Routine Practices and Additional Precautions for Preventing the Transmission of Infection in Healthcare Settings

PROTECTING AND EMPOWERING CANADIANS TO IMPROVE THEIR HEALTH

Public Health Agency of Canada
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Canada

TO PROMOTE AND PROTECT THE HEALTH OF CANADIANS THROUGH LEADERSHIP, PARTNERSHIP, INNOVATION AND ACTION IN PUBLIC HEALTH.

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Introductory statement

The Public Health Agency of Canada (PHAC) develops infection prevention and control guidelines to provide evidence-based recommendations to complement provincial/territorial public health efforts in monitoring, preventing, and controlling healthcare-associated infections. These guidelines support infection prevention and control professionals, healthcare organizations and healthcare providers in developing, implementing and evaluating infection prevention and control policies, procedures and programs to improve the quality and safety of health care and patient outcomes.

The purpose of this federal guideline, *Routine Practices and Additional Precautions for Preventing the Transmission of Infection in Healthcare Settings* is to provide a framework for developing policies and procedures for routine practices and additional precautions in healthcare settings.

Guidelines, by definition, include principles and recommendations and should not be regarded as rigid standards. This guideline, whenever possible, has been based on research findings. In some areas, where there is insufficient published research, a consensus of experts in the field has been used to provide recommendations specific to practice. This guideline may need to be adapted to meet local, provincial or territorial requirements.

The information in this guideline was current at the time of publication. Scientific knowledge and medical technology are constantly evolving. Research and revisions to keep pace with advances in the field are necessary.

Target users

This guideline is intended to assist infection prevention and control professionals and all other healthcare providers responsible for developing policies and procedures related to routine practices and additional precautions in all healthcare settings whether in acute or long-term care, ambulatory care, home care or prehospital care settings. This guideline is intended for settings where healthcare is provided.

Guideline working group

The *Routine Practices and Additional Precautions for Preventing the Transmission of Infection in Healthcare Settings* guideline is one in a series of infection prevention and

control guidelines developed by PHAC with technical expert advice from PHAC's Steering Committee on Infection Prevention and Control Guidelines Working Group. The Guideline Working Group was composed of members representing paediatric and adult infectious disease, hospital epidemiologists, acute and long-term care infection prevention and control practitioners, and home care, public health, medical microbiology, occupational health, respiratory therapy and emergency response professionals.

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Overview

The objective of this guideline is to identify and promote infection prevention and control (IPC) practices and precautions for preventing the transmission of microorganisms in healthcare settings, with the exception of bone marrow transplant settings. Specifications for a protective environment in bone marrow transplant units are outlined in the United States Healthcare Infection Control Practices Advisory Committee *2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings*. Infection control guidelines for classic Creutzfeldt-Jakob disease in Canada are provided in separate Public Health Agency of Canada (formerly Health Canada) publications.

For the purposes of this document, healthcare settings are any location where healthcare is provided, including emergency care, prehospital care, hospital, long-term care (LTC), home care, ambulatory care and facilities and locations in the community where care is provided (e.g., infirmaries in schools, residential facilities or correctional facilities). It should be noted that definitions of settings overlap, as some settings provide a variety of care (e.g., chronic care or ambulatory care provided in acute care facilities, complex care provided in LTC facilities). Acute care includes ambulatory care settings, such as hospital emergency departments, and free-standing or facility-associated ambulatory (day) surgery or other invasive day procedures (e.g., endoscopy units, hemodialysis, ambulatory wound clinics). Healthcare workers (HCWs) are individuals who provide health care or support services, such as nurses, physicians, dentists, nurse practitioners, paramedics and sometimes emergency first responders, allied health professionals, unregulated healthcare providers, clinical instructors and students, volunteers and housekeeping staff. Healthcare workers have varying degrees of responsibility related to the health care they provide, depending on their level of education and their specific job/responsibilities.

This guideline is designed for use by infection control professionals (ICPs). It is recommended that individuals who lack IPC expertise seek the expertise of ICPs in their organization or region for assistance. This guideline can be used to develop specific recommendations for local use, taking into consideration local conditions, such as the type of facilities available, risk of acquisition of infection, type of healthcare setting, type of care and level of education and awareness of the HCWs providing the care.

For the purposes of this document, the term “patient” will be used to include those receiving health care who are traditionally/routinely referred to as patients, clients or residents. Included in this document are the principles necessary to prevent transmission of microorganisms from patient to patient, patient to HCW and HCW to patient across the continuum of care. Principles of transmission, as well as routine practices and additional precautions, are outlined for acute care, LTC, ambulatory care, prehospital care and home care settings.

This revision promotes the consistent application of routine practices across the continuum of care and outlines modifications in the application of additional precautions for settings outside of acute care. Routine practices should be incorporated into everyday patient care. Organizational policy should provide: i) education of HCWs in the principles of routine practices and additional precautions; ii) adequate equipment and supplies to implement them and iii) a means by which compliance can be monitored, encouraged and supported.

The application of routine practices and additional precautions is based on a point-of-care risk assessment (PCRA). Each HCW has a responsibility to perform a PCRA before every interaction with every patient and/or the patient's environment, and to ensure that appropriate control measures (i.e., routine practices and, if necessary, additional precautions) are in place to prevent transmission of microorganisms.

This document replaces the 1999 version of *Routine Practices and Additional Precautions for Preventing the Transmission of Infection in Health Care.* The following developments or events have occurred since the 1999 document was written:

- Expecting HCWs to use alcohol-based hand rub (ABHR) at the point-of-care as the preferred method of hand hygiene in all healthcare settings unless exceptions apply (i.e., when hands are visibly soiled with organic material, if exposure to norovirus and potential spore-forming pathogens such as *Clostridium difficile* is strongly suspected or proven, including outbreaks involving these organisms).
- Preferring single inpatient rooms rather than multipatient rooms, with designated private toilets and patient sinks and accessible designated staff handwashing sinks.
- Implementing respiratory hygiene, a strategy involving a combination of measures designed to minimize the transmission of respiratory pathogens across the continuum of care.
- Changing the recommendation for spatial separation between a patient with a suspected or confirmed droplet transmissible respiratory infection who is coughing (infected source) and another patient without that infection (susceptible host) from one metre to two metres. When using a risk assessment, one metre may be sufficient for young children and others whose cough is not forceful enough to propel the droplets as far as two metres.
- Changing the recommendation that adult patients with known or suspected viral respiratory infections be placed on contact and droplet precautions (which is the current practice in pediatrics).
- Implementing strategies to reduce aerosol generation when performing aerosol-generating medical procedures (AGMPs) on patients with signs and symptoms of suspected or confirmed tuberculosis (TB), severe acute respiratory syndrome (SARS) or respiratory infection with an emerging respiratory pathogen. Strategies to reduce aerosol generation should also be implemented when AGMPs are necessary for

patients with viral hemorrhagic fevers. Routine practices and contact and/or droplet precautions, as indicated, should be used for AGMPs on other patients.

- Reaffirming the need for HCWs to follow aseptic technique for invasive procedures and in the handling and delivery of parenteral medications and intravenous systems.
- An expectation that healthcare organizations should perform an organizational risk assessment (ORA) — that is, evaluating the healthcare environment to identify the risk of exposure to microorganisms and implementing appropriate control measures (e.g., healthcare facility design and cleaning, disinfection and sterilization of patient care equipment).
- Emphasizing the expectation that HCWs should perform a PCRA prior to each patient interaction, taking into consideration the patient, patient environment and nature of the interaction.
- There are four main sections to this document, Part A to C, with the appendices provided in Part D.

Part A: Introduction to routine practices and additional precautions

I. Introduction

Routine Practices and Additional Precautions for Preventing the Transmission of Infection in Health Care represent the IPC practices to be used in all healthcare settings in Canada and the expected processes and practices of care. The objective of this guideline is to identify and promote IPC practices and precautions for preventing the transmission of infection in all healthcare settings. This guideline is designed for use by infection control professionals (ICPs). It is recommended that individuals who lack IPC expertise seek the expertise of ICPs in their organization or region for assistance.

This revision promotes the consistent application of routine practices and additional precautions across the continuum of care, and outlines modifications in the application of additional precautions outside of acute care. This guideline should be used to develop specific recommendations for local use, taking into consideration local conditions, such as the type of facilities available, risk of acquisition of infection, type of healthcare setting, type of care, and level of education and awareness of the healthcare workers (HCWs) providing the care. Included in this document are the principles necessary to prevent transmission of microorganisms from patient to patient, patient to HCW and HCW to patient across the continuum of care. This document does not provide a comprehensive approach to outbreak recognition, reporting and management, but does provide recommendations intended to prevent some of the most common outbreak situations (e.g., respiratory hygiene to prevent respiratory virus outbreaks and environmental cleaning and hand hygiene to prevent outbreaks of *Clostridium difficile* and norovirus). For the purposes of this document, the term “patient” will be used to include those receiving health care who are traditionally/routinely referred to as patients, clients or residents. Principles of transmission, as well as routine practices and additional precautions, are outlined for acute care, LTC, ambulatory care, prehospital care and home care settings. For the purpose of this document, acute care includes ambulatory care settings such as hospital emergency departments, and free-standing or facility-associated ambulatory (day) surgery or other invasive day procedures (e.g., endoscopy units, hemodialysis, ambulatory wound clinics).

A. Principles upon which this document is based

This document recognizes certain principles:

- Consistent application of routine practices is expected for the care of all patients, at all times, across the continuum of care.
- Adherence to routine practices can reduce the transmission of microorganisms in healthcare settings.
- Individual components of routine practices are determined by a point-of-care risk assessment (PCRA) (i.e., one that includes an assessment of the task/care to be performed, the patient's clinical presentation, physical state of the environment and the healthcare setting).
- Microorganisms may be transmitted from symptomatic and asymptomatic individuals, emphasizing the importance of adhering to routine practices at all times for all patients in all healthcare settings.
- In addition to routine practices, precautions should be used for patients with suspected or known infections or colonization with microorganisms for which routine practices are insufficient to prevent transmission.
- Additional precautions should be used empirically, based on the patient's condition or clinical presentation. These may need to be modified or discontinued based on the specific microorganism identified.
- The primary goal of IPC programs is to reduce the risk of acquiring a healthcare-associated infection (HAI) to a minimum level; zero risk may not be attainable in every circumstance, but should nevertheless be strived for. The consequences of cross-transmission of microorganisms should be balanced against the consequences (adverse effects and cost) of precautions taken.
- Application of additional precautions may vary between acute care, LTC, ambulatory care, prehospital care and home care settings. Local epidemiology should be considered in the application of additional precautions.

Major changes with this revision include:

- Expecting HCWs to use ABHR at the point-of-care as the preferred method of hand hygiene in all healthcare settings unless exceptions apply (i.e., when hands are visibly soiled with organic material, if exposure to norovirus and potential spore-forming pathogens such as *Clostridium difficile* is strongly suspected or proven, including outbreaks involving these organisms).
- Preferring single inpatient rooms rather than multipatient rooms with designated private toilets and patient sinks and accessible designated HCW handwashing sinks.
- Implementing respiratory hygiene, a strategy involving a combination of measures designed to minimize the transmission of respiratory pathogens, across the continuum of care.

