

Infection Control Preparedness

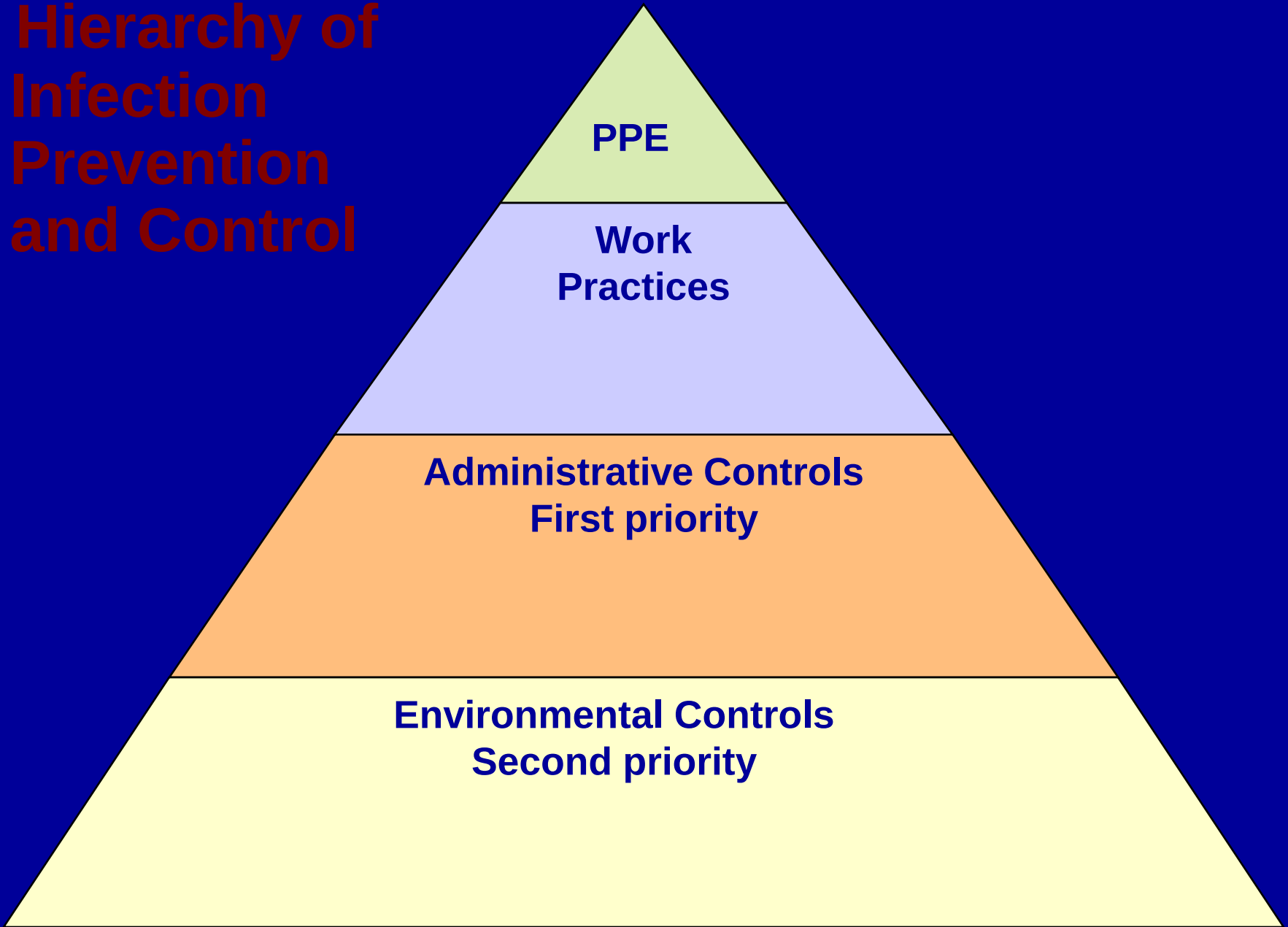
Hierarchy of Infection Prevention and Control

