth or sweeping may lead to aerosolization and should be avoided.
- Solutions, cloths and mop heads should be changed regularly in accordance with local health authority policies.
- All cleaning equipment should be cleaned and dried after each use.
- Re-usable mop heads should be laundered and dried after every use and before storage.
- Areas around the patient should be kept clear from unnecessary equipment, supplies and clutter to allow thorough daily cleaning to take place.
- Examination tables and surrounding equipment that have been used by patients known or suspected to be infected with an ARD of potential concern should be wiped down with disinfectants immediately after use.

### PPE for cleaning the environment

Cleaning is labour intensive, involving heavy duty tasks, and in certain settings associated with a high risk of exposure to sharp objects. The health-care worker should wear:

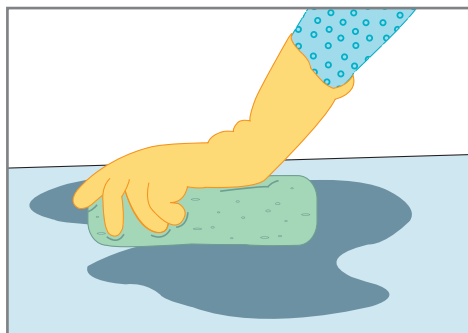
- rubber gloves;
- a gown and a rubber apron; AND
- resistant closed foot wear, such as boots.

### Cleaning of spills and splashes

When cleaning any spills or splashes of body fluids or secretions, it is essential that adequate PPE is worn by the health-care worker, including rubber gloves and gown.

The stages of cleaning of spills are as follows:

- put on gown, apron and rubber gloves;
- clean the surface area with water and detergent using a disposable cleaning cloth;
- dispose of the cleaning cloth in the appropriate leak-proof waste container;
- disinfect the area. (NB sodium hypochlorite can be used for disinfection; concentrations ranging from 0.05% to of 0.5% are suggested);
- remove the rubber gloves and apron and dispose of both items into appropriate container for further cleaning and disinfection;
- remove gown and place it into appropriate container;
- perform hand hygiene.



PPE, including rubber gloves and gown, must be worn during cleaning and disinfecting.

It is also important to note that **good ventilation of the area** is necessary during and immediately after the process of disinfection, regardless of the type of disinfectant used.

## 3.7 LINEN & WASTE MANAGEMENT

**Handle both waste and used linen with care, wearing appropriate PPE and practicing regular hand hygiene.**

The risk of being exposed to or acquiring an ARD as a result of handling waste or used linen is low. Nevertheless, it is good practice to handle both waste and used linen with care. This entails wearing the appropriate pieces of PPE and performing regular hand hygiene in line with the guiding principles of Standard Precautions.

### General principles

- All used linen and waste should be placed in bags or containers which are able to withstand transportation without being damaged.
- Double bagging is not needed for used linen or waste.

### Linen

- Any solid matter on soiled linen should be removed and flushed down a toilet. The soiled linen should then be placed immediately into a laundry bag in the patient area.
- Used linen should be handled carefully to prevent contamination of surrounding surfaces or people.
- Used linen should then be washed according to normal routines.

### Waste

- Waste should be classified, handled and disposed of according to local health authority regulations and policies. Classifying waste is key to ensure it is handled correctly and disposed of down the appropriate channel.

*Examples of waste classification include:*

- **general waste** - such as leftover meals, administrative rubbish;
- **clinical waste without sharp objects** - such as material used during wound care;
- **clinical waste with sharp objects** - such as needles, bistouries' blades;

- **clinical waste with anatomic pieces** - such as placenta.

- Health-care workers should take care to avoid aerosolization of matter whenever handling and disposing of the waste. This is especially important for faeces.
- Health-care workers should wear disposable gloves whenever handling waste and should perform hand hygiene immediately after removing the gloves.

### Managing linen & waste

- ✓ Handle linen and waste with care.
- ✓ Transport soiled linen and waste in closed containers or bags.
- ✓ Ensure safe handling and final treatment of waste, by classifying the waste (this is of utmost importance) and using the containers or bags specified according to its classification.
- ✓ Health-care workers must use adequate PPE whenever handling soiled linen and waste.



*Keep bins closed. If waste is placed outside the bin, ensure the bag is tied.*



## 4.0 DROPLET PRECAUTIONS

**Diseases which are spread via droplets can be transmitted by an infected person when talking, coughing or sneezing.**

Diseases in this category include adenovirus, human influenza, severe acute respiratory syndrome (SARS) and avian influenza A (H5N1).