- Changing the recommendation for spatial separation between a patient with a suspected or confirmed droplet transmissible respiratory infection who is coughing (infected source) and another patient without that infection (susceptible host) from one metre to two metres. When using a risk assessment, one metre may be sufficient for young children and others whose cough is not forceful enough to propel the droplets as far as two metres.
- Implementing strategies to reduce aerosol generation when performing aerosol generating medical procedure (AGMPs) on patients with signs and symptoms of suspected or confirmed tuberculosis (TB), SARS or respiratory infection with an emerging respiratory pathogen. (refer to Part A, Section II, C, 2c for discussion on AGMPs, and Part B, Section IV, subsection iii, 1b for strategies to reduce aerosol generation.) Routine practices and contact and/or droplet precautions, as indicated, are necessary for AGMPs on other patients.
- Changing to a recommendation that adult patients with known or suspected viral respiratory infections be placed on contact and droplet precautions (which is the current practice in pediatrics).
- Reaffirming the recommendation that HCWs follow aseptic technique for invasive procedures and in the handling and delivery of parenteral medications and intravenous systems.
- An expectation that healthcare organizations should perform an Organizational Risk Assessment (ORA) — that is, evaluating the healthcare environment to identify the risk of exposure to microorganisms and implementing appropriate control measures (i.e., healthcare facility design, and cleaning, disinfection and sterilization of patient care equipment).
- Emphasizing the expectation that HCWs perform a PCRA prior to each patient interaction, taking into consideration the patient, patient environment and nature of the interaction.

B. Routine practices

Routine practices are the IPC practices for use in the routine care of *all* patients at *all* times in *all* healthcare settings and are determined by the circumstances of the patient, the environment and the task to be performed.

Performing an Organizational Risk Assessment (ORA) (Refer Part A, Section III, B) and addressing deficiencies provides the framework to ensure that appropriate components in the hierarchy of controls related to routine practices are in place in order to minimize the risk of exposure to and transmission of microorganisms within healthcare settings.

A PCRA is performed by HCWs to determine the appropriate IPC measures for safe patient care (i.e., to protect the patient from transmission of microorganisms) and to protect the HCW from exposure to microorganisms (e.g., from sprays of blood, body fluids, respiratory

tract or other secretions or excretions and contaminated needles and other sharps). (Refer Part A. Section III, C).

Routine practices include:

- Point-of-care risk assessment
- Hand hygiene program (including point-of-care ABHR)
- Source control (triage, early diagnosis and treatment, respiratory hygiene, spatial separation)
- Patient placement, accommodation, and flow
- Aseptic technique
- Use of PPE
- Sharps safety and prevention of bloodborne pathogen transmission
- Management of the patient care environment
  - Cleaning of the patient care environment
  - Cleaning and disinfection of non-critical patient care equipment
  - Handling of waste and linen
- Education of patients, families and visitors
- Visitor management

C. Additional precautions

Additional precautions are applied when the transmission characteristics of, or impact of, infection with a specific microorganism (e.g., microorganisms with a low infectious dose such as *Shigella* spp., or microorganisms spread by the droplet route such as respiratory syncytial virus [RSV], or epidemiologically significant microorganisms such as antibiotic-resistant organisms [AROs]) or syndromes are not fully prevented by routine practices. These precautions should also be used when medical procedures increase the risk of transmission of a specific infectious agent (e.g., AGMPs) or when the clinical situation prevents consistent application of routine practices (e.g., care of the young child, incontinent adult or cognitively impaired individual). How additional precautions are applied is specific to the care setting (acute care, ambulatory care, prehospital care, LTC and home care).

Additional precautions are conventionally divided into:

- contact precautions, for microorganisms of very low infective dose or situations where heavy contamination of the patient's environment is anticipated.
- droplet precautions, for microorganisms primarily transmitted by the large droplet route.

- airborne precautions, for microorganisms transmitted through the air over extended time and distance by small particles.

Some infections may need a combination of additional precautions (contact, droplet, airborne), since some microorganisms can be transferred by more than one route. The application of routine practices continues even with the application of additional precautions.

Performing an ORA (refer Part A, Section III, B) and addressing deficiencies provides the framework to ensure that appropriate components in the hierarchy of controls (refer to Part A, Section III, A) related to additional precautions are in place to minimize the risk of exposure to and transmission of infectious agents within healthcare settings.

D. Evolution of isolation precautions

Isolation precautions have evolved from the concept of "fever hospitals" for the care of patients with specific communicable pathogens of major public health concern, such as smallpox, diphtheria and TB[1]. As these diseases became less prevalent, care was transferred to special isolation wards in general hospitals and eventually to single rooms on regular patient care wards. Over time, isolation precautions were extended to all patients with infections considered to be transmissible. Infectious diseases were classified into categories, according to the presumed major mechanism of transmission, and specific precautions were recommended for each transmission category[2]. A preprinted card listed the precautions to be taken for each selected category. Category-based precautions were simple to learn and implement. However, dissatisfaction with category-based precautions developed. Mechanisms of disease transmission did not always fit into the assigned categories, resulting in excessive or inadequate use of barrier techniques. Healthcare workers needed to have more flexibility in applying isolation precautions[3;4].

As a result, an alternative disease-specific system was developed, whereby isolation precautions were fine-tuned according to the needs of the individual patient and microorganism. Hospitals could choose between category or disease-specific systems[3]. Specific barrier techniques (e.g., single room, air control, gloves, gowns and masks) were assigned according to the patient's diagnosis or symptoms or the microorganism isolated, as well as to patient behaviours or characteristics (e.g., age, mental status, mobility, continence). Isolation precautions were written or selected from check boxes on an isolation card. Disease-specific precautions eliminated unnecessary measures, permitting more efficient use of facilities and materials. Compliance was expected to be higher, since these recommendations were more epidemiologically sound. There was an increased emphasis on decision making on the part of the HCW. However, there were a number of drawbacks. This system required more knowledge, initiative and responsibility on the part of HCWs. Selecting the appropriate techniques for individual patients was time consuming. There was a risk of error when HCWs were not adequately informed, when the diagnosis was incorrect or when personnel were rushed[5;6].

The most dramatic modification in isolation precautions occurred after the realization that the human immunodeficiency virus (HIV) could be transmitted from patients with unrecognized infection to HCWs[7]. Initiation of bloodborne pathogen precautions, based on symptoms or diagnosis, was no longer adequate. The response to this problem was the extension of the use of blood and body fluid precautions to all patients. These precautions became known as universal blood and body fluid precautions. Universal precautions included use of barrier precautions, such as gloves for contact with blood and certain other body fluids; gown, masks and eye protection in situations with potential for contamination of skin or clothing or for splashes with these fluids; measures to prevent injuries from contaminated needles and other sharp items; and protocols for blood spill clean-up and laboratory safety.

Universal precautions were developed with the primary purpose of protecting the HCW from exposure to bloodborne pathogens, and were based on the principle that it was not possible to know which patients harboured bloodborne pathogens. Universal precautions were used in conjunction with category - or disease-specific isolation systems for patients with specific symptoms or infections[8;9].

There was also concern that diagnosis-driven precautions were inadequate, in that they did not address potential transmission from body substances of asymptomatic colonized patients. To address this concern, a new isolation system, called body substance isolation, was created, in which barrier precautions were tailored to the activity performed rather than the diagnosis. This system extended barrier precautions to all direct contact with blood, body fluids, secretions and moist body substances, and with non-intact skin[10-12].

Gloves were used for all such contacts. Gowns, masks and eye protection were recommended for procedures in which soiling or splashing was anticipated. The principles of body substance isolation were that all persons harbour potentially pathogenic agents in moist body sites and substances and that all persons are at risk of acquiring microorganisms from inoculation of mucous membranes and non-intact skin. The goal was to prevent transmission by preventing contamination of the HCW's hands. There was confusion over whether or not handwashing was indicated after removal of gloves. Body substance precautions were not intended for control of droplet and airborne transmitted microorganisms[13;14].

The US Centers for Disease Control and Prevention (CDC) revised its isolation guidelines in 1996 by selecting what were considered to be the best recommendations from each of the previous systems[13]. These guidelines applied only to acute care inpatient facilities. A two-tiered system was developed, with standard precautions for all patients and three categories of transmission-based precautions for specific infections that warranted additional measures. Standard precautions addressed the concern of transmission by contact with asymptomatic patients and with contaminated sources in the environment of the infected or colonized patient. Gloves were recommended for all contacts, as indicated in body substance isolation and, in addition, for contact with contaminated items. The three categories of additional precautions were based on known or presumed routes of transmission (e.g., airborne, droplet and contact) and patient characteristics. Contact

precautions were more extensive than previously specified, in that barrier techniques were recommended for all persons entering the patient's room[13]. The *2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings*[15] provides recommendations that can be applied in all healthcare settings and introduced a number of new elements into standard precautions.

E. History of Canada's isolation guidelines

Infection control precautions and isolation guidelines were originally published by the Steering Committee on Infection Control Guidelines Development, as convened by the Bureau of Communicable Disease Epidemiology of the Laboratory Centre for Disease Control, Health Canada, in 1985. These guidelines, revised in 1990[16], were written from a disease-specific perspective, listing specific precautions for diseases and microorganisms. The 1990 revision added symptoms as a basis for determining isolation precautions. Separate documents were issued in 1987, 1988 and 1989 outlining universal precautions[17-19], which were incorporated into the 1990 revision. Infection control guidelines for LTC were published in 1986 and revised in 1994[20]. These did not address specific issues related to isolation in LTC facilities, but referred to the 1990 Health Canada guidelines for isolation and precaution techniques[16]. In 1996, recommendations to prevent transmission of TB were published[21]. Revised guidelines for preventing transmission of bloodborne pathogens[22], and vancomycin-resistant enterococci (VRE)[23] were published in 1997.

Revised guidelines for isolation and precautions, *Routine Practices and Additional Precautions for Preventing the Transmission of Infection in Health Care*, were published in 1999[24]. The term "routine practices" was chosen to emphasize that this is the level of care that should be provided for all patients at all times, in all healthcare settings. When routine practices are insufficient, "additional precautions" should be used. The 1999 *Routine Practices and Additional Precautions for Preventing the Transmission of Infection in Health Care* provided recommendations that were specific to acute care, LTC, ambulatory care and home care settings. Recommendations for acute care settings did not differ in principle from the standard precautions and transmission-based precautions published by the CDC in 1996, although more details were included in the Canadian document.

F. Changing populations and healthcare delivery systems

Over the past decade, healthcare systems have continued to be restructured. The patient population in acute care hospitals has continued to shift toward a group at higher risk for HAIs. New technologies and aggressive treatments, many of which compromise host defences, have permitted patients with previously fatal diseases to survive. Organ and hematopoietic stem cell transplants, HIV, and an aging population have also added to the number of high-risk patients. The shift has resulted in: increased acuity of illness in acute care facilities; increased level of acuity in LTC (providing complex care such as intravenous therapy, hemodialysis or ventilation therapy); performance of invasive procedures and

complex treatments in day treatment or outpatient settings exposing this population to the risk of HAIs; and transfer of care for many similar conditions or treatments to the home or outpatient settings. In addition, an aging population has increased the demand for healthcare services at the same time as the nation is experiencing a shortage of HCWs.

There is the potential for HAI across the continuum of care, from prehospital care to acute care hospitals, rehabilitation centers, LTC facilities, nursing homes, adult residential care, ambulatory care centres and home care. Transfers of patients between facilities and between different levels of care within facilities[25], and transfers back to Canada, from a foreign country, of patients who had trauma (such as returning soldiers[26] or people who have been hospitalized in a foreign country) are frequent and increase the risk for transmission of antimicrobial-resistant microorganisms.

G. Burden of healthcare-associated infections

Healthcare-associated infections (e.g., surgical site infections, central venous catheter-associated bloodstream infections) result in a substantial burden of disease in Canadians, and are an important public health problem[27-29]. They are also a burden on Canada's healthcare system and a barrier to timely access to care for all Canadians.