PPE

**Work
Practices**

**Administrative Controls
First priority**

**Environmental Controls
Second priority**



Session Overview

- **Disease transmission**
- **Precautions levels**
- **Personal protective equipment (PPE)**
- **Infectious Disease emergency**
- **Planning**

Routes of Transmission of ID agents

- **Contact**
 - Direct or indirect
- **Droplet**
- **Airborne**
- **Common Vehicle transmission**
 - Water, Food etc.
- **Vector-borne**
 - Transmitted by insects

Routes of Transmission

Contact

Direct Contact

- **Kissing, skin-to-skin contact, sexual intercourse**
- **Contact with soil or vegetation**

Indirect Contact

- **Contaminated surfaces (fomites)**

Routes of Transmission

Droplet

Large droplets within 1 meter transmit infection via:

- Coughing, sneezing, talking
- Medical procedures

Examples:

- Influenza
- Severe Acute Respiratory Syndrome

Routes of Transmission

Airborne (droplet nuclei)

Very small particles of evaporated droplets or dust with infectious agent may..

- Remain in air for a long time
- Travel farther than droplets
- Become aerosolized during procedures

Examples:

- Tuberculosis
- Measles (Rubeola)

Precaution Levels

- **Standard**

Transmission based precautions:

- **Contact**
- **Droplet**
- **Airborne**

Standard Precautions

Standard/Routine Precautions

- **Apply to ALL individuals in health care settings**

Assumes blood and body fluid of ANY patient could be infectious

- **Hand hygiene, AND**
- **PPE based on risk assessment**

Efficacy of Hand Hygiene Preparations in Killing Bacteria

Good

Better

Best



Plain Soap

Antimicrobial
soap

Alcohol-based
handrub

How to hand rub?

- Rub hands for hand hygiene.
- Wash hands only when visibly soiled.
- A good technique is important
- **20-30 seconds and hands are safe** (WHO training materials, 2006)

Alcohol
based
hand
rub



1. Before patient contact
2. Before aseptic task
3. After body fluid exposure task
4. After patient contact
5. After contact with patient surroundings



PPE for Standard Precautions (risk assessment)

Wear:

- **Gloves**

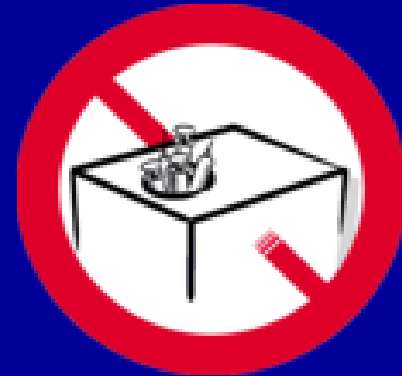
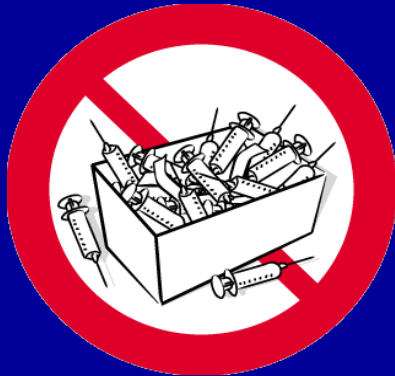
- **Gowns**

- **Eye Protection and / or Mask**

If:

- **Touching**
 - Respiratory secretions
 - Contaminated items or surfaces
 - Blood & body fluids
- **Soiling clothes with patient body fluids, secretions, or excretions**
- **Procedures are likely to generate splashes / sprays of blood, body fluids, secretions, excretions**

Prevention of Needlestick Injuries



Environmental Decontamination

- **Cleaning MUST precede decontamination**
- **Disinfectant ineffective if organic matter is present**
- **Clean, then disinfect patient room daily**
 - **Bed rails**
 - **Bedside tables**
 - **Lavatory surfaces**
 - **Blood pressure cuff, equipment surfaces**