Typically, droplets travel only a short distance through the air but have the potential to land in the eyes, mouth or nose of an unprotected person or on an environmental surface. Droplets do not stay suspended in the air.

### **Droplet Precautions**

Droplet Precautions should be followed as a complement and in addition to Standard Precautions. They should be applied whenever providing care to a patient suspected or confirmed of having a disease spread by droplets.

### **Droplet precautions guidelines**

- ✓ Wear a medical mask when within a 1 metre range of the patient.
- ✓ Put the patient in a single room or in a room that contains only other patients with the same diagnosis, or with similar risk factors, and ensure that every patient is separated by at least one metre.
- ✓ Ensure that the transportation of a patient to areas outside of the designated room is kept to a minimum.
- ✓ Perform hand hygiene immediately after removing any item of PPE.



*An example of a medical mask.*

## 5.0 CONTACT PRECAUTIONS

**Transmission by contact is a risk for health-care workers; additional precautions should be taken to avoid the risk of infection through direct contact.**

Some common respiratory pathogens can be spread through the contamination of a patient's hands, the hands of a health-care worker or an environmental surface.

Hands can transmit these diseases by having direct contact with a contaminated surface, followed by contact with either another body surface such as the conjunctival or nasal mucosa or by contaminating another intermediate area.

### Contact Precautions

Contact Precautions should be followed as a complement and in addition to Standard Precautions. They should be applied whenever providing care to a patient suspected or confirmed of having a disease spread by contact with contaminated surfaces.

Ensure that any movement of patients into areas outside of their designated room is kept to a minimum.

Ensure that any contact between patients is kept to a minimum.

### Key contact precautions



- ✓ Use clean, unsterilized gloves and a disposable or re-usable gown whenever you have direct contact with a patient.
- ✓ Remove safely the gloves and gown immediately following any contact with a patient. Perform hand hygiene immediately after removing any item of PPE.
- ✓ Dedicate specific equipment for use with a single patient and ALWAYS clean and disinfect shared equipment between patient uses.
- ✓ Avoid touching your face, eyes or mouth with either gloved or un-gloved hands as these may be contaminated.
- ✓ Place patients in a single occupancy room whenever possible or alternatively with other patients with the same diagnosis.

## 6.0 AIRBORNE PRECAUTIONS

**Some pathogens are transmitted through inhalation of droplet nuclei that can remain infectious over a long distance in excess of one metre.**

Airborne pathogens require special precautions to avoid their transmission. Diseases such as pulmonary tuberculosis, measles, chickenpox are transmitted by this route.

When a new, not yet reported, respiratory disease first appears, the mode of transmission may not be clear, and the potential for airborne transmission should always be taken into consideration.

Transmission of droplet nuclei at short range may also occur with diseases normally transmitted mainly through droplets, such as human influenza, or through droplets and contact, such as SARS, when carrying out some procedures that may result in aerosols being generated in inadequately ventilated rooms and with inadequate PPE.

In such situations the health-care worker should wear a particulate respirator instead of a medical mask, wear eyewear and perform the procedure in an adequately ventilated room.

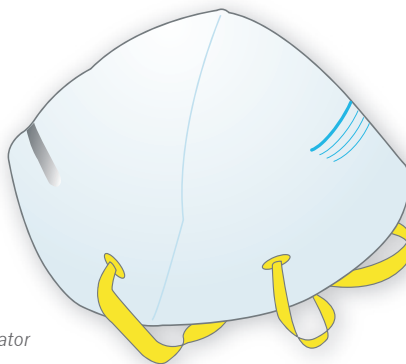
### Airborne Precautions

Airborne Precautions should be followed as a complement and in addition to Standard Precautions. They should be applied whenever providing care to a patient suspected or confirmed of having a disease spread by airborne pathogens.

### Airborne precautions guidelines



- ✓ Use a particulate respirator whenever entering and providing care within the patient isolation facilities ensuring that the seal of the respirator is checked before every use.
- ✓ Place the patient in an airborne precaution room which has **≥ 12 ACH plus control of airflow direction**.
- ✓ Limit the movement of the patient and ensure that the patient wears a medical mask if outside their room.
- ✓ Perform hand hygiene immediately after removing any item of PPE.

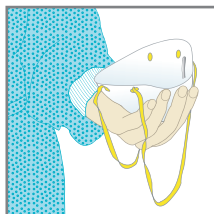


*Particulate respirator*



## HOW TO

# Perform a particulate respirator seal check



### Step 1

- Cup the respirator in your hand with the nosepiece at your fingertips allowing the headbands to hang freely below your hand.



