Recommendations on Implementing Isolation Precautions in Hospital Settings

Jointly prepared by
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I. Introduction

In an era of emerging and re-emerging communicable disease threats, the importance of infection prevention and control measures in healthcare facilities to avoid healthcare associated infections (HAIs) and amplification of outbreaks should not be underestimated. One of the essential components of preventing the transmission of infections is the adherence of isolation precautions that composed of two tiers: standard precautions and transmission-based precautions.

2. Standard precautions constitute a group of infection control practices that are intended to apply to all patients, regardless of their diagnosis or presumed infection status. It is based on the assumption that all blood, body fluids, secretions, excretions except sweat, non-intact skin, and mucous membranes are potentially infectious in nature.

3. In addition to standard precautions, transmission-based precautions should be implemented for patients who are known or suspected to be infected or colonised with highly transmissible or epidemiologically important pathogens that require additional control measures to prevent transmission. There are three types of transmission-based precautions, namely contact precautions, droplet precautions and airborne precautions. Combination of precautions may be required for diseases that have multiple routes of transmission.

4. This recommendation aimed to provide healthcare workers (HCWs) the general principles of implementing isolation precautions in hospital settings. In the meantime, the emergence of MDROs infections and novel ARDs presents new challenges on the control of infection transmission. For special consideration on MDROs and novel ARDs in hospital settings, please refer to

Appendices 3 and 4.

II. Recommendations on Implementing Isolation Precautions in Hospital Settings

A. Standard precautions

Standard precautions served as the basic infection control precautions in hospital settings and it is intended to apply to all patients, regardless of their diagnosis or presumed infection status. The components of standard precautions are as follows:

(a) Hand hygiene

(i) Perform hand hygiene in the following situations: (a) before touching a patient; (b) before clean/ aseptic procedures; (c) after body fluid exposure/risk; (d) after touching a patient; (e) after touching patient surroundings. (1)(2)

(ii) Preferably use an alcohol-based handrub for routine hand antisepsis if hands are not visibly soiled. Wash hands with soap and water when hands are visibly dirty or soiled with blood or other body fluids; after using toilet; or if exposure to potential spore-forming organisms is strongly suspected or proven (1)(2).

(b) Respiratory hygiene and cough etiquette

(i) Offer surgical masks to patients with symptoms of respiratory infection if tolerated(3). And HCWs should wear surgical masks while caring for patients with acute respiratory diseases .(4)

(ii) HCWs with symptoms of respiratory infection are advised to avoid direct patient contact, especially with high risk patients. If this is not possible, then a surgical mask should be worn while providing patient care.

(c) Use of Personal Protective Equipment (PPE) (Appendix 1)

(i) The use of PPE is based on the nature of the patient care activities and/or the modes of transmission. It can be either used alone or in combination. (5)

(ii) Wear gloves when there are contacts with blood, body fluids, secretions and excretions except sweat, non-intact skin, mucous membranes and other potentially infectious materials (5)(6).

(iii) While performing procedures or patient care activities for which splashing of blood, body fluids, secretions, or excretions is anticipated:

1. wear eye protective device and surgical mask to protect mucous membranes of eyes, nose and mouth (7);
2. wear appropriate gown to protect the skin and prevent soiling of the clothing of HCWs (8)

(iv) Remove PPE promptly after use by using proper technique to prevent excessive contamination of the surrounding environment (7)(9)

(d) Prevention of needlesticks and sharps injuries (10)

(i) Avoid the use of needles where safe and effective alternatives are available; or use needle devices with safety features whenever possible.

(ii) Avoid work practices that pose sharps injury hazards, for example: recap, bend, break or hand-manipulate used needles. Use either one-handed "scoop" technique or a mechanical recap device if recapping is unavoidable.

(iii) Place used needles and sharps into a nearby puncture-resistant sharps box (11).

(e) Safe injection practices

(i) Use sterile, single-use, disposable needle and syringe for each injection (12)(13)(14).

(ii) Use of single-dose vials is preferred over multiple-dose vials, especially when medications will be administered to multiple patients (12). If multidose vials must be used, both the needle or cannula and syringe used to access the multidose vial must be sterile (12)(15).

(f) Handling of used equipment

(i) Handle used equipment in a manner that prevents skin and mucous membrane exposures, contamination of clothing and environment, and transfer of microorganism to other persons (16).

(ii) Ensure that contaminated reusable equipment are cleaned and disinfected before being used on another patient (17)(18).

(g) Linen management

(i) Minimal agitation during handling of used linen in order to avoid contamination of involved persons and environment (19)(20)(21).

(ii) Remove the bulky soiled material (e.g. faeces) cautiously from all soiled linen before the linen is placed into the laundry bag (21).

(h) Environmental hygiene

(i) The areas that are in close proximity to the patient (e.g., bed rails, bedside tables) or frequently-touched in the patient care environment (e.g., door knobs, surfaces in and surrounding toilets in patients' rooms) should be cleaned more frequently compared to that for other surfaces (e.g., floors in waiting rooms) (22)(23)(24)(25)

(ii) Perform terminal cleaning and disinfection of the patient areas upon patients discharge.

(i) Patient placement

(i) Prioritize for single room or physically segregated location if patients are

1. at increased risk of transmitting infection, including those likely to contaminate the environment or does not maintain appropriate hygiene (5); or
2. at increased risk of acquiring infection or developing adverse outcome following infection(8)(26).

(j) Spatial separation with at least one meter apart for patients.(27)

B. Transmission-based precautions

General principles

Implement appropriate transmission-based precautions in the situation that standard precautions are not adequate to prevent the infection transmission. See Appendix 2: Recommended precautions for specific infections. Extend the duration for immune-suppressed patients with viral infections due to prolonged shedding of viral agents(28)(29)(30).

Transmission-based precautions should be empirically implemented once the patient presented with signs and symptoms compatible with infections caused by certain possible pathogens and pending for definitive diagnosis. They can be used singly or in combination (5).