Environmental Decontamination: Disinfecting

- Household bleach (diluted)
- Quaternary ammonia compounds
- Chlorine compounds (Chloramin B, Presept)
- Alcohol
 - Isopropyl 70% or ethyl alcohol 60%
- Peroxygen compounds
- Phenolic disinfectants
- Germicides with a tuberculocidal claim on label
- Others

Preparing 1 liter of Bleach Solutions

- With bleach containing 5% sodium hypochlorite
10 ml bleach + 990 ml cold tap water
- With bleach containing 2.5% sodium hypochlorite
20 ml bleach + 980 ml cold tap water

Household Bleach Safety

- Use mask, goggles, rubber gloves, waterproof apron
- Mix in well-ventilated area
- Do not use or mix with other detergents
- Use cold or room temperature water to mix



Using Bleach Solutions

- First clean organic material from surfaces or items
- Clean using warm water and detergent
- Wipe surfaces with sponge or wet cloth
 - Allow to dry
- Make fresh diluted bleach daily!

Waste Disposal

- **Use Standard Precautions**
 - Gloves and hand washing
 - Gown + Eye protection
- **Avoid aerosolization**
- **Prevent spills and leaks**
 - Double bag if outside of bag is contaminated (not always necessary)
- **Segregation and disposal as per national regulations.**

Managing Linens and Laundry

- **Use Standard Precautions**
 - **Gloves and hand hygiene**
 - **Gown**
 - **Mask**
- **Avoid aerosolization – do not shake**
- **Fold or roll heavily soiled laundry**
 - **Remove large amounts of solid waste first**
- **Place soiled laundry into bag in patient room**

Droplet Precautions

Taken in addition to Standard Precautions

- **Place patients in single rooms or cohort 1 meter apart**
- **Wear surgical mask within 3 feet or 1 meter of patient**
- **Wear face shield or goggles within 3 feet or 1 meter of patient if particulate generating procedure**
- **Limit patient movement within facility**
 - **Patient wears mask when outside of room**

Airborne Precautions

- **N95 respirator (or equivalent) for personnel**
 - Check seal with each use
- **Patient in isolation**
- **Airborne isolation room, if available**
 - Air exhaust to outside or re-circulated with HEPA filtration
- **Patient to wear a surgical mask if outside of the isolation room**

Contact Precautions

- **Gloves**
- **Gowns**

Personal Protective Equipment

Personal Protective Equipment (PPE)



Types of PPE Used in Healthcare Settings

- **Gloves – protect hands**
- **Gowns/aprons – protect skin and/or clothing**
- **Masks and respirators– protect mouth/nose**
 - **Respirators – protect respiratory tract from airborne infectious agents**
- **Goggles – protect eyes**
- **Face shields – protect face, mouth, nose, and eyes**

How to put on PPE



- Hand hygiene
- Long sleeved, cuffed disposable gown
- Apron is optional, if splashes are expected and the gown is permeable (e.g., cloth gown)
- Caps are optional for aerosol-generating procedures (e.g., intubation)
- Particulate respirators: completely seal mouth and nose, perform seal check
- Protective eyewear: goggles (upper edge of mask under goggles), faceshield
- Gloves, with gown sleeve tucked into gloves

How to Remove PPE

**Avoid self-contamination when removing PPE!
Remember where PPE could be contaminated.**

➤ **Example of suggested order**

- Remove gloves with gown (if disposable gowns), peel from hand, discard
- Alcohol hand rub or wash hands
- Remove face shield / goggles, WITHOUT touching the front part
- Remove respirator, WITHOUT touching the front part
- Alcohol hand rub or wash hands

Where to Remove PPE

- **At doorway, before leaving patient room or in anteroom***
- **Remove respirator outside room, after door has been closed***

* Ensure that hand hygiene facilities are available at the point needed, e.g., sink or alcohol-based hand rub

Who should wear PPE?

Ex: caring for MERS=CoV patients

- Anyone who enters the isolation area:
 - All health care workers
 - Radiographers
 - Physiotherapists, etc.
 - Laboratory staff
 - All support staff
 - Family members and visitors

Prioritizing the Use of PPE When Supplies Are Limited

- *Provision of necessary supplies should be an institutional priority.*
- Reuse of disposable PPE items should be avoided.
- Avoid wastage, critically evaluate in which situations PPE is indicated.