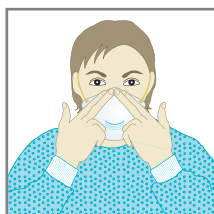
### Step 2

- Position the respirator under your chin with the nosepiece up.



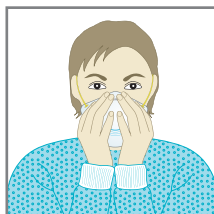
### Step 3

- Pull the top strap over your head resting it high at the back of your head.  
Pull the bottom strap over your head and position it around the neck below the ears.



### Step 4

- Place fingertips of both hands at the top of the metal nosepiece. Mould the nosepiece (USING TWO FINGERS OF EACH HAND) to the shape of your nose. Pinching the nosepiece using one hand may result in less effective respirator performance.



### Step 5

- Cover the front of the respirator with both hands, being careful not to disturb the position of the respirator.

#### Step 5a: Positive seal check

- Exhale sharply. A positive pressure inside the respirator = no leakage. If leakage, adjust the position and/or tension straps. Retest the seal.
- Repeat the steps until the respirator is secured properly.

#### Step 5b: Negative seal check

- Inhale deeply. If no leakage, negative pressure will make respirator cling to your face.
- Leakage will result in loss of negative pressure in the respirator due to air entering through gaps in the seal.

## 7.0 SELECTING & USING MASKS IN HEALTH CARE

Masks are used to avoid the nose and mouth mucosa being exposed to splashes of the patient's body fluids. However, masks can also be used to protect against infectious respiratory aerosols.

There are two main types of masks that are available to the health-care worker: **medical mask** and **particulate respirator**.

Medical masks provide protection against large aerosol particles (droplets) and particulate respirators provide protection against fine aerosols that are kept suspended in the air (droplet nuclei) and droplets.

The particulate respirator can only be effective to protect against infectious droplet nuclei if the seal is intact and there is no leak of air between the wearer's face and the device.

The type of mask to select should be appropriate for the anticipated procedure(s) that will be performed and the level of risk the health-care worker may face of having contact with respiratory secretions or other fluids associated with each procedure(s).

### The correct use of masks



- ✓ Change and dispose of a mask as soon as it becomes moist or dirty.
- ✓ Remove the mask when not in use and ensure it is not allowed to hang loose around the neck when not in use.
- ✓ Perform hand hygiene immediately after touching, removing or disposing of a mask.
- ✓ If using a particulate respirator, perform a seal check (see in section 6) before every use to help assure the fit and reduce the leak of air.



*An example of a medical mask.  
Other types of masks can also be used.*

**When to use a medical mask**

- Masks should be used by the health-care worker when providing routine care to any patient with a disease that may be transmitted through droplets, such as:

- febrile acute respiratory disease; and
- RSV, adenovirus and influenza.

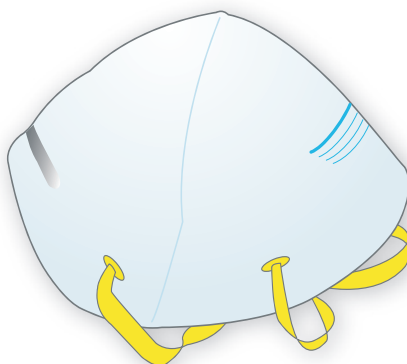
- Any patient displaying symptoms of respiratory infection should also be required to use a mask whenever outside of the isolation room regardless of the known or probable disease.

**When to use a particulate respirator**

- Whenever entering a room of a patient with an airborne disease, such as pulmonary tuberculosis or measles.

- Whenever performing aerosol-generating procedures associated with an increase in the risk of respiratory pathogen transmission, such as intubation, cardiopulmonary resuscitation and related procedures, including manual ventilation and suction; bronchoscopy; and autopsy or surgery involving the use of high speed devices.

- Whenever entering the room of a patient suspected of being infected with a novel or unknown organism causing an ARD, for which the main mode of transmission is completely unknown.



*Particulate respirator*

## 8.0 PATIENT AREAS & PATIENT TRANSPORTATION

**A patient with an ARD must be placed in an appropriate area to ensure that the risk of infection is kept to a minimum.**

### Factors to consider when placing patients

In selecting the appropriate area the health-care worker should consider:

- If there are any epidemiological or clinical clues that might indicate infection with an ARD of potential concern;
- Which recommended precautions, in addition to the Standard Precautions, are appropriate for the suspected or confirmed causative agent; and
- The availability and accessibility of the necessary supplies and equipment in the vicinity of the facilities.