The principles of managing used equipment, cleaning and disinfection of environment and used linen for patients under transmission-based precautions should be the same as in standard precautions, unless otherwise specified.

Limit transport and movement of patients for essential purposes only (5). The receiving end should be notified on the infection status in advance.

(a) Contact precautions

Use contact precautions for patients known or suspected to be infected or colonised with important pathogens that can be transmitted by direct contact with the patients or indirect contact with environmental surfaces or used equipment (Refer Appendix 3 for the specific recommendations to the patients with MDROs colonisation or infection). The major components of contact precautions are as follows:

(i) Use of PPE (Appendix 1)

1. Wear gloves whenever touching the patient's intact skin (1)(2)(23)(31) or surfaces and articles in close proximity to the

patient (e.g., medical equipment, bed rails) (24).

2. Wear a gown if it is anticipated that the clothing will have direct contact with the patient, environmental surfaces, or items in close proximity to the patient (3).

(ii) Handling of used equipment

Dedicate the use of non-critical care equipment to a single patient (or cohort of patients infected or colonised with the same pathogen requiring precautions) if possible. Otherwise, shared non-critical items must be cleaned and disinfected between uses in different patients(25)(31)(32)(33).

(iii) Environmental hygiene

Ensure that the immediate environment of patients on contact precautions are prioritized for frequent cleaning and disinfection (e.g., at least daily) with a focus on frequently-touched surfaces (e.g., bed rails, bedside table, bedside commode, lavatory surfaces in patient bathrooms, doorknobs) and equipment in the close proximity of the patient (5)(22).

(iv) Patient placement

Patient is preferably put in a single room. Alternatively, cohort patients colonised or infected with the same pathogens (32)(34).

(v) Patient transport

Ensure open wounds of patients are contained and covered before transport (5).

(b) Droplet precautions

Use droplet precautions for patients known or suspected to be infected with pathogens transmitted by respiratory droplets (more than 5μm in diameter), which are generated by patients during coughing, sneezing or talking. The components of droplet precautions are as follows:

(i) Use of PPE (Appendix 1)

Wear surgical mask when working within one meter of the patient (7).

(ii) Patient placement

Patient is preferably put in a single room, especially for those who have excessive cough and sputum production. Alternatively, cohort patients colonised or infected with the same pathogens (21)(31)(35).

(iii) Patient transport

Minimize dispersal of droplets by placing a surgical mask on the patient if possible and educate the patient to maintain respiratory hygiene and cough etiquette (5).

(c) Airborne precautions

Use airborne precautions for patients known or suspected to be infected with pathogens transmitted by droplet nuclei (less than 5μm in diameter) that can remain suspended in air and dispersed over a long distance, or when performing aerosol-generating procedures, which may be associated with an increased risk of infection transmission . The components of airborne precautions are as follows:

(Remark: aerosol-generating procedures with documented increase in risk of pathogen transmission include intubation and related procedures [e.g. mechanical ventilation, suctioning]; cardiopulmonary resuscitation; bronchoscopy; and surgery where high-speed devices are used (21). Other aerosol-generating procedures with controversial studies evaluating the risk of respiratory pathogen transmission are non-invasive positive pressure ventilation and bi-level positive airway pressure, high-frequency oscillating ventilation, nebulization. Nasopharyngeal aspirate and high flow oxygen are also theoretically at risk of dispersal of infectious respiratory droplets. Additional precautions for HCWs when performing these procedures on patient with acute respiratory disease appeared warranted (21). Other procedures should be assessed at the discretion of hospital Infection Control Officer (36).

(i) Patient placement

1. Patient should be placed into a negative pressure Airborne Infection Isolation Room (AIIR) (22)(37) with at least six (existing facility) or twelve (new construction / renovation) air changes per hour. (5) The room door should be kept close all the time when not required for entry and exit. According to the prevailing international guidelines, all the air of the AIIR (new construction/ renovation) must be exhausted to the outdoor directly (38).
2. Patients infected with the same pathogens (with similar drug resistance profiles where specific drug treatment is available) may share the same AIIR, especially in outbreak situation involving large numbers of patients who require airborne precautions (5). For exposed contacts, symptomatic contacts should be promptly segregated from those without symptoms and evaluated quickly to ascertain the infectious status to guide further management.

(ii) Use of PPE (Appendix 1)

1. Wear a particulate respirator at least as protective as a NIOSH-certified N95 or equivalent when entering the room of patient with known or suspected infection of airborne transmitted infectious diseases (37), or performing aerosol-generating procedures, which may be associated with an increased risk of infection transmission.
2. Seal check should be performed for each time when a respirator is worn.(21)

(iii) Environmental hygiene

Once the patient is discharged, the room should remain vacant for the appropriate time according to the ventilation status of the room (22)(37).

(iv) Patient transport

1. Minimize the dispersal of droplet nuclei by placing a surgical mask on patient if possible and advise for respiratory hygiene and cough etiquette (37).
2. Cover the skin lesions caused by varicella or draining skin

lesions caused by *M. tuberculosis* to prevent aerosolization or direct contact with the pathogens (39)(40)(41)(42).

(v) Susceptible persons should not enter the room of patients known or suspected to have measles or varicella (chickenpox) if other immune HCWs are available (43)(44).