Duration of PPE Use

Surgical Masks (if N95 not available)

- Wear once and discard
- Discard if moist

N95 Particulate Respirators

- May use just one with cohorted patients

Eye Protection

- May wash, disinfect, reuse

Emergency situation

**Pandemic influenza or an acute
respiratory infections of
potential concern (MERS-CoV)**

Transmission of Viruses

	Seasonal Influenza in Humans	Avian Influenza in Humans	MERS-CoV
Droplet	Yes	Probable (human to human)	Probable
Airborne	Likely	Unknown	Unknown
Contact	Yes	Yes (bird to human)	Probable

MERS-CoV

- No evidence of sustained human to human transmission

Environmental Factors That Increase Risk for Transmission

- **Exposure in small, enclosed spaces**
- **Inadequate ventilation**
- **Recirculating air containing infectious droplets**
- **Inadequate cleaning and disinfection of equipment**
- **Improper specimen-handling procedures**

- **Implement precautions at point of first encounter**
- **Prevention begins when a patient or visitor walks through the door of an Emergency Department or outpatient office.**

Emergency Departments and Outpatient Offices

- **Patient examination by the healthcare provider**
 - **Where will the patient with respiratory symptoms be examined? (designated area)**
 - **What PPE will the provider wear?**

Assess Airborne Isolation Capacity in Emergency Departments and Outpatient Areas

- **Is there an airborne isolation room available for the initial patient examination?**
- **If not, what room or area would be appropriate for the initial examination of a patient with respiratory infection with potential airborne transmission?**
 - **Distance from other examination rooms**
 - **Ability to redirect air flow**

Precautions for Probable or Confirmed Cases

- Place patient in adequately ventilated single rooms or a negative air pressure room
- To create a negative air pressure room:
 - Install exhaust fan and direct air from inside to an outside area with no person movement
- If no **air conditioning**, open windows in isolation areas but keep doors closed
- Place patients in rooms alone
 - Alternative: cohort patients away from other patient care areas with beds > 1 meter apart