### Options for placing patients with ARD of potential concern

There are two main options for placing a patient with an ARD of potential concern. Patients can be placed in either:

- An Airborne Precaution Room (APR) (with  $\geq 12$  air changes per hour (ACH) plus control of airflow), or
- An Adequately Ventilated Room (AVR) (with  $\geq 12$  ACH).

It is recommended that any patient infected with either a novel organism causing an ARD with potentially high public health impact or infected with an airborne transmitted disease, such as pulmonary tuberculosis, measles or chickenpox, should be placed in an APR whenever available.

### Key recommendations for patient areas

- ✓ All patient areas should be well ventilated - at least 12 air changes per hour.
- ✓ The distance between patients' beds should be at least 1 meter.
- ✓ Patients with an ARD of potential concern should be placed in a separate area specifically designated for these patients.
- ✓ Patients with an ARD of potential concern can be placed in either naturally or mechanically ventilated rooms.



Patients with other ARDs of potential concern, such as SARS or human infection of avian influenza, can be placed in an AVR or in an APR. However, when considering allocating available space in APRs, priority should be given to patients with airborne transmitted diseases.

Areas in which patients are waiting or are being triaged or in which procedures are taking place that may result in aerosol generation, must also have a minimum ventilation rate of 12 ACH.

### **Triage areas & corridors**

- Triage areas should allow for a distance of at least 1 metre to be maintained between patients.
- Corridors through which patients are frequently transported should be well-ventilated.

### **Isolation and cohorting**

Isolation refers to the process of confining patients to a specific, defined and designated area.

Cohorting refers to the practice of caring for more than one patient in the same designated place and by the same designated staff. Only patients that have been confirmed by laboratory diagnosis as being infected or colonized with the same pathogens can be cohorted in the same area.

If the etiological diagnosis is not laboratory-confirmed, cohorting, as described above, is not possible. Because of the transmission risk, patients should be housed in single rooms, whenever possible. However, if sufficient single rooms are not available, patients with epidemiological and clinical information suggestive of a similar diagnosis can share the same room.

Cohorting is used when there are insufficient single rooms available for every patient to be put under isolation.

- A distance of at least 1 metre must be maintained between each patient. This is essential as a patient may have other transmissible diseases in addition to the confirmed infection.
- Designated staff must not be assigned to provide care to any other non-cohorted patient.
- The number of persons permitted to enter the area in which cohorting or isolation are in place must be kept to a minimum.
- Avoid sharing of equipment, but if unavoidable, ensure that re-usable equipment is appropriately disinfected between patients.
- Ensure regular cleaning and proper disinfection of common areas, and adequate hand hygiene by patients, visitors and caregivers.

# 8.1

## ENVIRONMENTAL VENTILATION

**Environmental ventilation can play a critical role in helping to reduce the risk of infection.**

The risk of infection being transmitted through respiratory aerosols can be reduced by ensuring that patients are cared for in well-designed, well-ventilated rooms allowing for the removal of contaminated air. In high-risk areas, such as isolation rooms and waiting rooms, the recommended minimal ventilation rate is 12 air changes per hour (ACH).

The ventilation rate relates directly to the rate of decay of infective particles in the air. However, particle volume and quantity can vary between different health-care settings. It is important to remember that although adequate ventilation can reduce the risk of infection, it cannot eliminate the risk. It is essential, therefore that PPE be used as an additional protective measure.

There are basically three different kinds of environmental ventilation: **mechanical**, **natural** and **mixed mode**.

### Mechanical ventilation

Mechanical ventilation is created by the use of a fan to force air exchange and to drive air flow. It works by generating negative pressure in the room to drive airflow inward.

To be effective in rooms designated for the isolation of infectious patients, it is essential that:

- all doors and windows are kept closed;
- a minimum of 12 ACH is maintained.

### Natural ventilation

Natural ventilation is created by the use of external airflows generated by natural forces such as wind. Naturally-ventilated rooms can achieve very high

ventilation rates, but mosquito-nets should be used in endemic areas for vector-borne diseases (e.g. malaria, dengue). In naturally ventilated airborne precaution rooms the air should be directed to flow from patient-care areas towards transit-free areas. This ensures that contaminated air is able to mix with the air in the surrounding and external areas and become rapidly diluted.

### Mixed-mode ventilation

Mixed mode ventilation combines the use of mechanical and natural ventilation. This type of ventilation is done through the installation of an exhaust fan to increase the rate of air changes in the room. It can be useful in places where natural ventilation is not suitable (e.g. very cold weather) and fully mechanically ventilated airborne precautions rooms are not available.