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Appendix

Appendix 1

Summary of recommended PPE usage in different precautions

PPE / Precautions		N95 respirator or above	Surgical mask	Eye protection	Gown	Gloves
Standard Precautions (SP)		-	Splashing procedure	Splashing procedure	Splashing procedure	Touching blood, body fluid, secretion, excretion and contaminated items
Additional (Transmission-Based) Precautions	Airborne Precautions	When entering patient's room	Place on the patient if transport or movement is necessary	-	-	-
	Droplet Precautions	-	Within one metre of patient Place on the patient if transport or movement is necessary	-	-	-
	Contact Precautions	-	-	-	Extended contact	Touching the patient's intact skin or surfaces and articles in close proximity to the patient

Appendix 2
Type and Duration of Precautions Needed for Selected Infections and Conditions [adopted from Guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings] (5)(21)(45)(46)(47)

Infection/ Condition	Precautions		
	Type*	Duration+	Comments
Abscess			
- Draining, major	C	DI	Until drainage stops or can be contained by dressing
- Draining, minor or limited	S		If dressing covers and contains drainage
Acquired human immunodeficiency syndrome (see Human immunodeficiency virus, HIV below)			
Actinomycosis	S		
Amebiasis	S		
Anthrax			
- Cutaneous	S		Transmission through non-intact skin contact with draining lesions possible, therefore use Contact Precautions if large amount of uncontained drainage. Handwashing with soap and water preferable to use of waterless alcohol based antiseptics
- Pulmonary	S		
Anibiotic-associated colitis (see gastroenteritis, *Clostridioides difficile*)			
Arthropod-borne			
- viral encephalitides (eastern, western, Venezuelan equine encephalomyelitis; St Louis, California encephalitis; West Nile Virus)	S		Install screens in windows and doors in endemic areas. Use DEET-containing mosquito repellants and clothing to cover extremities.
- viral fevers (dengue, yellow fever, Colorado tick fever)	S		
Ascariasis	S		
Aspergillosis	S		Contact and Airborne Precautions if massive soft tissue infection with copious drainage and repeated irrigations required
Avian influenza (see influenza , avian below)			
Babesiosis	S		Not transmitted from person to person except rarely by transfusion
Blastomycosis, North American, cutaneous or pulmonary	S		
Botulism	S		
Bronchiolitis (see respiratory infections in infants and young children)	C	DI	
Brucellosis (undulant, Malta, Mediterranean fever)	S		Not transmitted from person

Infection/ Condition	Precautions		
	Type*	Duration+	Comments
			to person except rarely via banked spermatozoa and sexual contact. Provide antimicrobial prophylaxis following laboratory exposure.
Campylobacter gastroenteritis (see gastroenteritis)			
Candidiasis, all forms including mucocutaneous	S		
Cat-scratch fever (benign inoculation lymphoreticulosis)	S		
Cellulitis	S		
Chancroid (soft chancre) (*H. ducreyi*)	S		Transmitted sexually from person to person
Chickenpox (see varicella)			
Chlamydia trachomatis infection, causing conjunctivitis, genital (lymphogranuloma venereum), and pneumonia (infants ≤ 3 mos. of age)	S		
Chlamydia pneumoniae	S		
Cholera (see gastroenteritis)			
Closed-cavity infection - Open drain in place; limited or minor drainage - No drain or closed drainage system in place	 S S		 Contact precautions if there is copious uncontained drainage.
- *Clostridioides difficile* (see Gastroenteritis, C. *difficile*)	C	DI	
- *Clostridium botulinum*	S		
- *Clostridium perfringens* Food poisoning Gas gangrene	 S S		 Use Contact Precautions if wound drainage is extensive.
Coccidioidomycosis infection (valley fever) - Draining lesions - Pneumonia	 S S		
Colorado tick fever	S		
Congenital rubella	C	U 1yr of age	Standard Precautions if nasopharyngeal and urine cultures repeatedly negative after 3 months of age.
Conjunctivitis - Acute bacterial, *Chlamydia*, Gonococcal - Acute viral (acute haemorrhagic)	 S C	 DI	 Adenovirus most common; enterovirus Coxsackie virus also associated with community outbreaks. Highly contagious. Eye clinics should follow Standard Precautions when handling patients with conjunctivitis and practice infection control measures in the handling of instruments and equipment.
Corona virus associated with SARS (SARS-CoV) (see sever acute respiratory syndrome)			
Coxsackie virus disease (see enteroviral infection)			
Creutzfeldt-Jakob disease (CJD, vCJD)	S		Use disposable instruments or special sterilization/disinfection for

Infection/ Condition	Precautions		
	Type*	Duration+	Comments
			surfaces, objects contaminated with neural tissue if CJD or vCJD suspected and has not been R/O; No special burial procedures
Croup (see respiratory infections in infants and young children)			
Crimean-Congo Fever (see Viral Hemorrhagic Fever)	S		
Cryptococcosis	S		Not transmitted from person to person, except rarely via tissue and corneal transplant
Cryptosporidiosis (see gastroenteritis)			
Cysticercosis	S		
Cytomegalovirus infection, including in neonatal and immunosuppressed patients	S		
Decutitus ulcer (see Pressure ulcer)			
Dengue fever	S		
Diarrhoea, acute-infective etiology suspected (see gastroenteritis)			
Diphtheria - Cutaneous	C	U off antimicrobial treatment and culture negative	Until 2 cultures taken at least 24 hours apart negative.
- Pharyngeal	D	U off antimicrobial treatment and culture negative	Until 2 cultures taken at least 24 hours apart negative.
Ebola virus (see viral haemorrhagic fever)			
Echinococcosis (hydatidosis)	S		
Echovirus (see enteroviral infection)			
Encephalitis or encephalomyelitis (see specific etiologic agents)			
Endometritis (endomyometritis)	S		
Enterobiasis (pinworm disease, oxyuriasis)	S		
Enterococcus species (see multidrug-resistant organisms if epidemiologically significant or vancomycin resistant)			
Enterocolitis, *C. difficile* (see gastroenteritis, C. *difficile*)			
Enteroviral infections (i.e. Group A and B Coxsackie viruses and Echo viruses)(excludes polio virus)	S		Use Contact Precautions for diapered or incontinent children for duration of illness and to control institutional outbreaks
Epiglottitis, due to *Haemophilus influenzae* type b	D	U 24 hrs after initiation of effective therapy	See specific disease agents for epiglottitis due to other etiologies
Epstein-Barr virus infection, including infectious mononucleosis	S		
Erythema infectiosum (see Parvovirus B19)			