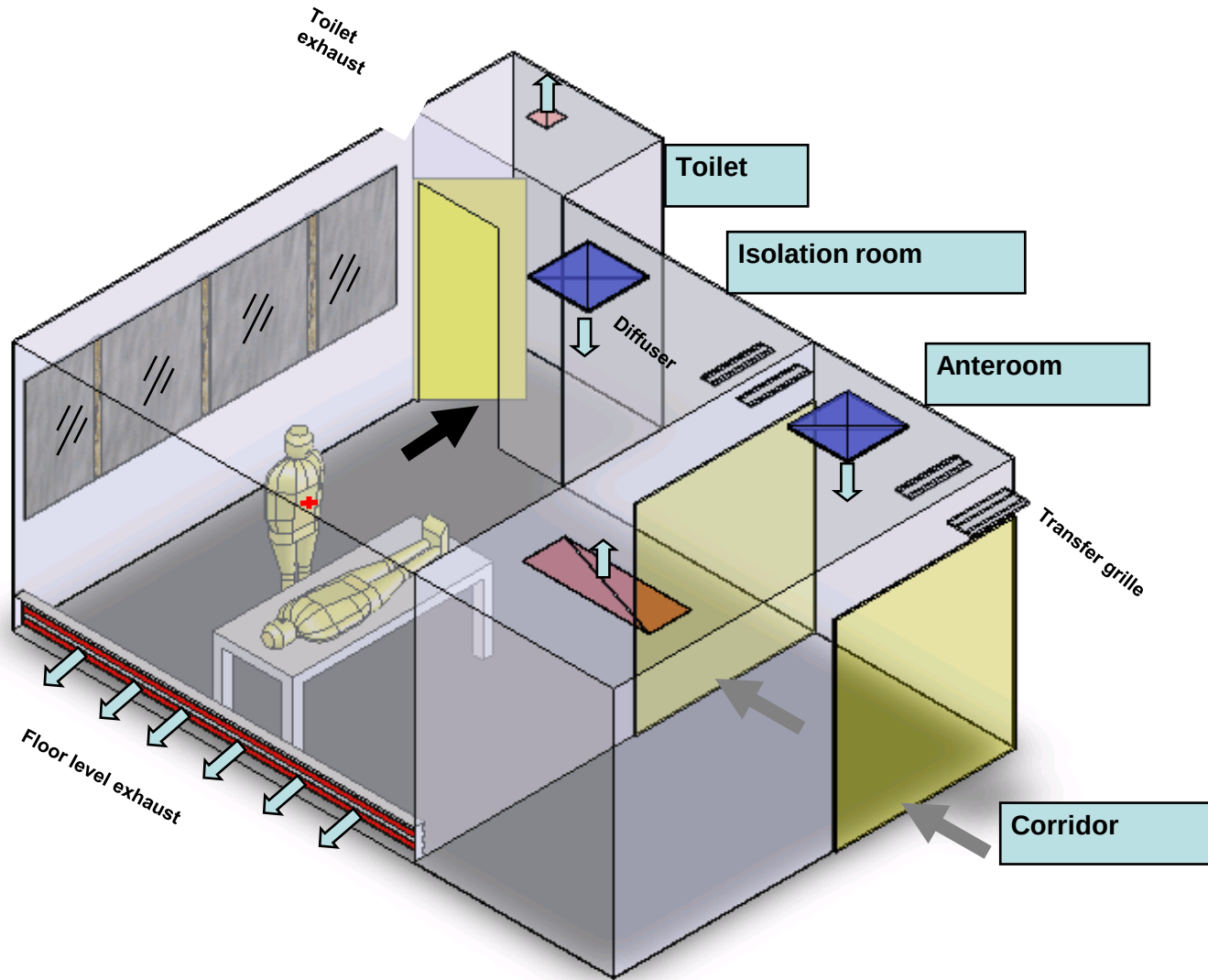


Table 1. ACH in a naturally ventilated AIR³⁷

<i>Room conditions</i>	<i>ACH rates</i>
Completely opened window + Open door	29.3-93.2 ACH
Completely opened window + Closed door	15.1-31.4 ACH
Half-opened window + Closed door	10.5-24 ACH
Close window + Open door	8.8 ACH

Precautions for Probable or Confirmed Cases

- **Limit number of health care workers, family members and visitors**
- **Designate experienced staff to provide care**
- **Limit designated staff to patient care**
- **Teach family and visitors to use PPE**

Additional precautions: probable or confirmed case

- **Medical mask**
- **Eye protection**
- **Clean, non-sterile long-sleeved gown**
- **Gloves**
- **Hand hygiene**
- **Disposable or dedicated equipment**
- **Clean and disinfect equipment between each patient use**
- **Refrain from touching eyes, nose or mouth with hands**

Placement: probable or confirmed case

- Adequately ventilated single rooms or Airborne Precaution rooms.
- Ideally the room should be segregated from other patient-care areas
- When single rooms are not available: put patients with the same diagnosis together
- If not possible place patient beds at least 1 m apart

Transport

- Avoid transport unless medically necessary
- Use designated portable equipment if possible
- If transport required use routes that minimize exposure
- Notify receiving area
- Clean and disinfect patient-contact surfaces
- Ensure HCWs transporting patients wear appropriate PPE

WHO Guidance

- **Droplet Precautions when providing routine patient care**
- **However, whenever performing aerosol-generating procedures, HCWs should apply Airborne Precautions as part of infection control precautions**

Aerosol-generating procedures

- Endotracheal intubation
- Nebulized medication
- Bronchoscopy
- Airway suctioning
- Tracheostomy care
- Chest PT
- Nasopharyngeal aspiration
- Positive pressure ventilation
- Resuscitation manoeuvres
- Postmortem excision of lung tissue