There has been no comprehensive survey of the occurrence of HAIs in Canada; however, it is generally estimated that 5%–10% of hospitalized Canadians will develop a HAI[30]. A survey of sentinel Canadian hospitals in February 2002 by Gravel et al. found that 10.5% of adult inpatients and 9.1% of paediatric inpatients had a HAI on the survey[28;29]. In a repeat survey in 2009, involving a similar hospital group, Gravel et al. found that 12.3% of adult patients and 7.2% of paediatric patients had a HAI on the day of the survey. Between the two surveys, the number of patients on isolation precautions had nearly doubled (from 7.7% to 14.8%), largely due to the impact of *C. difficile* infection and AROs (personal communication, Canadian Nosocomial Infection Surveillance Program 2010). Extrapolating from US data, Zoutman et al. estimated that each year, approximately 220,000 HAIs occur in Canada, as do more than 8,000 deaths attributable to HAIs[27]. Healthcare-associated infections vary in type, frequency and severity. For example, healthcare-associated urinary tract infections are among the most common of all HAIs, but result in less serious patient impact[31]. In contrast, the less common ventilator-associated pneumonia has a case mortality rate exceeding 10%[32].

Healthcare-associated infections are also costly to treat. In the US, it is estimated that the attributable cost of treating HAIs range from US$1,257 for urinary tract infections to US$9,986 for ventilator-associated pneumonia[30]. In a study to determine the incremental cost attributable to methicillin-resistant *Staphylococcus aureus* (MRSA) in a Canadian hospital, patient-specific hospitalization costs for a cohort of patients with hospital-acquired MRSA and a matched comparison group of uninfected patients were investigated. The median total hospitalization cost per nosocomial MRSA patient (colonized and infected) was $14,841, whereas the corresponding cost for those in the uninfected comparison group was $5,844, which suggests an incremental cost of $8,997 per

nosocomial MRSA patient. The incremental cost to prevent a case of nosocomial MRSA was $19.77. The authors suggested the cost-effectiveness ratio can be improved by decreasing hospital length of stay[33].

Patients with HAIs occupy scarce hospital beds (e.g., healthcare-acquired surgical site infections prolong hospital stay by a mean of 25.7 days)[30], and investigation and treatment of these infections consumes other scarce healthcare resources. Healthcare-associated infections are therefore a significant barrier to access to care for other health conditions.

All healthcare interventions have potential risks, including risk of infection, and potential benefits. Currently, not all HAIs are preventable. However, HAIs are not inevitable; it has been known for many years[34] that organized approaches to HAI prevention are highly effective in reducing their frequency. The gap between those that can be prevented and those that are currently being prevented exists because of a lack of awareness and implementation of prevention strategies by frontline HCWs and inadequate prioritization of HAI prevention strategies by healthcare managers and administrators.

Application of *Routine Practices and Additional Precautions for Preventing the Transmission of Infection in Healthcare Settings* is an important component of a comprehensive approach to HAI prevention. By adopting the recommendations in this document across the continuum of care, the burden of HAIs on Canadians and Canada's healthcare system can be reduced.

H. Balancing risk and benefit in preventing cross-transmission

Ideally, care should be provided in a manner that maximizes the probability that all transmission of potential microorganisms from all patients — asymptomatic colonized as well as symptomatic — in all healthcare settings will be prevented. In reality, this is currently not achievable. Transmission of microorganisms in the healthcare setting cannot always be prevented, and attempts to do so would entail additional costs and restrictive measures that would interfere with the quality of life for the patient or avoidance of potentially beneficial medical procedures or interventions. Thus, IPC practices should be tailored to the level of care that is being provided and the inherent risk to the individual and the population if infection occurs. Precautions that may be justified in terms of risk–benefit in an intensive care unit (ICU) or acute care ward may not be of equal benefit or indicated for a patient in LTC.

Unnecessary use of additional precautions is to be avoided. It is clear that isolation practices can be stigmatizing and psychologically damaging, and run some risk of having adverse effects on the quality of health care delivered (e.g., medical errors)[35-39]. Furthermore, unnecessary isolation practices are expensive and consume scarce healthcare resources that could be used to benefit other patients. Consequently, only IPC

isolation practices that are clearly indicated in the setting where the care is provided should be implemented, and they should be discontinued as soon as appropriate.

In most instances, the precautions to apply are clear-cut, based on the evidence available. In other situations, certain measures may need to be modified for different types of healthcare settings, based on assessment of risks and benefits. The benefit of reducing risk of transmission needs to be balanced against the cost (in quality of life, adequacy of medical care and monetary outlay) of the precautions taken to achieve this reduction in risk.

II. Principles of transmission of microorganisms

A. Chain of infection

Epidemiologic analysis helps us prevent disease by explaining the distribution of illness (in terms of person, place and time) and identifying modifiable factors that affect its occurrence and outcomes. It provides the rationale for control measures to minimize transmission of microorganisms, and ultimately to reduce the incidence of HAIs in patients and occupational infections in HCWs.

Transmission of microorganisms may result in transient carriage or long-term colonization, asymptomatic infection or clinical disease. The presence of microorganisms in or on a host, with growth and multiplication but without tissue invasion or cellular injury, is referred to as colonization. Infection is the condition in which microorganisms are able to multiply within the body and cause a response from the host's immune defences. Infection may or may not lead to clinical disease (symptomatic infection). The establishment of infection involves a set of complex interrelationships between the source of the infectious agent (microorganism), the susceptible host and the environment, and requires the transmission of microorganisms from the source to a susceptible host. One framework for understanding this complex relationship is the chain of infection, which can have six links (as shown in Figure 1a): the infectious agent, reservoir, portal of exit, mode of transmission, portal of entry and susceptible host. Breaking any one of the links in the chain of infection will prevent infection from occurring (Figure 1b).

Figure 1a and 1b: Chain of infection

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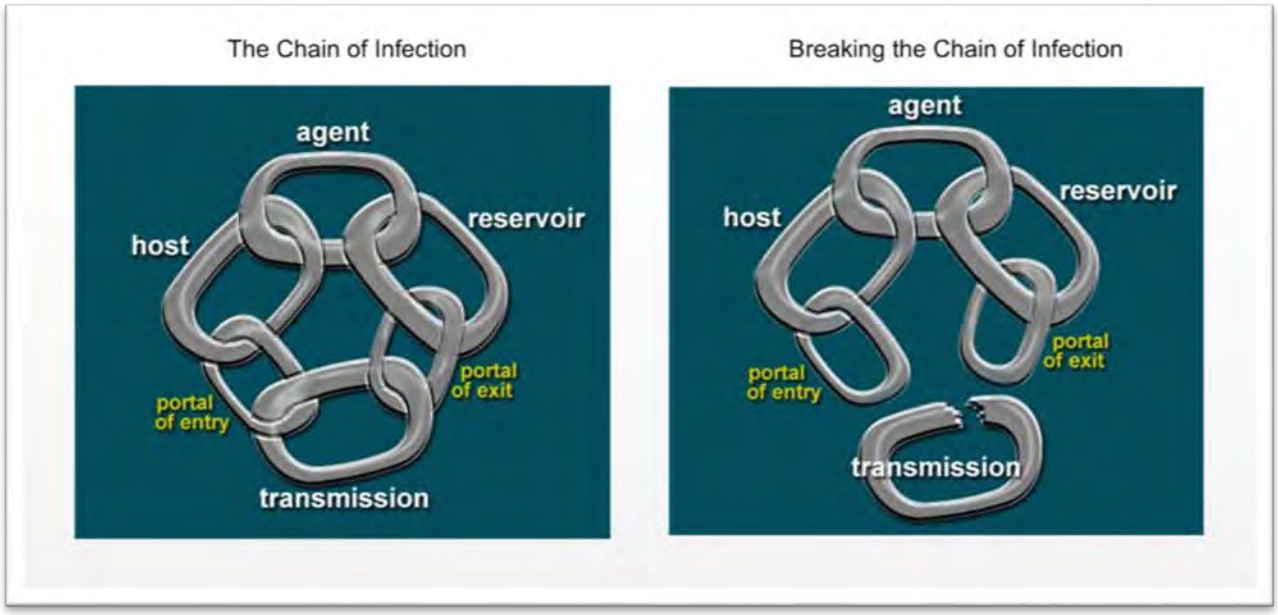


A brief explanation of each link follows:

1. Infectious agents (microorganisms)

These include bacteria, viruses, fungi and parasites. They can be either endogenous flora (i.e., patient's own microorganisms) or exogenous flora (i.e., microorganisms external to the patient, for example from other individuals, plants or inanimate objects). Regardless of whether they are from other parts of the body or from another person or object, microorganisms are considered to be transient flora if they are temporarily carried by the patient (refer to Part A, Section II, B). Antimicrobials, disinfectants and hand hygiene with ABHRs kill microorganisms, breaking this link in the chain of infection, where applicable. The characteristics of a particular microorganism affect the ease of its transmission. Microorganisms that can survive environmental conditions and remain viable on inanimate objects, such as patient care equipment, are more likely to be transmitted[40-43], as are those with a low infective dose (e.g., *Shigella*)[44].

2. Reservoirs in health care

Humans, animals and the environment are reservoirs of infectious agents (microorganisms) relevant to health care. Hand hygiene following contact with individuals or their environment, preoperative skin preparation and cleaning the environment all reduce the number of microorganisms present in a reservoir, breaking this link in the chain of infection (refer to Part A, Section II, B).

3. Portals of exit

A portal of exit is the route by which an infectious agent (microorganism) leaves the reservoir, although not all reservoirs have an obvious portal of exit (e.g., the environment). Infectious agents are contained in blood, body fluids, excretions, secretions and skin of human reservoirs, depending on the agent, and leave the reservoir through the respiratory, gastrointestinal or integumentary (skin/mucous membranes) system. Reduction of excretions or secretions or covering portals of exit (e.g., dressings on wounds, masks), break this link in the chain of infection.

4. Routes of transmission

Routes of transmission of infectious agents (microorganisms) are conventionally categorized into five routes: contact, droplet, airborne, common vehicle and vectorborne. It should be recognized that the transmission of the many varieties of microorganisms and infections they may cause cannot always be precisely circumscribed within a limited number of carefully contained transmission modes. Nevertheless, these transmission categories have proven very useful in describing the spread of microorganisms in populations. The routes of transmission vary with the microorganisms involved, and some microorganisms can be transferred by more than one route (refer to Part A, Section II, C). The appropriate use of barriers and adherence to hand hygiene break this link in the chain of infection.

5. Portals of entry

A portal of entry is the route by which an infectious agent enters the host. Examples include mucous membranes of the respiratory tract, the gastrointestinal tract, the urinary tract, breaks in the skin (e.g., wounds) and devices such as intravenous lines. This link in the chain of infection can be broken by protecting portals of entry by covering wounds, wearing PPE, reducing breaches in the mechanical barriers of the skin and mucous membranes, using sterilized equipment when required, or by performing hand hygiene so that hands do not transfer microorganisms to a portal of entry.

6. Susceptible host

An individual must be susceptible to the infectious agent (microorganism) for an infection to occur. Humans do not become infected with most animal viruses because they do not have the appropriate cell receptors, and individuals with circulating antibodies to vaccine-preventable diseases do not get the infection because the immune response prevents the infectious agent from multiplying (refer to Part A, Section II, D). This link in the chain of infection can be broken by ensuring host defences are maximized (e.g., through immunization, optimal nutrition, reduction of smoking and control of diabetes).

B. Sources or reservoirs of infectious agents (microorganisms)

The sources or reservoirs of infectious agents transmitted in health care may be human or environmental. Portals of exit vary by reservoir and infectious agent.

1. Human sources

Source individuals may have active disease, be in the asymptomatic and/or incubation period of an infection or may be transiently or indefinitely colonized with microorganisms, particularly on the skin and mucous membranes. Human reservoirs include patients[45-52], HCWs[53-63], household members and other visitors[64-68].

Transmission of microorganisms in health care is increased by the presence of patients who visibly soil the environment or cannot maintain appropriate hygiene, including respiratory hygiene; patients who are cognitively impaired; patients with uncontained secretions or excretions; patients with wound drainage that cannot be contained by a dressing; patients with fecal incontinence if stools cannot be contained in incontinence products or infant diapers; and those with viral respiratory or gastrointestinal infections[48;69;70], especially infants.