Infection/ Condition	Precautions		
	Type*	Duration+	Comments
Escherichia coli gastroenteritis (see gastroenteritis)			
Food poisoning, due to Botulism, Staphylococcal, *C. perfringens* or *welchii*	S		
Furunculosis-staphylococcal	S		Contact Precautions if drainage not controlled. Follow institutional policies if MRSA
Infants and young children	C	DI (with wound lesions, until wounds stop draining)	
Gangrene (gas gangrene)	S		
Gastroenteritis, caused by			
- Adenovirus, *Campylobacter* species, Chloera (*Vibrio cholerae*), *Cryptosporidium* species, *Escherichia coli*, O157:H7 and other Shiga toxin-producing strains, and other species, *Giardia lamblia*, *Salmonella* species (including *S. typhi*), *Shigella* species (Bacillary dysentery), *Vibrio parahaemolyticus*, Viral (if not covered elsewhere), *Yersinia enterocolitica*	S		Use Contact precautions for diapered or incontinent persons for the duration of illness or to control institutional outbreaks.
- *Clostridioides difficile*	C	DI	Discontinue antibiotics if appropriate. Ensure consistent environmental cleaning and disinfection. Hypochlorite solutions may be required for cleaning if transmission continues. Handwashing with soap and water preferred
- Norovirus	S		Use Contact precautions for diapered or incontinent persons for a minimum of 48 hours after the resolution of symptoms or to control institutional outbreaks. Persons who clean areas heavily contaminated with feces or vomitus may benefit from wearing masks since virus can be aerosolized from these body substances.
- Rotavirus	C	DI	Ensure consistent environmental cleaning and disinfection and frequent removal of soiled diapers. Prolonged shedding may occur in both immunocompetent and immunocompromised children

Infection/ Condition	Precautions		
	Type*	Duration+	Comments
			and the elderly
German measles (see rubella; see congenital rubella)			
Giardiasis (see gastroenteritis)			
Gonococcal ophthalmia neonatorum (gonorrhoeal ophthalmia, acute conjunctivitis of new born)	S		
Gonorrhoea	S		
Granuloma inguinale (Donovanosis, granuloma venereum)	S		
Guillain-Barre syndrome	S		
Hand, foot and mouth disease (see enteroviral infection)			
Hansen's Disease (see Leprosy)			
Hantavirus pulmonary syndrome	S		
Helicobacter pylori	S		
Hepatitis viral - Type A	S		Provide hepatitis A vaccine post-exposure as recommended
- Type A-Diapered or incontinent patients	C		Maintain Contact Precautions in infants and children <3 years of age for duration of hospitalization; for children 3 to 14 years of age for 2 weeks after onset of symptoms; >14 years of age for 1 week after onset of symptoms.
- Type B-HBsAg positive; acute or chronic; Type C and other unspecified non-A, non-B	S		
- Type D (seen only with hepatitis B); Type G	S		
- Type E	S		Use Contact precautions for diapered or incontinent individuals for the duration of illness
Herpangina (see enteroviral infection)			
Hookworm	S		
Herpes simplex (*Herpesvirus hominis*) - Encephalitis; Mucocutaneous, recurrent (skin, oral, genital)	S		
- Mucocutaneous, disseminated or primary, severe	C	U lesions dry and crusted	
- Neonatal	C	U lesions dry and crusted	For asymptomatic, exposed infants delivered vaginally or by C-section and if mother has active infection and membranes have been ruptured for more than 4 to 6 hours until infant surface cultures obtained at 24-36 hours of age negative after 48 hours incubation
Herpes zoster (varicella zoster) (shingles)			

Infection/ Condition	Precautions		
	Type*	Duration+	Comments
- Disseminated disease in any patient - Localized disease in immunocompromised patient until disseminated infection ruled out	A,C A,C	DI DI	Susceptible HCWs should not enter the room if immune caregivers are available.
- Localized in patient with intact immune system with lesions that can be contained/ covered	S	U lesions dry and crusted	Susceptible HCWs should not provide direct patient care when immune caregivers are available.
Histoplasmosis	S		
Human immunodeficiency virus (HIV)	S		Post-exposure chemoprophylaxis for some blood exposures
Human metapneumovirus	C, D	DI	
Impetigo	C	U 24 hrs after initiation of effective therapy	
Infectious mononucleosis	S		
Influenza - Avian (e.g., H5N1, H7, H9 strains, see avian influenza)	A, C		Put on eye protection (i.e., goggles or face shield) upon entry to the patient room or care area.
- Human (seasonal influenza)	D	5 days from onset of symptoms	DI in immunocompromised patient.
- Pandemic influenza (also a human influenza virus)	D	5 days from onset of symptoms	DI in immunocompromised patient.
Kawasaki syndrome	S		
Lassa fever (see viral hemorrhagic fevers)			
Legionnaires' disease	S		
Leprosy	S		
Leptospirosis	S		
Lice - Head (pediculosis)	C	U 24 hrs after initiation of effective therapy	
- Body	S		Transmitted person to person through infested clothing. Wear gown and gloves when removing clothing; bag and wash clothes
- Pubic	S		Transmitted person to person through sexual contact
Listeriosis (*listeria monocytogenes*)	S		
Lyme disease	S		