Precaution		No pathogen identified, no risk factor for TB or ARI of potential concern (e.g. influenza-like illness without risk factor for ARI of potential concern)	Pathogen						
			Bacterial ARI ² , including plague	TB	Other ARI viruses (e.g. parainfluenza RSV, adenovirus)	Influenza virus with sustained human-to-human transmission (e.g. seasonal influenza, pandemic influenza)	New influenza virus with no sustained human-to-human transmission (e.g. avian influenza)	SARS	Novel ARI ³
Hand hygiene ^c		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gloves		Risk assessment ^d	Risk assessment ^d	Risk assessment ^d	Yes	Risk assessment ^d	Yes	Yes	Yes
Gown ^e		Risk assessment ^d	Risk assessment ^d	Risk assessment ^d	Yes	Risk assessment ^d	Yes	Yes	Yes
Eye protection		Risk assessment ^f	Risk assessment ^f	Risk assessment ^f	Risk assessment ^f	Risk assessment ^f	Yes	Yes	Yes
Medical mask for health-care workers and caregivers		Yes	Risk assessment ^f	No	Risk assessment ^f /Yes ^g	Yes	Yes ^h	Yes ⁱ	Not routinely ^b
Particulate respirator for Health-care workers and caregivers	for room entry	No	No	Yes	No	No	Not routinely ^h	Not routinely ⁱ	Yes
	within 1 m of patient	No	No	Yes	No	No	Not routinely ^h	Not routinely ⁱ	Yes
	for aerosol-generating procedures ^j	Yes ^k	Yes ^k	Yes	Yes ^k	Yes ^k	Yes ^k	Yes	Yes ^{l,k}
Medical mask for patient when outside isolation areas ^l		Yes	Yes	Yes	Yes ^m	Yes	Yes	Yes	Yes
Adequately ventilated separate room		Yes, if available ⁿ	No	No	Yes, if available ⁿ	Yes, if available ⁿ	Yes	Yes	Not routinely ^b
Airborne Precaution room ^o		No	No	Yes ^p	No	No	Not routinely ^p	Not routinely ^p	Yes ^p
Summary of isolation precautions for routine patient care, excluding aerosol-generating procedures ^l (Annex B)		Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard
		Droplet	--	--	Droplet	Droplet	Droplet	Droplet	--
		--	--	--	Contact	--	Contact	Contact	Contact
		--	--	Airborne	--	--	--	--	Airborne

Duration of isolation

- Usually as long as the patient is symptomatic and for 24 hours after resolution of symptoms
- Some may prefer to do additional testings prior to the discontinuation of isolation

Interviewing - Asymptomatic Exposed Persons and Contacts

- **Low-risk activity**
- **Routine use of PPE not recommended**
- **Maintain >1 meter distance between interviewer and interviewee**
- **Use proper hand hygiene**

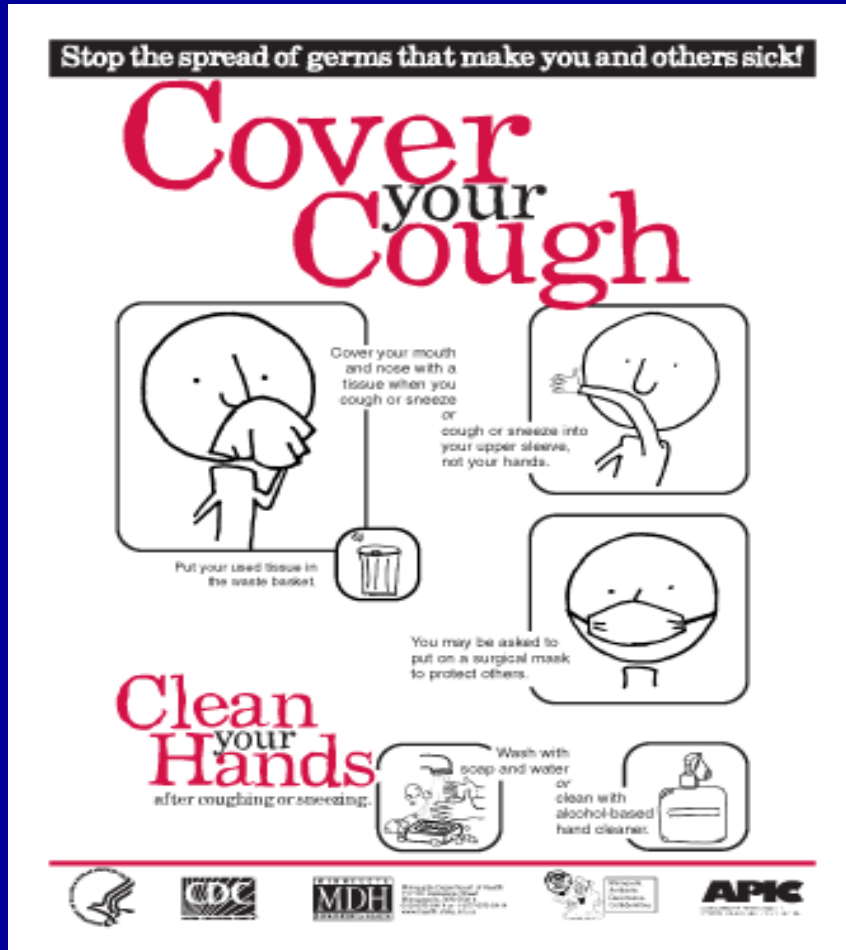
Interviewing - Symptomatic Exposed Persons