2. Animal sources

This is not a common or usual mode of transmission of HAI in most care settings, although the advent of pet therapy in acute care and the presence of companion animals in home and LTC provides some opportunity for zoonotic infection[71;72]. Recently researchers have demonstrated transfer of MRSA and *C. difficile* to canine visitors, emphasizing the importance of hand hygiene before and after contact with animals in healthcare settings[73;74].

3. Environmental sources

Environmental factors may either assist or impede the transmission of microorganisms. The environment may play a larger role in the survival and growth of certain microorganisms than previously appreciated, reinforcing the importance of minimizing environmental contamination by patient secretions and excretions, avoiding unnecessary hand contact with environmental surfaces and ensuring high standards for environmental cleaning are maintained.

Respiratory viruses[75-77], rotavirus, norovirus[78-81] and *C. difficile* spores[82;83] persist for prolonged periods in the environment and may be a source of transmission. The role of the environment is increasingly recognized as an important source of patient-to-patient transmission of AROs[84;85].

The mobile environment (i.e., equipment and items that are shared between patients), if not cleaned between uses, may increase the chance of exposure to the microbial flora of other patients, and also be a source of transmission. Examples of items implicated in the transmission of infection or known to be an environmental source of contamination are listed in List 1.

List 1: Examples of environmental sources of contamination

1a. **Patient care items implicated in the transmission of infection**

- Contaminated blood pressure cuffs in the transmission of *C. difficile*[86], *Klebsiella* spp.[87]
- Contaminated thermometers in the transmission of VRE and *C. difficile*[42;88-90]
- Ultrasonic nebulizers in the transmission of MRSA[91]
- Reusable fingerstick blood sampling devices in the transmission of hepatitis B[92]
- Environmental surfaces near infant bedside, such as countertops, crib sides, pacifiers, toys in the transmission of RSV[77]
- Toys in the transmission of multiresistant *Pseudomonas aeruginosa*[93]

1b. **Patient care items contaminated but not clearly implicated in the transmission of infection**

- Call bells contaminated with VRE[94]
- Bedside tables, bedrails and furniture contaminated with VRE[94-96] and MRSA[70]
- Tourniquets, monitoring devices, otoscopes, stethoscopes[97-104]
- Computers[105-108], computer keyboards, faucets[109]
- Toys[110-112]
- Furnishings, mattresses, curtains, linen[113-118]
- Apparel, neckties[119;120], medical charts[121]

C. Exposure to and routes of transmission of infectious agents

1. Exposure to infectious agents (microorganisms)

Exposure occurs when a susceptible host comes into contact with an infected source or contaminated environment (e.g., inanimate/animate object or particles in the air). Not all exposures lead to transmission and resultant infection. The probability of transmission and infection is further dependent on a number of factors, including host susceptibility, presence of host receptors for the microorganism, microorganism inoculum size, viability

and virulence, and the effectiveness of the hierarchy of controls (refer to Part A, Section III, A) utilized by an organization and the individual barriers worn by a HCW.

Figure 2 illustrates the continuum of infectious agent exposure specific to the contact, droplet or airborne routes that may be relevant to a susceptible host when having contact with an infected source or a contaminated environment (physical or passive, face-to-face contact or close contact (within two metres of an infected coughing source) and when a susceptible host inhales a microorganism (as an aerosol or droplet). Research has demonstrated[122-124] that both droplet and airborne-sized particles can be found in the air at close proximity (up to two metres) to a coughing/sneezing source. In addition, a portion of larger particles (droplets) may desiccate (and so become smaller) while in the air and become, in effect, droplet nuclei. Particles with a diameter of 1 µm to 10 µm may penetrate as far as the alveolar ducts (i.e., beyond the vocal cords), but may also be deposited at any point in the respiratory tract, as shown in Figure 3.

Figure 2. Exposure to particles

Developed by the Canadian Pandemic Influenza Plan – Annex F Working Group, 2008

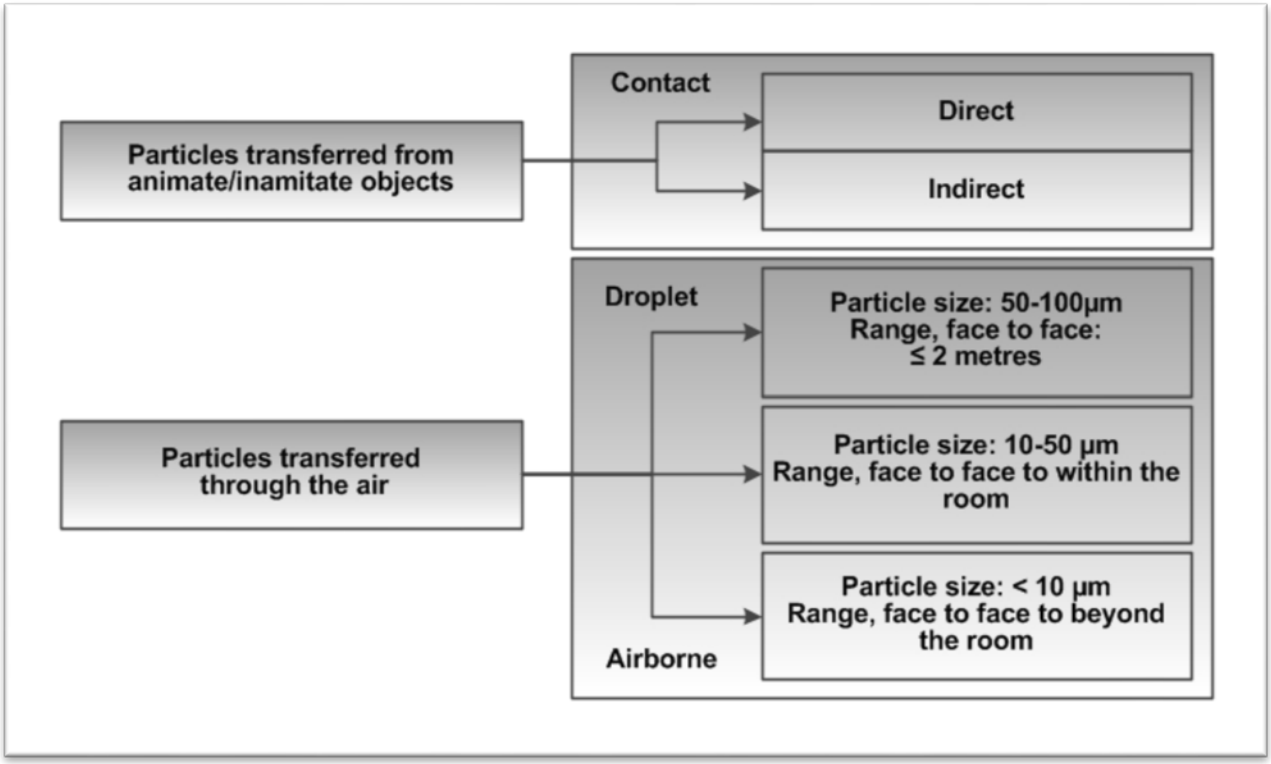
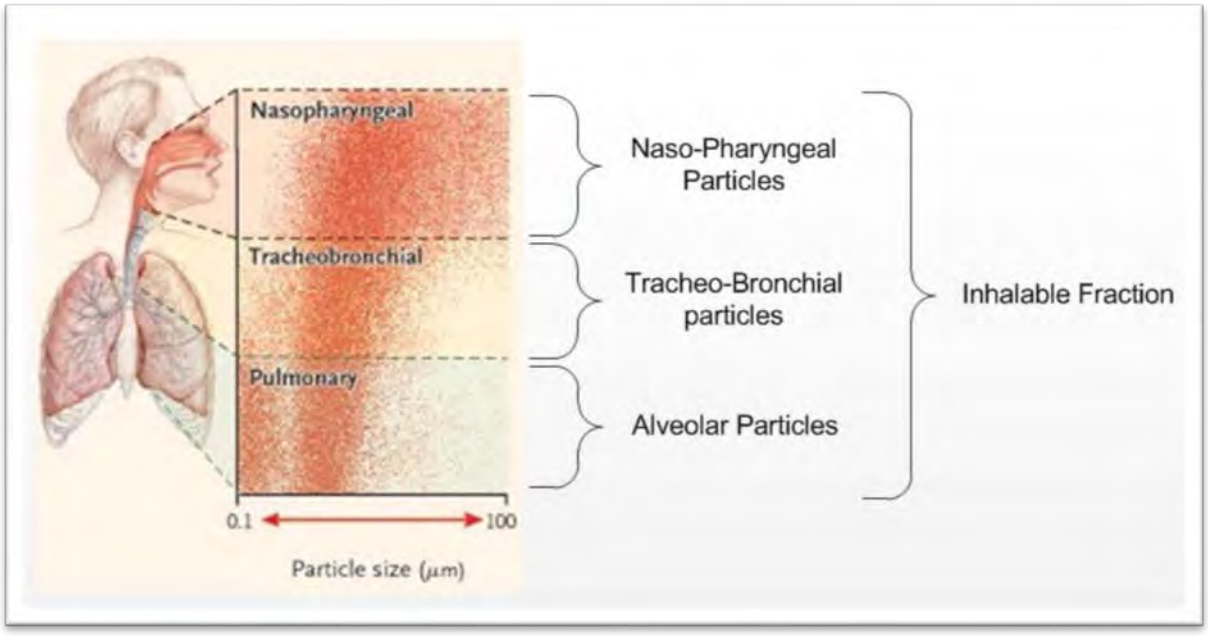


Figure 3. Deposition regions of the respiratory tract for the various particle sizes[125]



a. Continuum of droplet and airborne exposure

The probability of airborne exposure to an infectious aerosol is influenced by several factors, in addition to the proximity of the infected source to the host. These include the particle sizes containing the infectious agent, the viability of the infectious agent and the animate and inanimate environment of a room (e.g., the concentration of the viral particles in droplet nuclei, the concentration of aerosol in the room, the relative humidity, the direction of air flow and the number of air changes per hour [ACH] in the room).

Particles of a variety of sizes are expelled from the human airway during coughing, sneezing, talking and medical procedures. The size of these particles and the distance they will be propelled is dependent on the force generated by the individual or the procedure. Large particles (greater than 10 µm) will fall quickly (in a few seconds) to the ground[125]. However, smaller particles may remain suspended for a significantly longer time: tens of seconds for a droplet 10 µm in diameter and minutes or hours for small droplet nuclei. The particles that remain aloft for minutes or hours (less than 10 µm in diameter) can be carried by air currents over a measurable distance, including beyond the room, and are considered to represent an airborne exposure.

2. Routes of transmission

In IPC terminology, routes of transmission of microorganisms have conventionally been classified as contact, droplet, airborne, common vehicle and vectorborne. The routes of transmission vary with the microorganisms involved. For most microorganisms,

transmission may primarily be by one route, such as direct or indirect contact (e.g., rotavirus or *C. difficile*), by droplet route (e.g., pertussis) or by airborne route (e.g., *Mycobacterium tuberculosis*). Some infectious agents, however, may be transmitted by more than one route (e.g., RSV can be transmitted by both the droplet and contact routes).

a. Contact exposure and transmission

Contact exposure occurs when microorganisms are transferred through physical contact between an infected source and a host, or through the passive transfer of the microorganisms to a host via an intermediate object[24]. Hands can be contaminated by contact with an infected source or by contact with contaminated inanimate surfaces or objects in the immediate environment of an infected source[77;126-128].

Contact exposure includes both direct contact and indirect contact:

i. Direct contact exposure occurs when the transfer of microorganisms results from direct physical contact between an infected or colonized source and a host (body surface to body surface without barriers), such as shaking hands, as shown in Figure 4.