Infection/ Condition	Precautions		
	Type*	Duration+	Comments
Lymphocytic choriomeningitis	S		
Lymphogranuloma venereum	S		
Malaria	S		
Marburg virus disease (see viral hemorrhagic fevers)			
Measles (rubeola)	A	4 days after onset of rash; DI in immune compromised	Susceptible HCWs should not enter room if immune care providers are available.
Melioidosis, all forms	S		
Meningitis, caused by - Aseptic (nonbacterial or viral; also see enteroviral infections),	S		Contact Precautions for infants and young children.
- Bacterial (gram-negative enteric, in neonates), Fungal, *Listeria monocytogenes* (see Listeriosis), *Streptococcus pneumonia* and other diagnosed bacterial infection	S		
- *M. tuberculosis*	S		Concurrent, active pulmonary disease or draining cutaneous lesions may necessitate addition of Contact Precautions and/or Airborne Precautions; For children, Airborne Precautions until active tuberculosis ruled out in visiting family members (see tuberculosis below)
- *Haemophilus influenzae* (type b, known or suspected);	D	U 24 hrs after initiation of effective therapy	
- *Neisseria meningitides* infection (known or suspected)	D	U 24 hrs after initiation of effective therapy	See meningococcal disease below
Meningococcal disease: sepsis, pneumonia, meningitis	D	U 24 hrs after initiation of effective therapy	Postexposure chemoprophylaxis for household contacts, HCWs exposed to respiratory secretions; postexposure vaccine only to control outbreaks
Middle East respiratory syndrome (MERS)	A,C		Put on eye protection (e.g., a disposable face shield) upon entry to the patient room or care area.
Molluscum contagiosum	S		
Monkeypox	A,C	A-Until ypox	

Infection/ Condition	Precautions		
	Type*	Duration+	Comments
		confirmed and smallpox excluded C- Until lesions crusted	
Mucormycosis	S		
Multidrug-resistant organisms (MDROs), infection or colonisation	C	See Appendix 3	
Mumps (infectious parotitis)	D	U 5 days after onset of swelling	Susceptible HCWs should not provide care if immune caregivers are available.
Mycobacteria, nontuberculosis (atypical) Pulmonary , Wound	S		
Mycoplasma pneumonia	D	DI	
Necrotizing enterocolitis	S		Contact Precautions when cases clustered temporally
Nocardiosis, draining lesions or other presentations	S		
Norovirus / Norwalk agent gastroenteritis (see gastroenteritis)			
Orf	S		
Parainfluenza virus infection, respiratory in infants and young children	C	DI	
Parvovirus B19	D		Maintain precautions for duration of hospitalization when chronic disease occurs in an immunocompromised patient. For patients with transient aplastic crisis or red-cell crisis, maintain precautions for 7 days.
Pediculosis (lice)	C	U 24 hrs after initiation of effective therapy after treatment	
Pertussis (whooping cough)	D	U 5 days after initiation of effective therapy	Single patient room preferred. Cohorting is an option.
Pinworm infection (Enterobiasis)	S		
Plague (*Yersinia pestis*) - Bubonic - Pneumonic	S D	U 48 hrs after initiation of effective therapy	Antimicrobial prophylaxis for exposed HCW
Pneumonia, caused by			

Infection/ Condition	Precautions		
	Type*	Duration+	Comments
- Adenovirus	D,C	DI	In immunocompromised hosts, extend duration of Droplet and Contact precautions due to prolonged shedding of virus
- Bacterial not listed elsewhere (including gram-negative bacterial); *Chlamydia;* Fungal; *Haemophilus influenzae* (type b) in adults; *Legionella spp.*; *Staphylococcus aureus*, viral infection in adults	S		
- *B. cepacia* in patients with cystic fibrosis, including respiratory tract colonisation	C	Unknown	Avoid exposure to other persons with CF; private room preferred.
- *B. cepacia* in patients without cystic fibrosis (see MDROs)			
- *Haemophilus influenzae* (type b) in infants and children;	D	U 24 hrs after initiation of effective therapy	
- Meningococcal	D	U 24 hrs after initiation of effective therapy	See Meningococcal Disease above
- Multidrug-resistant bacterial (see MDROs)			
- *Mycoplasma* (primary atypical pneumonia)	D	DI	
- Pneumoncoccal pneumonia	S		Use Droplet precautions if evidence of transmission within a patient care unit or facility.
- *Pneumocystis jiroveci (Pneumocystis carinii)*	S		Avoid placement in the same room with an immunocompromised patient.
- *Streptococcus* (group A)	D	U 24 hrs after initiation of effective therapy	Contact Precautions if skin lesions present
- Varicella-zoster (see varicella-zoster)			
- Viral infection in infants & young children (see respiratory infectious disease, acute or specific			

Infection/ Condition	Precautions		
	Type*	Duration+	Comments
viral agent);			
Poliomyelitis	C	DI	
Pressure ulcer (decubitus ulcer, pressure sore) infected			
- Major	C	DI	Until drainage stops or can be contained by dressing.
- Minor or limited	S		If dressing covers and contains drainage.
Prion disease (See Creutzfeld-Jacob Disease)			
Psittacosis (ornithosis) (*Chlamydia psittaci*)	S		
Q fever	S		
Rabies	S		
Rat-bite fever (*Streptobacillus moniliformis* disease, *Spirillum minus* disease)	S		
Relapsing fever	S		
Resistant bacterial infection or colonisation (see MDROs)			
Respiratory infectious disease, acute (if not covered elsewhere)			
- Adults	S		
- Infants and young children	C	DI	
Respiratory syncytial virus infection, in infants, young children, and immunocompromised adults	C,D	DI	Wear mask according to Standard Precautions In immunocompromised patients, extend the duration of Precautions due to prolonged shedding
Reye's syndrome	S		
Rheumatic fever	S		
Rhinovirus	D	DI	Add Contact Precautions if copious moist secretions and close contact likely to occur (e.g. young infants).
Rickettsial fevers, tickborne (Rocky Mountain spotted fever, tickborne typhus fever)	S		
Rickettsialpox (vesicular rickettsiosis)	S		
Ringworm (dermatophytosis, dermatomycosis, tinea)	S		
Ritter's disease (staphylococcal scalded skin syndrome)	C	DI	See staphylococcal disease, scalded skin syndrome below
Rocky Mountain spotted fever	S		
Roseola infantum (exanthema subitum; caused by HHV-6)	S		
Rotavirus infection (see gastroenteritis)			
Rubella (German measles; also see congenital rubella)	D	U 7 days after onset of rash	Susceptible HCWs should not enter room if immune caregivers are available. Pregnant women who are not immune should not care for these patients
Rubeola (see measles)			
Salmonellosis (see gastroenteritis)			
Scabies	C	U 24 hrs	
Norwegian Scabies	C	C until skin scrapings	Isolate patients with crusted scabies from other patients who do not have crusted scabies