- **Higher risk activity**
- **PPE recommended in community and healthcare facility**
 - **Contact precautions**
 - **Droplet precautions**
 - **N95 respirator for aerosolized generating procedures**
- **In healthcare facility, person should be placed in adequately ventilated single room**

Specimen Collection

- High-risk aerosol-generating procedure
- PPE recommended
 - Gloves
 - Gown
 - Goggles or face-shield
 - N95 or better respirator

Preventing Transmission in the Community



- Respiratory etiquette
 - Cover nose / mouth when coughing or sneezing
- Hand washing!

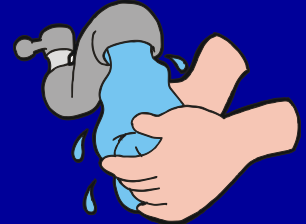
Recommendation for all individuals with respiratory symptoms

Respiratory hygiene and cough etiquette

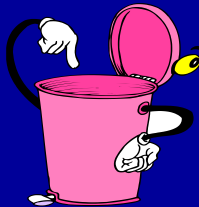
- Cover the nose/mouth when coughing or sneezing



- Perform hand hygiene if contact respiratory secretions and contaminated objects



- Use tissue paper to contain respiratory secretions and dispose in the waste receptacle



- Put on a surgical mask



Food

- **Heat to $> 70^{\circ}\text{C}$ to kill microorganisms**
- **Consumption of raw / undercooked meat ingredients is risky**
 - **Runny eggs**
 - **Meat with red juice**
- **Separate raw meat from cooked or ready-to-eat foods to avoid cross-contamination**
- **Wash hands before and after preparing food**

Patients Cared for at Home

- Potential for transmission!
- Must educate family caregivers
- Fever / symptom monitoring
- Infection control measures
 - Hand washing
 - Use of available material as PPE

Patients Cared for at Home

- **Handle laundry with gloves; do not shake to prevent aerosolization**
- **Use disposable or dedicated dishes, utensils**
- **Decontaminate the home environment**
 - **Frequent cleaning before disinfection**

Precautions for Handling Corpses

- Mortuary staff should use **Full Barrier PPE**
- Anyone handling a corpse infected with disease of potential concern should be informed

Assess Existing Infection Control Infrastructure

- **Is there a written preparedness plan?**
- **Do policies describe PPE for health care workers?**
- **Are procedures in place for patient room cleaning?**
- **Are there negative air pressure rooms? (ER, wards, ICU)**
- **Cohorting plan**
- **Contingency plan for surge capacity**

- **Stockpiling: PPE, drugs, vaccine, other**

What's in it? Where is it? How long will it last?

When will you draw from it? Who decides?

How will you distribute/utilize it?

- **Prioritization when shortage of supply**
- **Training**
- **Drills**