Figure 4: Direct contact where there is skin to skin contact between two persons

ii. Indirect contact exposure involves the passive transfer of microorganisms to a host via an intermediate object, such as contaminated hands that are not cleaned between episodes of patient care[129;130], contaminated patient care equipment (e.g., commodes, wheelchairs, base of electronic thermometers, blood pressure cuffs, monitoring equipment)[90;92;131;132], surfaces such as bedrails[77] that are not appropriately cleaned and disinfected between patients, or devices that have manufacturing defects that impede appropriate reprocessing. Other inanimate objects in the patient's environment that may be involved include computers[105-109], toys[93;110] and electronic recreational devices that are not cleaned or disinfected between patients, as shown in Figure 5.

Figure 5: Indirect contact where there is contact with an inanimate object which may serve as the vehicle for transmission of pathogens

Contact transmission occurs when contact exposure leads to an infectious dose of viable microorganisms from an infected/contaminated source, resulting in colonization and/or infection of a susceptible host.

Microorganisms transmitted by the contact route include many of the epidemiologically significant microorganisms in healthcare settings, such as *C. difficile*, AROs (e.g., MRSA, VRE), and the viruses that cause gastroenteritis (refer to Appendix VI). Other infectious agents, especially respiratory viruses (e.g., RSV, influenza, parainfluenza and rhinovirus) that are expelled in large droplets, remain viable in droplets that settle on objects in the immediate environment of the patient and survive long enough on surfaces to be picked up on the hands of patients or HCWs[75;76;124;133].

Refer to List 3 and Table 5 for the list of microorganisms transmitted by the contact route. Prevention and control of infectious agents transmitted by the contact route involve adhering to routine practices and contact precautions.

b. Droplet exposure and transmission

Droplet exposure may occur when droplets that contain microorganisms are propelled a short distance (i.e., within 2 metres)[122-124] through the air and are deposited on the mucous membranes of a host. Droplets may also contaminate the immediate environment when they settle on surfaces and may contribute to contact transmission, as shown in Figure 6.

Figure 6: Droplet transmission, where large respiratory particles travel up to 2 meters

Droplets are generated naturally from an infected source, primarily during coughing, sneezing or talking[134], or artificially through AGMPs. Aerosol-generating medical procedures may also result in the generation of smaller infectious droplets that can travel farther than those generated spontaneously from patients (refer to Part A, Section II, C, 2c, for further discussion on AGMPs). The coughs and sneezes of some individuals (e.g., young children or frail elderly) may not be forceful enough to propel droplets as far as two metres[135].

Droplets of various sizes (refer to Figure 2) may contaminate the immediate environment when they settle on surfaces. Some microorganisms may remain viable for extended periods of time and contribute to contact transmission (e.g., many respiratory viruses)[136]. Large aerosol particles (i.e., greater than 10 µm in diameter) will fall to the surface in a few seconds, and droplet exposure can only occur if the source and host are in close proximity (within two metres). Some microorganisms expelled in large droplets are very fragile and do not survive outside the human host or on surfaces (e.g., *Bordetella pertussis,* meningococcus).

Droplet transmission occurs when the droplets that contain an infectious dose of viable particles are propelled a short distance (i.e., less than two metres) through the air and are deposited on the mucous membranes of the eyes, nose or mouth of a susceptible host, and overcome other host defences.

Microorganisms transmitted by the droplet route include viruses that cause respiratory tract infections (e.g., RSV, influenza, parainfluenza, rhinovirus, adenovirus), rubella, mumps and *Bordetella pertussis*.

Refer to List 4 and Table 5, for the list of infectious agents transmitted by the droplet route. Prevention and control of infections transmitted by the droplet route involve immunization for those that are vaccine preventable and adhering to routine practices and droplet precautions.

c. Airborne exposure and transmission

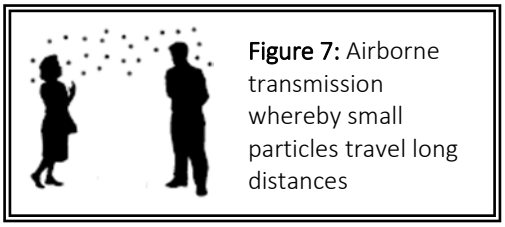


Figure 7: Airborne transmission whereby small particles travel long distances

Airborne exposure may occur if small particles (i.e., aerosols containing droplet nuclei) with viable microorganisms are generated, propelled over short or long distances, and inhaled. Aerosols containing viable microorganisms are generated naturally from an infected source during coughing, sneezing and talking, or artificially through AGMPs. Airborne exposure may result immediately after generation (i.e., the direct projection of an aerosol containing viable amounts of microorganisms through the air, and directly captured by a susceptible host's respiratory system) or after a longer period of time. Droplet nuclei can remain suspended in the air for a period of time before settling out of the air, during which time a susceptible host may inhale the suspended aerosol, as shown in Figure 7.

Airborne transmission may occur when viable microorganisms contained in aerosolized secretions from an infected source are propelled a short (i.e., within two metres) or long (i.e., greater than two metres) distance through the air[122-124] are inhaled, come into contact with receptors in a susceptible host's airway, overcome host defences and cause disease. For transmission of infection to occur, the microorganisms contained in the particles must be capable of remaining viable in the air for a prolonged period of time, and the susceptible host must be exposed to a sufficient concentration (infectious dose) of these viable microorganisms. Infection can result only if the appropriate receptors for the infectious agents are present at the site of exposure. Figure 3 depicts the various regions along the respiratory tract with the size classification of particles and their corresponding region of deposition[125].

Varicella zoster virus (chickenpox)[137], *Mycobacterium tuberculosis*[138-140], rubeola virus (measles)[141;142] and smallpox and monkeypox[143;144] are infectious agents that are transmitted by the airborne route. Measles transmission has been reported up to 90 minutes after the index case has left the room[141;145].

Refer to List 5 and Table 5, for the list of microorganisms transmitted by the airborne route. Prevention and control of infections transmitted by the airborne route involves vaccination against vaccine preventable viruses, and adhering to routine practices and airborne precautions, as outlined in Part B, Section IV, subsection iii. Specifics related to airborne precautions are that only immune HCWs work with patients infected with chickenpox or measles and that airflow is controlled. Control of airflow ensures that ventilation systems provide adequate rates of air exchange and appropriate pressure differentials to maintain direction of flow[146;147] for an airborne infection isolation room (AIIR).

Appendix VIII provides information regarding the length of time it takes for the removal of airborne particles from a room with no ongoing aerosol-generating source. There is time needed before the room is safe for a new patient or staff to enter without a respirator.

Aerosol-generating medical procedures

Aerosol-generating medical procedures are medical procedures that can generate aerosols as a result of artificial manipulation of a person's airway. Several types of AGMPS have been associated with an increased risk of TB or SARS transmission[148]. It should be acknowledged that while there is some evidence and consensus of opinion regarding the spread of infections by these procedures, further research is needed to provide additional evidence regarding the hazards that exist from these procedures. The risk of infection transmission may increase during AGMPs because of the potential to generate a high volume of respiratory aerosols that may be propelled over a longer distance than that involved in natural dispersion patterns[122;149]. These procedures include:

- intubation and related procedures (e.g., manual ventilation, open endotracheal suctioning)[150-152]
- cardiopulmonary resuscitation[152]
- bronchoscopy[153]
- sputum induction[154]
- nebulized therapy[155;156]
- non-invasive positive pressure ventilation (continuous or bilevel positive airway pressure)[157]

There is debate about whether other types of AGMPs may result in the generation of aerosols that can lead to transmission. However, there is no published literature that documents the transmission of respiratory infections, including TB, SARS and influenza, by the following means[136;158-160] :

- high-frequency oscillatory ventilation
- tracheostomy care
- chest physiotherapy
- nasopharyngeal swabs, nasopharyngeal aspirates

Patients should be carefully assessed for signs or symptoms of suspected or confirmed TB, SARS or respiratory infection with an emerging pathogen for which transmission routes are not yet fully known[150-156] prior to performing AGMPs, and strategies to reduce aerosol generation should be implemented (refer to Part B, Section IV, subsection iii, 1b). Strategies to reduce aerosol generation should also be implemented when AGMPs are necessary on patients with viral hemorrhagic fevers[161]. For novel influenza viruses or the emergence of new pathogens, refer to the PHAC website for specific guidance documents (http://www.phac-aspc.gc.ca/nois-sinp/guide/pubs-eng.php) Routine practices and contact and/or droplet precautions, as indicated, should be maintained for AGMPs on patients with no signs or symptoms of suspected or confirmed TB, SARS or emerging respiratory infections. Other procedures that may generate aerosols that have been shown to transmit TB include procedures that may aerosolize viable tubercle bacilli (e.g., irrigation) of nonrespiratory lesions[162-164] and use of oscillating saws during autopsy on patients with TB[165;166]. Airborne precautions are recommended when performing these procedures on patients with suspected or confirmed TB.

d. Common vehicle transmission

Figure 8: An example of common vehicle transmission is a contaminated multi-dose vial

Common vehicle transmission refers to a single contaminated source, such as food, multi-dose vials[167-173], intravenous fluids[174] or equipment, which serves to transmit infection to multiple hosts. Control is by maintenance of appropriate standards in the preparation of food and medications and in decontamination of equipment as shown in Figure 8.

e. Vectorborne transmission

Vectorborne transmission refers to transmission by insect vectors and is prevented by appropriate hospital construction and maintenance, closed or screened windows and proper housekeeping[175]. Such transmission has rarely, if ever, been reported in Canadian healthcare settings. Refer to figure Figure 9.

Figure 9: Disease transmitted by insects is an example of vectorborne transmissions

D. Host Factors

Microorganisms have to gain access to a susceptible host, by a receptive portal of entry, for transmission to occur. The risk of transmission is influenced by the susceptibility of the host. The host's defences, if normal, may be able to eliminate a few microorganisms but be overwhelmed by many, while an immunocompromised host may not be able to eliminate even a few. Host defences, both non-specific (e.g., normal flora, intact skin, neutrophils, macrophages) and specific (antibodies, cell-mediated responses), may be altered by extremes of age, underlying disease (e.g., diabetes[176;177], HIV[178], malignancy/transplantation[179]), genetic factors or medications. Additional factors that may facilitate acquisition of microorganisms are invasive/surgical procedures, radiation therapy, breaks in the skin and breaching of normal barriers such as occurs with the presence of invasive medical devices (e.g., endotracheal tubes, indwelling urethral catheters and intravascular devices)[180-182], and provision of wound care.

E. Outcomes of Transmission of Infectious Agents (Microorganisms)

Whether or not transmission results in colonization, asymptomatic infection or clinical disease (symptomatic infection) depends on the pathogenicity and virulence of the infectious agent (microorganism), the inoculum size and the integrity of host defences (refer to Part A, Section II, D). Pathogenicity refers to the ability of the microorganism to cause disease (i.e., harm the host). Some microorganisms are inherently pathogenic and cause disease in any susceptible host (e.g., varicella), whereas others are opportunists

causing infection only under special circumstances (e.g., coagulase-negative staphylococci in people who have prosthetic devices). Virulence refers to the intensity of pathogenicity and is related to the ability to cause morbidity and mortality (e.g., Ebola has high virulence; rhinovirus has low virulence). Several factors contribute to the virulence of a microorganism: toxin production, invasiveness, presence of capsule, adherence mechanisms and ability to survive in host cells. Inoculum size refers to the number of microorganisms transmitted to the host. Some microorganisms are highly pathogenic and need only a low inoculum to cause disease (e.g., *Shigella*).

1. Colonization

The presence of microorganisms in or on a host with growth and multiplication but without tissue invasion or cellular injury is referred to as colonization. With most microorganisms, colonization is far more frequent than clinical disease. Colonization of the nasopharynx with aerobic Gram-negative rods occurs with increased severity of illness, malnutrition, major surgery, alcoholism and diabetes[183]. Colonization with *Staphylococcus aureus* is common in normal healthy persons. Some patient populations are heavily colonized with *S. aureus* (e.g., hemodialysis patients, injection drug users, and patients with diabetes mellitus or skin disorders)[184].