Infection/ Condition	Precautions		
	Type*	Duration+	Comments
		from a patient are negative	
Scalded skin syndrome, staphylococcal	C	DI	See Staphylococcal Disease, scalded skin syndrome below
Schistosomiasis (bilharziasis)	S		
Severe acute respiratory syndrome (SARS)	A, C	DI plus 10 days after resolution of fever, provided respiratory symptoms are absent or improving	Put on eye protection (e.g. a disposable face shield) upon entry to the patient room or care area
Shigellosis (see gastroenteritis)			
Smallpox (variola)	A, C	DI	Until all scabs have crusted and separated (3-4 weeks).
Sporotrichosis	S		
Spirillum minor disease (rat-bite fever)	S		
Staphylococcal disease (*S. aureus*)			
- Skin, wound, or burn			
Major	C	DI	Until drainage stops or can be contained by dressing.
Minor or limited	S		If dressing covers and contains drainage adequately.
- Enterocolitis	S		Use Contact Precautions for diapered or incontinent persons for the duration of illness.
- Multidrug-resistant (see MDROs)			
- Pneumonia; toxic shock syndrome	S		
- Scalded skin syndrome	C	DI	
Streptobacillus moniliformis disease (rat-bite fever)	S		
Streptococcal disease (group A *streptococcus*)			
- Skin, wound, or burn			
Major	C, D	U 24 hrs after initiation of effective therapy	Until drainage stops or can be contained by dressing.
Minor or limited	S		If dressing covers and contains drainage.
- Endometritis (puerperal sepsis)	S		
- Pharyngitis in infants and young children; Pneumonia; Scarlet fever in infants and young children;	D	U 24 hrs after	

Infection/ Condition	Precautions		
	Type*	Duration+ of effective therapy	Comments
- Serious invasive disease	D	U 24 hrs after initiation of effective therapy	Contact Precautions for draining wound
Streptococcal disease (group B *streptococcus* in neonatal)	S		
Strongyloidiasis	S		
Syphilis, in all stages	S		
Tapeworm disease, caused by *Hymenolepis nana* and *Taenia solium* (pork), or other organisms	S		
Tetanus	S		
Tinea (e.g.dermatophytosis, dermatomycosis, ringworm)	S		
Toxoplasmosis	S		
Toxic shock syndrome (staphylococcal disease, streptococcal disease)	S		Droplet Precautions for the first 24 hours after implementation of antibiotic therapy if Group A *streptococcus* is a likely etiology
Trachoma, acute	S		
Transmissible spongiform encephalopathy (see Creutzfeld-Jacob disease, CJD, vCJD)			
Trench mouth (Vincent's angina)	S		
Trichinosis	S		
Trichomoniasis	S		
Trichuriasis (whipworm disease)	S		
Tuberculosis (*M. tuberculosis*)			
- Extrapulmonary with draining lesion	C, A*		Discontinue precautions only when patient is improving clinically, and drainage has ceased or there are three consecutive negative cultures of continued drainage. *Airborne precautions for cases with open draining lesion that cannot be covered.
- Extrapulmonary without draining lesion; Meningitis	S		Patient should be examined for evidence of pulmonary tuberculosis. For infants and children, use Airborne Precautions until active pulmonary tuberculosis in family members ruled out.
- Pulmonary, pleural or laryngeal disease (confirmed or suspected)	A		Discontinue precautions only when TB patient is on effective therapy, is improving clinically and has three consecutive negative sputum smears collected on separate days, or

Infection/ Condition	Precautions		
	Type*	Duration+	Comments
			TB is ruled out.
- Skin-test positive with no evidence of current active disease	S		
Tularemia	S		
Typhoid (*Salmonella typhi*) fever (see gastroenteritis)			
Typhus - Rickettsia prowazekii (Epidemic or Louse-borne typhus)	S		Transmitted from person to person through close personal or clothing contact
- *Rickettsia typhi*	S		
Urinary tract infection (including pyelonephritis), with or without urinary catheter	S		
Varicella zoster	A, C	U lesions dry and crusted	Susceptible HCWs should not enter the room if immune caregivers are available.
Vibrio *parahaemolyticus* (see gastroenteritis)			
Vincent's angina (trench mouth)	S		
Viral hemorrhagic fevers due to Lassa, Ebola, Marburg, Crimean-Congo fever viruses	C, D	DI	Single room preferred. Emphasize: 1. Use of sharps safety devices and safe work practices 2. Hand hygiene 3. Barrier protection against blood and body fluids upon entry into room (single gloves and fluid resistant or impermeable gown, face/ eye protection with masks, goggles or face shields);and 4. Appropriate waste handling.
Viral respiratory (if not covered elsewhere) - Adults	S		
- Infants and young children (see respiratory infectious disease, acute)			
Whooping cough (see pertussis)			
Wound infections - Major	C	DI	Until drainage stops or can be contained by dressing.
- Minor or limited	S		If dressing covers and contains drainage.
Yersinia enterocolitica gastroenteritis (see gastroenteritis)			
Zoster (varicella zoster) (see Herpes Zoster)			
Zygomycosis (phycomycosis, mucormycosis)	S		

* Type of Precautions: A=Airborne; C=Contact; D=Droplet; S=Standard; when A, C and D are specified, also use S.
+ Duration of precautions: DI=duration of illness (with wound lesions, DI means until they stop draining); U=until time specified in hours (hrs) after initiation of effective therapy.