### Effective natural ventilation guidelines

- ✓ Keep doors and windows open onto well ventilated corridors with open windows.
- ✓ Ensure the surrounding areas, including the corridors, are well ventilated to warrant rapid dilution of air coming from the patient room. If the corridor is not well ventilated, the room door should be kept closed. An exhaust fan can be added to increase the air circulation out of the open windows.
- ✓ Locate patient beds close to the exterior walls and open windows.



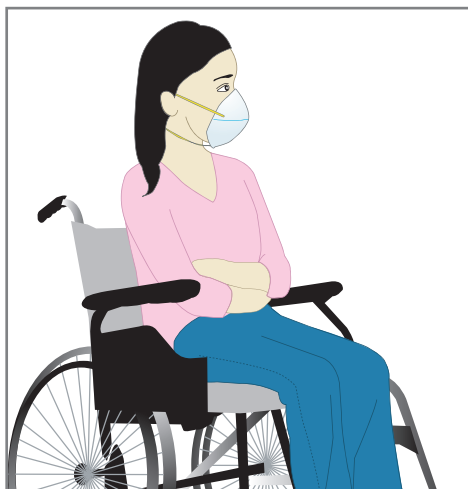
## 8.2

# TRANSPORT OF PATIENTS

**When transporting patients inside health-care facilities, consider your own protection and that of fellow health-care workers and other patients.**

Patients with ARDs should always be required to wear a medical mask when being transported or when being provided with care outside of isolation or cohorting areas.

Health-care workers in areas that have been designated to receive patients with ARDs of potential concern, must be alerted in advance to the patient's diagnosis and to the relevant infection control measures. Any surface area with which the patient comes into contact as a result of transportation through the health-care facility must be cleaned and disinfected immediately following contact.



*Patients with ARDs must wear a mask whilst being transported.*

### Patients diagnosed with SARS or avian influenza



- ✓ Do not permit them to leave the isolation area except for essential medical services.
- ✓ Transport them via routes that minimize the opportunities for exposure to staff, other patients or visitors.
- ✓ If the patient can use a medical mask, the health-care worker should use a gown and gloves. In case the patient cannot use a mask, the health-care worker should use a mask, gown and gloves.

## 9.0 MORTUARY HANDLING & POST-MORTEM EXAMINATION

**Standard Precautions, including the use of PPE are just as important after the death of a patient and should always be followed by the health-care worker.**

### Mortuary handling

- In the event of the death of a patient with an ARD of potential concern, the body should be placed in a fully sealed, impermeable body bag before it is removed from the isolation room for transportation to the mortuary. This will help to avoid any leakage of body fluids.
- Lifting a body is a heavy duty task and health-care workers should ensure that their PPE are of sufficient strength to withstand any damage.
- Items of PPE that should be worn by health-care workers when handling bodies include:
  - visors or goggles and medical mask or face shield to protect against any potential splashing of body fluids;
  - a waterproof, disposable, long-sleeved, cuffed gown and single-use, unsterilized, latex gloves;
  - if duties include lifting or carrying the body, it is advisable to use an additional pair of external heavy duty rubber gloves and a resistant waterproof apron.
- Family members who wish to view the body, should be required to wear the appropriate items of PPE to avoid direct contact with body fluids.
- Standard Precautions should be followed during the hygienic preparation of the body to avoid direct contact with body fluids.
- Subject to local directives, embalming can take place as long as the principles of Standard Precautions are followed to avoid direct contact with body fluids.

### Post-mortem examination

Autopsies must be performed in a safe environment. Those involved with performing or assisting with autopsies must wear appropriate PPE including:

- a scrub suit comprising top and trousers, or equivalent;
- a single-use, fluid-resistant, long-sleeved gown;
- a particulate respirator that complies with N95 standard if there is any risk of small particle aerosols being generated with the use of high speed devices such as saws;
- face shield or goggles;
- autopsy gloves or double pair of non-sterile gloves; and
- boots.

### How to reduce the risk of generating aerosols during autopsies

- ✓ Use containment devices.
- ✓ Use vacuum shrouds for oscillating saws.
- ✓ Avoid using high pressure water sprays.
- ✓ Open intestines under water.



**Always use PPE.** Any kind of fluid from a dead body may transmit disease. It is essential to wear the appropriate PPE to avoid unprotected contact with body fluids whenever handling dead bodies.









**Epidemic and Pandemic Alert and Response**

*[www.who.int/csr](http://www.who.int/csr)*