Disturbance of the normal flora by antimicrobials enhances overgrowth of endogenous aerobic Gram-negative rods and enterococci, and increases risk of colonization with exogenous microorganisms, including antimicrobial-resistant bacteria and yeast[40;183]. The presence of normal or endogenous bowel flora is a defence mechanism against colonization of the gastrointestinal tract by exogenous microorganisms. The endogenous flora (e.g., bacteria residing in the respiratory or gastrointestinal tract) can also be a cause of HAIs[185-193]. Once acquired, prolonged carriage of antimicrobial-resistant organisms (AROs) may be the norm in some patient populations. Colonization with resistant strains of *Pseudomonas aeruginosa* or *Burkholderia cepacia* is common in persons with cystic fibrosis. Persistent VRE colonization has been demonstrated in dialysis[194] and other[195;196] patient populations.

2. Subclinical/Asymptomatic Infection

Infection may or may not be associated with clinical disease (illness). Infection may cause cellular and tissue changes that may be detectable in the absence of overt signs and symptoms. This is a subclinical or asymptomatic infection.

3. Clinical Disease/Symptomatic Infection

When sufficient cellular and tissue changes occur to produce overt signs and symptoms, the individual has clinical disease, which may range from mild to severe, depending on the microorganism and the health status of the host.

III. Control measures to reduce healthcare worker exposure to and transmission of microorganisms

A. Hierarchy of controls to reduce exposure to and transmission of infectious agents

Collaboration between IPC/OH professionals and healthcare building engineers has led to better understanding and application of a tiered framework of measures/interventions that enables healthcare organizations to comprehensively evaluate the risk of HCW (including volunteers) exposure to microorganisms and other hazards in the workplace and the effectiveness of the healthcare organization's mitigation responses.

The ideal approach to containment of a hazard is to implement a hierarchy of controls. The first level of control is engineering interventions. If this level of control is not possible or adequate, then administrative interventions are used. Last in the hierarchy of controls is PPE. Personal protective equipment is not the first control measure to use, as its use is dependent on the variable of worker adherence. An understanding of the engineering, administrative (including patient care practices) and PPE controls enables healthcare organizations to determine how the healthcare environment in each setting (e.g., infrastructure, equipment, processes and practices) increases or decreases a susceptible host's (e.g., patient, HCW, visitor) likelihood of exposure to a microorganism/reservoir within the healthcare setting.

1. Engineering controls

The engineering control tier reduces the risk of exposure to an infectious agent/infected source hazard by applying methods of isolation or ventilation. Engineering controls do not depend on an individual's compliance with exposure prevention strategies. These controls are usually established and controlled within the building structure, thereby eliminating an individual's choice about their application, and reducing the opportunity for individual error. As such, they provide more effective protection.

2. Administrative controls

The administrative control tier provides an infrastructure of policies, procedures and patient care practices intended to prevent exposure to and/or transmission of microorganisms to a susceptible host during the provision of health care. To be effective in preventing the transmission of microorganisms and/or detecting cases of infection, administrative controls are best implemented at the point of first encounter with an infected source and continued until the infected source leaves the healthcare setting or is

no longer infectious. Inherent in the development of administrative controls to prevent transmission of infection is the commitment, by the healthcare organization, to provide the necessary resources to implement the controls.

3. Personal protective equipment

Although the use of PPE controls are the most visible in the hierarchy of controls, PPE controls are the weakest tier in the hierarchy of controls, and should not be relied on as a stand-alone primary prevention program. The PPE tier refers to the availability and appropriate use of barriers that a susceptible host may wear to provide a physical barrier between him/her and an infectious agent/infected source. These barriers include gloves, gowns, masks, facial protection, eye protection (including face shields, or masks with visor attachments) and respirators. The healthcare organization plays a critical role in ensuring the availability of appropriate PPE for use by patients, HCWs, visitors, contractors, etc., to prevent exposure to an infectious agent/infected source.

A singular focus on availability and use of various PPE to the exclusion of other tiers in the hierarchy of controls will result in suboptimal protection of all people in the healthcare setting, including patients, HCWs and other staff. The effective and appropriate use of PPE is the control that is most reliant on the user's adherence and competence and, therefore, the control most easily compromised (resulting in ineffective protection from an infectious agent/infected source). The use of PPE is the final step in the hierarchy of controls to minimize exposure and subsequent transmission (refer to Appendix X).

List 2: Examples of control measures according to hierarchy of controls

2a. Tier 1: Examples of engineering controls

Source control:

- single rooms, with private toilets, patient sink, designated staff handwashing sinks
- AIIRs
- signage to direct patients to separate entrances (during community outbreaks) for patients symptomatic with respiratory infections
- physical barriers (e.g., partitions in triage areas to prevent exposure to patients symptomatic with respiratory infections)
- appropriate spatial separation (in patient rooms, waiting areas and in the home)
- appropriate ventilation and, in the home, natural ventilation when appropriate

Installation of:

- point-of-care ABHR
- point-of-use sharps containers
- appropriately functioning, accessible dispensers for hand hygiene products (ABHR, soap, lotion, paper towels) and respiratory hygiene/cough etiquette products
- designated handwashing sinks for HCW use

Appropriate number of commodes

Appropriate supply of and accessibility of PPE

Appropriate number of accessible no-touch waste receptacles for disposal of paper towels, tissues, masks, gloves, etc.

2b. Tier 2: Examples of administrative controls

Appropriate resources for diagnosis and treatment of infection or colonization, and for immunization of patients and staff

Organizational support for effective IPC and OH services and for management of outbreaks

Appropriate OH and safety policies, including preplacement assessment, work restrictions, respiratory protection program, sharps safety and prevention of exposure to bloodborne pathogens and immunization programs

Education of HCWs

Policies, procedures and resources to support the application of:

- point-of-care risk assessment
- point-of-care ABHR as the standard of care in all healthcare settings
- routine practices as the standard of care for all patients in all healthcare settings
- source control (instructions for patients)

Patient placement, accommodation and flow

2c. Tier 3: Examples of personal protective equipment to prevent exposure of patients, healthcare workers and other staff

Following PCRA, PPE for the appropriate application of routine practices and additional precautions may include:

- gloves
- gowns
- masks (surgical or procedure masks used by HCW and/or infectious source)
- facial protection (masks and eye protection, or face shields, or masks with visor attachment)
- respirators (refer to Appendix V, glossary)

B. Role of the organization to reduce exposure to and transmission of infectious agents

1. Organizational risk assessment

A major responsibility of any healthcare organization is the evaluation (i.e., ORA) of the components in the hierarchy of controls to minimize the risk of exposure to and transmission of microorganisms within healthcare settings. This ORA is central to any healthcare organization's preparation and planning to protect all individuals (e.g., patient, HCW, visitor, contractor) from HAIs in all healthcare settings. Organizations have a responsibility to provide information and train HCWs regarding the organization's ORA and its impact on their practice. For example, the availability of functioning AIIRs may affect when and where AGMPs are performed and may influence the PCRA performed by HCWs.

An ORA should be conducted on an annual basis and re-evaluated when major reorganization/restructuring and building/renovation take place. The need for an ORA applies to all levels of healthcare settings, including prehospital care, acute care, LTC, ambulatory care and home care settings. Ongoing systematic evaluation of the ORA is important to ensure that policies, procedures and programs:

- are consistent across the organization
- achieve their stated objectives
- are in compliance with current applicable regulations

The ORA will characterize the organization's patient population, level and intensity of health care provided and resources available, including the variously skilled workers. It will need to evaluate the effectiveness of present control measures and the breadth of the hierarchy of controls to prevent HAIs.

To conduct the ORA an organization will need to:

- determine situations/conditions where infectious microorganisms (hazards) might exist
- evaluate the potential for exposure to and/or transmission of the microorganism
- determine the consequences of exposure to the microorganism
- determine the severity of illness caused by the microorganism
- determine the consequences of transmission of the microorganism on individuals, organizations and the community
- assess available control measures in place (e.g., engineering, administrative and PPE) to mitigate exposure to or transmission of the microorganism in the specific healthcare setting

2. Organizational control measures

Once the ORA is completed, control measures can be implemented to address any areas of concern. Such control measures, described below, can be at one or more of the three levels of the hierarchy of controls. Appropriate ventilation and hospital design (e.g., AIIRs, single patient rooms) are engineering controls, whereas education of HCWs, routine practices and additional precautions and OH (e.g., respiratory protection programs) are administrative controls.

Engineering controls—Healthcare facility design, renovation and construction

Facility design is an example of engineering control[197-203] . Room design, ventilation systems, room air flow and human traffic patterns, positioning of ABHR dispensers and designated handwashing sinks, and physical barriers to separate patients in multi-bed wards and patients in waiting areas are all examples of engineering controls. Adherence to spatial separation recommendations (i.e., preferably a high proportion of single patient rooms or, alternatively, a two-metre separation between patient spaces) when designing new healthcare facilities, planning renovations to existing facilities or reorganizing patient care areas will enhance a healthcare organization's ability to prevent transmission of infections.

Healthcare facility design related to IPC also includes appropriate number, location, and type of AIIRs; location(s) of special ventilation and filtration, such as emergency department triage and waiting areas; air handling and ventilation needs in surgical services and laboratories; local exhaust systems for hazardous agents and other special areas; water systems to limit *Legionella* species and waterborne opportunistic pathogens; and consideration of preferred surface characteristics (of the ideal product) such as[201;202]:

- ease of maintenance/repair and cleanability
- does not support microbial growth
- nonporous, smooth
- durable
- sustainable
- ease of installation, demolition and replacement
- seamless
- resilient, impact resistant

Infection prevention and control professionals should be included from the beginning of projects (i.e., when designing new healthcare facilities, planning renovations to existing facilities or reorganizing patient care areas) until the project ends[197;198;202-206].

Engineering controls—Heating, ventilation and air conditioning in healthcare facilities

To ensure optimal performance of ventilation systems for removal of particulates and elimination of excess moisture, organizations have a responsibility to design, construct, install and maintain ventilation systems in accordance with engineering and manufacturers' recommendations. Recommendations for heating, ventilation and air conditioning systems particular to healthcare facilities have been published[146;147;207]. Additional information specific to *Mycobacterium tuberculosis* can be found in the latest edition of The Canadian Tuberculosis Standards.

Healthcare settings that provide care for, or potentially care for, patients with suspected or confirmed airborne transmissible infections should have an adequate number of AIIRs (also called negative pressure rooms)[138;208-211]. The ORA should determine the appropriate number of AIIRs required. Airborne infection isolation rooms are recommended for placement in the following areas in healthcare facilities, including but not limited to: emergency departments, critical care settings, inpatient units, bronchoscopy and autopsy suites[138;209-212].

This guideline does not recommend specific ACH requirements but provides healthcare organizations with the recommendations that currently exist (refer to Table 1. Ventilation Recommendations for Selected Areas in Healthcare Facilities, (below). Further research in this area is needed including collaboration between experts in engineering and biomedical sciences to provide additional insights and clear evidence for ventilation requirements.

Table 1: Ventilation recommendations for selected areas in healthcare facilities.

Area	CSA, 2010	ASHRAE, 2008	CDC, 2005
Autopsy suite	20 ACH	12 ACH	12 ACH
Bronchoscopy, sputum induction rooms	20 ACH	12 ACH	12 ACH
Airborne infection isolation rooms (AIIR)	12 ACH	12 ACH	
New construction (existing)			12 ACH (at least 6 ACH)

CSA Z317.2-10 Special Requirements for Heating, Ventilation, and Air Conditioning (HVAC) Systems in Health Care Facilities[146].
ASHRAE American Society of Heating, Refrigerating and Air-conditioning Engineers, Ventilation of Health Care Facilities[147].
CDC Centers for Disease Control, Guidelines for Preventing the Transmission of Mycobacterium Tuberculosis in Health-care Settings[207].