Appendix 3

Special consideration for patients colonised or infected with MDROs

1 MDROs referred in this recommendation are (i) Methicillin-Resistant *Staphylococcus aureus* (MRSA) / Vancomycin-Intermediate / Resistant *Staphylococcus aureus* (VISA / VRSA); (ii) Extended Spectrum Beta Lactamase (ESBL) producing organisms; (iii) Vancomycin-Resistant Enterococci (VRE); (iv) Carbapenem-Resistant *Enterobacteriaceae* (CRE); (v) Carbapenem-Resistant *Acinetobacter* (CRA) / Multiple-drug Resistant *Acinetobacter* (MDRA); and (vi) Multiple-drugs Resistant *Pseudomonas aeruginosa* (MRPA)

2 Infection control measures for patients colonised or infected with MDROs are grossly the same as recommended in the part of contact precautions, unless otherwise stated.

3 Environmental surfaces

A more frequent environmental cleaning and disinfection are indicated, especially for the pathogens that are likely to cause extended environmental contamination (48)(49)(50)(51)(52)(53).

4 Implement contact precautions for all patients infected / colonised with MDROs (54).

5 Patient placement

Patient colonised / infected with emerging MDROs should be placed in a single room. Otherwise, patients colonised / infected with other MDROs should follow the recommendations as listed in contact precautions.

6 Discontinuation of single room isolation

Patients can be released from single room isolation after clearance of MDRO carriage. For operational reasons, clearance of MDRO carriage is defined differently subject to microbiological nature of microorganisms. For details, please refer to specific guidelines for each MDRO.

Appendix 4

Special consideration for patients confirmed or suspected with novel Acute Respiratory Diseases (ARDs)

1. Type of novel ARDs

   Novel ARDs referred in this recommendation are ARDs with epidemic or pandemic potential that can cause outbreaks with high morbidity and mortality.

2. Mode of transmission

   Most novel ARDs are predicted to be primarily transmitted via droplets. However, when a new, not yet reported novel ARD first appears, the potential for airborne transmission should always be taken into consideration.

3. Early identification (21)(36)

   Although the case definition may vary according to the specific disease, there are some general clinical and epidemiological clues that should increase the alertness of clinicians.

   3.1 Clinical clues

   Unexplained severe acute febrile respiratory illness such as fever in excess of 38 ℃ with cough and shortness of breath, or other severe unexplained illness such as encephalopathy or diarrhoea.

   3.2 Epidemiological clues (i.e. TOCC)

   3.3.1 Travel: recent travel to a geographical area where there are patients known to be suffering from novel ARDs;

   3.3.2 Occupational exposure: Working in location with potential ARDs contact, e.g., handling specimens from novel ARD patients in a laboratory or working in a farm with poultry known to have novel ARDs;

   3.3.3 Contact history: recent contact with others infected with a novel ARD

   3.3.4 Clustering phenomenon: Cluster of persons with the above clinical symptoms of recent onset or of high attack rate during an outbreak.

4 Isolation precautions (21)(36)

4.1 When a new infectious disease is identified, the modes of transmission are not well understood, the minimal requirements for caring patients with novel ARDs should include standard, contact and airborne precautions (plus eye protection).

4.2 Airborne precautions should be adopted when performing aerosol generating procedures for patients with novel ARDs.

5 Patient placement (21)(36)

5.1 Patients confirmed or suspected with a novel ARD should be resided separately in designated areas. Never mix confirmed cases with the suspected ones.

5.2 Place the patient in an AIIR if available and keep the doors closed at all time. When single-bed AIIRs are fully occupied, patients confirmed with same novel ARD could be placed in a multiple-bed AIIR. The distance between patients' beds should be at least one meter apart.

Glossary

Aerosol generating procedure: It is defined as any procedure on a patient that can induce the production of aerosols of various sizes, including droplet nuclei. Several procedures have been reported to be aerosol generating, in which some were documented with an increased risk of pathogen transmission. These include intubation and related procedures, cardiopulmonary resuscitation, bronchoscopy, and surgery where high-speed devices (e.g. saw) are used. The risk associated with many other aerosol generating procedures [e.g. non-invasive positive pressure ventilation and bi-level positive airway pressure, high-frequency oscillating ventilation, nebulization] are less well-defined.

Air changes per hour (ACH): Frequency of air being replaced in an enclosed area in one hour. One air change per hour means that all the air in that environment will be replaced in one hour.

Airborne transmission: Airborne transmission of infectious agents refers to the transmission of disease caused by dissemination of droplet nuclei that remain infectious when suspended in air over long distance and time.

Airborne Infection Isolation Room (AIIR): An AIIR is a room used to isolate persons with a suspected or confirmed airborne infectious disease / novel ARDs. AIIRs should provide negative pressure in the room (so that air flows under the door gap into the room); and an air flow rate of 6-12 ACH (6 ACH for existing structures, 12 ACH for new construction or renovation); and direct exhaust of air from the room to the outside of the building for newly constructed or renovated facilities.

Carbapenem-Resistant *Enterobacteriaceae* (CRE): *Enterobacteriaceae* which are resistant to carbapenem group of antibiotics (ertapenem, meropenem,imipenem or doripenem).

Carbapenem-Resistant *Enterobacteriaceae* with carbapenemase gene detected by PCR (CRE PCR+): *Enterobacteriaceae* which showed reduced susceptibility towards carbapenem group of antibiotics (ertapenem, meropenem, imipenem or doripenem) AND with positive carbapenemase gene detected by

PCR.

Cohort: Placing patients infected or colonised with the same pathogen in the same designated area.

Colonisation: Proliferation of microorganisms on or within body sites without detectable host immune response, cellular damage, or clinical expression. The presence of a microorganism within a host may occur with varying duration, but may become a source of potential transmission.