Specific recommendations for heating, ventilation and air conditioning in operating room settings are beyond the scope of this document and are available from the Facility Guidelines Institute[201] and Canadian Standards Association[146].

Engineering controls—Source control

Source control measures are used to contain microorganisms from dissemination from an infectious source. Instructions on how to comply with source control should be provided to patients and other persons with symptoms at the point of initial encounter in any healthcare setting (e.g., triage in emergency departments, acute assessment settings, reception and waiting areas in emergency departments, outpatient clinics and physician's offices) and in strategic places (e.g., elevators, cafeteria) within ambulatory and inpatient settings. Policies and procedures (administrative controls) should be implemented to develop a program for source control. Source control measures may include but are not limited[124;148]:

- signage at entrances to healthcare settings for early recognition of symptoms (e.g., syndromic screening)
- separate entrances/waiting areas for symptomatic patients
- spatial separation
- physical barriers for acute assessment
- early identification, diagnosis and treatment of infection (e.g. TB, norovirus)
- respiratory hygiene
- hand hygiene
- patient placement (e.g., patient care areas, single rooms/AIIRs)
- strategies to reduce aerosols during AGMPs (refer to Part B, Section IV, subsection iii, 1b).

Engineering controls—Source control—Spatial separation

Appropriate spatial separation and spacing recommendations to decrease exposure to microorganisms for patients and visitors in clinical and waiting areas should be implemented. A two-metre spatial distance between a coughing/sneezing infected source (e.g., symptomatic individual with an acute respiratory illness) and an unprotected susceptible host (e.g., patients, HCWs, visitors, contractors) should be considered to prevent the transmission of droplet-borne infectious particles[122-124].

Spatial separation recommendations should be included when designing new healthcare facilities or planning renovations to existing facilities (refer to Part A, Section III, B, 2).

Engineering controls—Source control—Respiratory hygiene

Respiratory hygiene refers to a combination of measures designed to minimize the transmission of respiratory pathogens[45;48;148;213-215]. These source control measures are targeted to all individuals with symptoms of respiratory infection, starting at the initial encounter in a healthcare setting, and are maintained throughout every encounter in the healthcare setting (e.g., triage in emergency departments, reception in ambulatory clinics or healthcare provider offices, and in strategic places such as elevators and cafeterias). Respiratory hygiene involves educating and encouraging all individuals (patients, HCWs and visitors) who have the physical and cognitive abilities to do so to practice respiratory hygiene. Specific measures may include instructional signs, education programs and provision of materials for respiratory hygiene (e.g., tissues, no-touch plastic-lined waste receptacles, ABHR).

Further information is available in the PHAC *Infection Control Guideline for the Prevention of Healthcare–Associated Pneumonia*[216] .

Engineering controls—Source control—Hand hygiene

Organizational barriers related to engineering controls, such as a lack of accessibility to and maintenance of hand hygiene facilities and poor access to hand hygiene products, negatively affect adherence to hand hygiene. Organizations have the responsibility to ensure that such barriers are addressed. Readers are referred to the PHAC IPC guideline for *Hand Hygiene Practices in Healthcare Settings*[217].

Engineering controls—Source control—Patient placement

Recently, in an effort to increase access to scarce inpatient beds and reduce emergency department crowding, some Canadian hospitals have developed “overcapacity” or “full capacity” protocols (i.e., admitting patients to inpatient units that are already at maximum capacity)[218]. The Canadian Nurses Association (CNA) Position Statement, “Overcapacity Protocols and Capacity in Canada’s Health System” noted such protocols may affect the safety of patients and nurses including increasing the number and severity of adverse events and have concerns regarding control of infectious disease[218]. The CNA advises that hospitals take every necessary step to avoid use of overcapacity protocols and that an overcapacity protocol not be considered the norm in the delivery of hospital services. Hospitals that have short-term use of overcapacity or full capacity protocols should develop and implement policies and practices that minimize the risk of spread of infection through overcrowding and understaffing. Patients who present to hospital with acute transmissible infections (including but not limited to vomiting, diarrhea, fever, cough, coryza, shortness of breath) are not candidates for overcapacity placement.

Engineering controls—Source control—Strategies to reduce aerosols during aerosol-generating medical procedures

Refer to Part A, Section II, C, 2c for discussion on AGMPs and Part B, Section IV, subsection iii, 1b for strategies to reduce the risk of aerosol generation.

3. Administrative control measures

Occupational health program

An objective of an OH program is to identify risk situations with the potential for occupational exposure or transmission of a microorganism, either to or from the HCW and other individuals. Components of an OH program that support the use of routine practices and additional precautions to prevent exposure or transmission of microorganisms can be found in the PHAC IPC guideline *Prevention and Control of Occupational Infections in Health Care*[219] and include:

- preplacement assessment (at time of employment)
- ensuring immunity to vaccine preventable infectious diseases
- tuberculosis screening (preplacement and screening, as per organizational policies)
- annual influenza immunization
- policies for management of HCWs with infections
- management of latex and other glove component allergies
- prevention of exposure to bloodborne pathogens, including a sharps safety program (refer below)
- management of HCWs who cannot wear PPE (e.g., respirators)

Important components of an OH program that support the use of routine practices and additional precautions not in the PHAC IPC guideline *Prevention and Control of Occupational Infections in Health Care*[219] include:

- management of HCWs unable to comply with hand hygiene recommendations (for details refer to PHAC IPC guideline Hand Hygiene Practices in Healthcare Settings[217]
- respiratory protection program (refer below)

Occupational health program—Sharps safety and prevention of exposure to bloodborne pathogens

The prevention of sharps injury and HCW exposure to bloodborne pathogens is a component of routine practices.

Users of sharps require education and training about how to safely handle sharp devices to prevent injuries to themselves and others who may encounter the device during or after procedures. Safety programs should include a formal incident investigation for every sharp

injury occurring in the work setting[220]. Components of a sharps injury prevention program have been published[221;222]. The CDC workbook for designing, implementing and evaluating a sharps injury prevention program is available on the CDC website (http://www.cdc.gov/sharpssafety/resources.html).

Use of safety engineered devices, such as protected needle devices, needle-free systems with self-sealing ports and syringes with safety features, have been reported to reduce needlestick injuries[220], and their use has been identified as a priority in risk-reduction strategies[223]. In some jurisdictions, these safety devices are required by regulation (refer to local regulations). The choice of specific needleless devices for a healthcare organization should be considered carefully[224-227], as some models have demonstrated a risk for patients[228-232].

Occupational health program—Respiratory protection program

Respiratory protection specifies the use of a respirator to prevent inhalation of aerosols containing infectious particles. Respirators should be used for the care of patients with suspected or confirmed airborne respiratory pathogens (e.g., TB, measles), and in some situations when AGMPs are performed (refer to Part B, Section IV, subsection iii, 7). Healthcare organizations that use respirators should have a respiratory protection program in place[233]. The respiratory protection program should provide health screening, fit-testing/retesting and training to all HCWs who may wear a respirator. The organization should be committed to developing, implementing, maintaining and evaluating the respiratory protection program.

Healthcare organizations are responsible for choosing specific respirator brands, models and sizes to be used by their workforce, while taking into consideration the diversity of their workforce and patient population. Organizations should ensure their workforce has access to recommended respirator models and sizes, as required by local Labour Code and Occupational Health regulations.

Healthcare Organizations should consider the following:

- When respirators are being selected by the organization, those with inherently good fit characteristics are preferred.
- Respirators from more than one manufacturer may be needed to fit the range of ethnic groups/facial structures represented within the organization's workforce.
- Fit testing is used to evaluate how well a given respirator fits a given person by assessing leakage around the face seal. Published literature regarding fit-testing respirators in the healthcare setting is inconclusive[234-236] however, most Canadian jurisdictions require fit testing for HCWs to determine their ability to obtain a satisfactory seal when using respirators[233]. As a result, HCWs are referred to jurisdictional regulations regarding fit testing. In the absence of such regulation, consult your provincial/territorial public health authorities. Most jurisdictions specify that fit-testing be repeated on a set schedule (e.g., at least every 2 years)[233], or as

defined by jurisdictional regulations, or more frequently if facial conditions change (e.g., weight gain/loss, dental work).

- If an organization chooses to change the brand and/or model of respirators available for use, it should be aware that fit-testing results are not transferable between respirator brands and/or models.
- Healthcare organizations should develop policies for HCWs who are unable to form a tight facial seal when wearing a respirator (e.g., facial deformities, men with beards).

Healthcare workers should consider the following:

- Healthcare workers should only use respirators to which they were fit-tested.
- Healthcare workers should be knowledgeable of the applications, advantages and limitations, and proper use of the specific respirator model(s) that they have been fitted for (refer to Appendix X).
- Each time HCWs put on a respirator, they are to perform a seal check (sometimes referred to as fit check) to enable proper functioning of the respirator[233].

Education of healthcare workers

Education and training on IPC policies and procedures should be provided to all HCWs during their training in health professions, during employment orientation, as a result of special circumstances (e.g., outbreaks, new equipment/information) and on a regular basis. Healthcare organizations have the responsibility to provide the training, and HCWs have the responsibility to take advantage of educational opportunities. Planning and evaluating educational programs for an adult learner is complex, and appropriate resources should be consulted (e.g., Community and Hospital Infection Control Association–Canada, IPC core competencies for HCWs[237], planning programs for adult learners)[238]. It is important that topics, methods and materials for education and training are appropriate to the level of the HCW understanding and responsibility. Content for routine practices and additional precautions education and training sessions should include, but are not limited to, the following principles:

- point-of-care risk assessment
- transmission of microorganisms (chain of infection)
- prevention of exposure to microorganisms (including source control)
- importance of immunization
- knowledge of immune status to vaccine preventable diseases (e.g., varicella)
- indications for hand hygiene (ABHR at point-of-care as preferred method unless exceptions apply (i.e., when hands are visibly soiled with organic material, if exposure to norovirus and potential spore-forming pathogens such as *Clostridium difficile* is strongly suspected or proven, including outbreaks involving these organisms)
- indications for and appropriate application of aseptic technique

- safe use and disposal of sharps
- cleaning and disinfection of non-critical patient care equipment between patients
- patient/visitor education
- indications for and appropriate use of PPE
- implementation of additional precautions
- modification of practices during outbreaks
- how to use Table 4 to implement additional precautions empirically
- how to use Table 5 to modify or discontinue additional precautions

Reprocessing of patient care equipment—Reprocessing reusable equipment

The appropriate reprocessing (i.e., cleaning, disinfection and sterilization) of reusable medical devices (e.g., equipment, instruments) is important in preventing the transmission of microorganisms, and an obligatory component of health care that must be performed according to published guidelines[239;240] and standards[241-245].

Spaulding developed a system to classify the cleaning, disinfection and sterilization specifications for equipment used in patient care[246]. This system divides medical devices, equipment and surgical materials into three categories (non-critical, semi-critical and critical), based on the potential risk of infection involved in their use[247]. Healthcare workers need to be able to identify semi-critical and critical items for reprocessing by high level disinfection or sterilization. Healthcare workers also need to be able to identify non-critical equipment and ensure it has been cleaned before use (refer to item below).

Reprocessing of reusable medical devices can occur within a hospital or regional health facility, or it can be contracted to a third-party reprocessor. When third-party reprocessors are contracted, provincial/territorial regulations should apply. Reusable devices need to be reprocessed by trained personnel under the supervision of specially trained individuals. To the largest extent possible, reprocessing should be in a centralized location and audited on a regular basis. Where this is not achievable, single-use disposable devices are preferred.

Identification and reprocessing of prion-contaminated equipment (agents responsible for transmissible spongiform encephalopathies such as Creutzfeldt-Jakob disease) require more rigorous and highly specific processes. Readers should refer to specific PHAC guidance[248-250] for further information.