Contact transmission: Contact transmission can be direct and indirect. Direct contact transmission involves both a direct body surface to body surface contact and physical transfer of microorganisms between an infected or colonised person and a susceptible host. Indirect contact transmission involves contact of a susceptible host with a contaminated intermediate object (e.g. contaminated hands), that carry and transfer the microorganisms.

Droplet nuclei: Microscopic particles < 5 μm in size that are the residue of evaporated droplets and are produced when a person coughs, sneezes, shouts, or sings. These particles can remain suspended in the air for prolonged periods of time and can be carried on normal air currents in a room or beyond, to adjacent spaces or areas receiving exhaust air.

Droplet transmission: Droplets are generated from an infected (source) person primarily during coughing, sneezing, and talking. Transmission occurs when these droplets containing microorganisms are propelled a short distance (usually < one meter) through the air and deposited on the conjunctivae, mouth, nasal, throat or pharynx mucosa of another person. Because droplets do not remain suspended in the air, special air handling and ventilation are not required to prevent droplet transmission.

Extended spectrum beta-lactamase producing organisms (ESBL): Organisms which show reduced susceptibility towards extended spectrum cephalosporins with the presence of extended spectrum beta-lactamase (ESBL).

Healthcare workers (HCWs): Person who has professional training and

provides patient care in a healthcare facility; or any person who provides services that support the delivery of healthcare.

Healthcare associated infections (HAIs): An infection that develops in a patient who is cared for in any setting where healthcare is delivered and is related to receiving health care (i.e., was not incubating or present at the time healthcare was provided).

Infection: The transmission of microorganisms into a host after evading or overcoming defense mechanisms, resulting in the organism's proliferation and invasion within host tissues. Host responses to infection may include clinical symptoms or may be subclinical, with manifestations of disease mediated by direct organisms pathogenesis and/or a function of cell-mediated or antibody responses that result in the destruction of host tissues.

Multiple-drug Resistant *Acinetobacter* (MDRA): *Acinetobacter* species which show concomitant resistant (not including intermediate resistant) to all the 13 antibiotics indicators under the following 5 antibiotics classes*: (i) Cephalosporins (Cefepime & Ceftazidime); (ii) Aminoglycosides (Amikacin & Gentamicin); (iii) Fluoroquinolones (Ciprofloxacin & Levofloxacin); (iv) Beta-lactam with/ without beta-lactamase inhibitor (Pipericillin, Piperacillin-tazobactam, Ticarcillin-clavulanic acid, Ampicillin-sulbactam & Cefoperazone-sulbactam); and (v) Carbapenem (Imipenem & Meropenem)

Multi-Drugs Resistant Organisms (MDROs): Microorganisms, usually bacteria (exclude drug resistance tuberculosis), which are resistant to one or more classes of antimicrobial agents which require special control in healthcare facilities either due to limited choice of treatment or because they are epidemiological important (e.g. carrying transmissible resistance gene).

Multiple-drugs Resistant *Pseudomonas aeruginosa* (MRPA): *Pseudomonas aeruginosa* which show concomitant resistant (not including intermediate resistant) to all the 12 antibiotics indicators under the following 5 antibiotics classes*: (i) Cephalosporins (Cefepime & Ceftazidime); (ii) Aminoglycosides (Amikacin & Gentamicin); (iii) Fluoroquinolones (Ciprofloxacin & Levofloxacin); (iv) Beta-lactam with/ without beta-lactamase inhibitor (Piperacillin, Piperacillin-tazobactam, Ticarcillin-clavulanic acid &

Cefoperazone-sulbactam); and (v) Carbapenem (Imipenem & Meropenem)

Methicillin-Resistant *Staphylococcus aureus* (MRSA): *Staphylococcus aureus* which are resistant to penicillinase resistant penicillins (e.g. methicillin, oxacillin, cloxacillin) and cephalosporins.

Novel Acute respiratory diseases (ARDs): ARD is defined as an acute respiratory tract illness that is caused by an infectious agent transmitted from person to person. It can result in a spectrum of illnesses ranging from asymptomatic or mild infection to severe and fatal disease, depending on the causative pathogen, environmental, and host factors. Novel ARDs referred in this recommendation are ARDs with epidemic or pandemic potential that can cause outbreaks with high morbidity and mortality.

Particulate respirator: Type of mask that uses a filter as an integral part of the face piece or with the entire face piece composed of the filtering medium and a means of sealing to the face. Particulate respirator referred in this recommendation is at least as protective as a NIOSH-certified N95, EU FFP2 or equivalent.

Personal Protective Equipment (PPE): A variety of barriers used alone or in combination to protect mucous membranes, skin, and clothing from contact with infectious agents. PPE includes gloves, masks, respirators, goggles, face shields, and gowns.

Standard Precautions: A group of infection control measures that apply to all patients, regardless of suspected or confirmed diagnosis or presumed infection status. It is based on the principle that all blood, body fluids, secretions, excretions except sweat, non-intact skin, and mucous membranes may contain transmissible infectious agents.

Vancomycin-Resistant *Enterococcus* (VRE): *Enterococcus faecalis* and Enterococcus *faecium* which are resistant to Vancomycin.

Vancomycin-Intermediate *Staphylococcus aureus* (VISA): *Staphylococcus aureus* which is intermediate resistant to Vancomycin (i.e. minimum inhibitory

concentration MIC = 4-8 ug/mL)

Vancomycin-Resistant *Staphylococcus aureus* (VRSA): *Staphylococcus aureus* which is resistant to Vancomycin (i.e. minimum inhibitory concentration MIC ≥16 ug/mL)

*Due to operational reasons, some laboratory may not choose to test all antibiotics indicators within the same class, antibiotic indicators not tested will be considered as resistant for surveillance and infection control purpose.

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