Reprocessing of patient care equipment—Reprocessing and reuse of single-use medical devices

Devices designed and sold for single use are not intended for reprocessing and reuse. Nevertheless, a 2006 survey to investigate the practices of reprocessing and reusing single-use devices (SUDs) in Canadian acute-care hospitals found that 28% of hospitals reprocess

SUDs, either by in-house or third-party reprocessing[251]. These results were similar to a Canadian survey in 2000[252]. Concerns related to reprocessing SUDs include the increased risk of patient adverse events, legal liability, ethical concerns and the cost-effectiveness of reprocessing[251]. Reprocessing SUDs involves a process to ensure an original SUD previously used on one patient is safe for use on another patient, and includes cleaning, functional testing, repacking, relabeling, testing for pyrogenic substances and disinfection or sterilization[253]. Healthcare organizations contracting third-party reprocessors for this purpose must adhere to provincial/territorial legislation. At the time of this writing, there is no process to regulate third-party reprocessors of SUDs in Canada. For this reason, facilities that choose to reprocess SUDs must contract to Food and Drug Administration–regulated facilities in the US.

Reprocessing of patient care equipment—Cleaning and disinfection of non-critical patient care equipment

Contamination of patient care equipment, items in the patient environment and the patient's environment has been documented and implicated in transmission of infection. (Refer to List 1, Examples of environmental sources of contamination). Used or potentially contaminated items that have had contact with a patient's intact skin should always be cleaned and disinfected before use with another patient. Refer below for cleaning of the patient environment.

Environmental cleaning

Measures to minimize exposure to environmental contamination include[239]:

- dedicating non-critical medical equipment to a single patient[254]
- assigning responsibility and accountability for routine cleaning and disinfection of patient care equipment[255-258]
- ensuring environmental cleaning is done according to a set procedure and frequency, documented and supervised by adequately trained personnel and by dedicated personnel
- ensuring surfaces are constructed of materials that can be easily cleaned at the point-of- use[201;202]
- increasing the frequency of cleaning and disinfecting frequently touched surfaces[70;82;95;254;259;260]
- monitoring adherence to recommended environmental cleaning practices[261-263]
- ensuring rooms are terminally cleaned following patient discharge and after discontinuing precautions[263] (refer to Appendix VII)
- determining what product to use for routine environmental cleaning

In situations of continued transmission of certain microorganisms (e.g., norovirus, rotavirus, *C. difficile*) use of specific disinfectant products may need to be

considered[78;239;264;265]. In outbreak situations or when there is continued transmission, rooms of *C. difficile* infection patients should be decontaminated and cleaned with chlorine-containing cleaning agents (at least 1,000 ppm) or other sporicidal agents[43;266-271].

Additional information is available in the CDC/Healthcare Infection Control Practices Advisory Committee *Guideline for Disinfection and Sterilization in Healthcare Facilities*[239] and CDC's *Guidelines for Environmental Infection Control in Health-Care Facilities*[72].

Waste

Most waste generated in healthcare settings is no more hazardous than household waste[272-274]. Special handling of sharps and some biomedical waste (e.g., sponges, dressings or surgical drapes soaked with blood or secretions) may be required by local regulations[275]. Waste receptacles should be conveniently located and preferably no-touch. Local regulations may apply.

Additional information is available in the Canadian Standards Association *Handling of Waste Materials in Health Care Facilities and Veterinary Health Care Facilities*[275].

Linen

Although linen in healthcare facilities may become contaminated with pathogens, risk of transmission of disease is negligible[117;276;277]. Care should be taken in the handling of soiled linen to prevent dispersal of microorganisms[278;279]. Special handling of linen from patients on additional precautions is not required[276;280].

If laundry chutes are used, they should be properly designed, maintained and used in a manner to minimize dispersion of aerosols from contaminated laundry[281;282].

Clean linen should be transported and stored in a manner to prevent inadvertent handling or contamination by dust, which may contain fungal spores harmful to immunocompromised patients[72].

Additional information is available in the CDC's Guidelines for Environmental Infection Control in Health-Care Facilities[72].

Management of deceased bodies

There are no special recommendations when handling deceased bodies, preparing bodies for autopsy or transferring bodies to mortuary services. Routine practices properly and consistently applied and the additional precautions as indicated prior to death (contact or airborne) is sufficient. Droplet precautions are an exception and are not necessary postmortem. Some provinces and territories may have specified communicable disease regulations.

Management of pets/animals

The use of pet therapy in health care may have benefits to patients. Policies and procedures for animal health screening and IPC for animal-assisted interventions in healthcare facilities are an organizational responsibility. Recommendations for IPC practices related to animal health screening and interventions in healthcare facilities have been published[71;72].

C. Role of the healthcare worker

1. Point-of-care risk assessment

Prior to every patient interaction, HCWs have a responsibility to assess the infectious risk posed to themselves and other patients, visitors and HCWs by a patient, situation procedure. The PCRA is an evaluation of the variables (risk factors) related to the interaction between the HCW, the patient and the patient's environment to assess and analyze their potential for exposure to infectious agents and identify risks for transmission[283]. This PCRA is based on judgement about the clinical situation (including the patient's clinical condition, physical, emotional and mental state) and up-to-date information on how the specific healthcare organization has designed and implemented engineering and administrative controls, availability and use of PPE. Control measures are based on the evaluation of the variables (risk factors) identified.

Healthcare workers should routinely perform PCRAs many times a day to apply control measures for their safety and the safety of patients and others in the healthcare environment.

For example, a PCRA is performed when a HCW evaluates a patient and situation to:

- determine the priority for single rooms or for roommate selection if rooms are to be shared by patients
- determine the possibility of exposure to blood, body fluids, secretions and excretions and non-intact skin and select appropriate control measures (e.g., PPE) to prevent exposure
- apply strategies to reduce aerosol generation during AGMPs (refer to Part B, Section IV, subsection iii, 1b)
- determine the need for additional precautions when routine practices are not sufficient to prevent exposure

Risk factors affecting control measures

Control measures to prevent exposure or transmission may differ according to specific microorganism, patient condition, situation or procedure and care setting. For example, measures to reduce the transmission of respiratory infections will differ from those to

reduce the transmission of gastrointestinal infections. Certain patients (e.g., young children, incontinent adults and cognitively impaired individuals) or specific procedures on certain patients may increase risk of transmission, thereby requiring different control measures. Healthcare workers are at higher risk of exposure to respiratory viruses when providing care to patients who have copious respiratory secretions or frequent cough and are unable to perform self-care, including respiratory hygiene and hand hygiene. Procedures such as AGMPs have been shown to increase the transmission of TB[153] and SARS[150;152;284] and, therefore, specific control measures (refer to Part B, Section IV, subsection iii, 1b) should be used.

Some infections may be more readily transmitted in paediatric settings than in adult settings. Infection is a frequent cause of healthcare utilization by young children, who often harbour microorganisms, especially respiratory and gastrointestinal viruses that they may shed, even if asymptomatic[181;285]. Young children are also susceptible to many infections, as they may have not yet developed immunity to many microorganisms. The close proximity of large numbers of infectious persons and susceptible hosts favours transmission, as do behavioural characteristics of young children, such as incontinence, inadequate hygiene, frequent mouthing of hands and toys or other objects, drooling and direct contact between children during play. In addition, frequent hands-on contact from HCWs and parents may occur during basic care. Shared toys, playrooms and visiting siblings may also contribute to the transmission risk[181;285].

There is variation of risk within different settings (e.g., prehospital, acute, LTC, ambulatory and home care). Therefore, control measures may often need to be modified, depending on the healthcare setting, as it would be inappropriate to impose the same level of precautions in each setting. The usual care model of LTC is to provide a home-like setting with participation in activities of daily living. There should be a balanced approach offering a safe environment without undue restrictive measures that could be detrimental to the individual's overall well-being or quality of life[286]. There may be potential for increased risk of transmission with prehospital care, as it is an uncontrolled environment[287].

The risk of cross-transmission may increase when patients share rooms instead of being accommodated in single patient care rooms[48;201;202;288-302].

Knowledge and skills for point-of-care risk assessment

Healthcare workers should have sufficient knowledge, skills and resources to perform a PCRA before every interaction with a patient to apply appropriate control measures. In order to perform a PCRA, each HCW should have an understanding of the following principles, taking into consideration the level of care they are providing, their level of education and their specific job/responsibilities:

- the links in the chain of infection
- variables that influence transmission of microorganisms that may include type of exposure, size of inoculum, host susceptibility and control methods that reduce risk

- characteristics of the microorganisms that may include reservoirs, infectivity, mode of transmission, incubation period, period of communicability and virulence
- patient care practices and activities that contribute to exposure to microorganisms
- exposure risks specific to the healthcare setting
- environmental circumstances
- the level of risk and the appropriate control measures to be put in place to reduce the risk of transmission of microorganisms
- how to consult with IPC with concerns or questions
- control measures that may differ with different microorganisms and in different healthcare settings

Application of point-of-care risk assessments

When performing a PCRA, each HCW may consider asking questions to determine the risk of exposure and potential for transmission of microorganisms during patient interactions. Examples of such questions are:

- What contact is the HCW going to have with the patient?
- What task(s) or procedures(s) is the HCW going to perform? Is there a risk of splashes/sprays?
- If the patient has diarrhea, is he/she continent? If incontinent, can stool be contained in an adult incontinence product?
- Is the patient able and willing to perform hand hygiene?
- Is the patient in a shared room?

Tables 2 and 3 provide an overview of some of the risk factors identified in the questions above to consider when applying a PCRA, using C. difficile infection and seasonal influenza as examples. The tables outline how the risk of exposure and potential transmission changes, depending on variables in the infected source, environment and susceptible host. Risk factors to be considered as part of your PCRA, as outlined in Tables 2 and 3, include the following.

- An infected source*:* The PCRA should evaluate the changing nature of the infected source's symptoms and environment to determine the appropriate PPE for the HCW, other staff members and visitors. The PCRA should also determine if there is a need to move the patient to a single room with a private bathroom, and any other practice changes needed to address a change in a patient's condition.
- A susceptible host: The PCRA should evaluate whether the susceptible host has developed an infection such as *C. difficile* infection (e.g., cross-infection from a roommate/HCW) or whether the risk posed by an infected source has increased or decreased (e.g., diarrhea has increased or stools are now formed). The PCRA should lead to a determination of appropriate PPE that should be used to care for the patient

in various situations. Examples include changing diaper products, taking a blood pressure or delivering meal trays with no patient or environmental contact, determining whether there is a need to move the patient or the roommates to another area, determining whether there is a need for enhanced housekeeping, and any other care practices required as a result of the change in risk for *C. difficile* acquisition.

Table 2: Factors influencing transmission risk using *C. difficile* as an example of contact spread

Source	Higher transmission risk	Lower transmission risk
Infectious agent/infected source	Frequent diarrhea	Formed stools
	Incontinence	Continence
	Poor hygiene	Good hygiene
	Not capable of self-care due to physical condition, age or cognitive impairment	Capable of self-care
Environment	High patient/nurse ratio	Low patient/nurse ratio
	Shared bathroom, shared sink	Single room, private in-room toilet, designated patient handwashing sink
	Shared commode without cleaning between patients	Dedicated commode
	No hand hygiene at point-of-care	Hand hygiene at point-of-care
	No designated staff handwashing sink or sink is used for other purposes or sink is dirty	Accessible, designated, clean staff handwashing sink
	Inadequate housekeeping	Appropriate housekeeping
Susceptible host (patient)	Receiving direct patient care	Capable of self-care
	Poor personal hygiene	Good personal hygiene

Table 3: Factors influencing transmission risk using seasonal influenza as an example of droplet spread

Source	Higher transmission risk	Lower transmission risk
Infectious agent/ infected source	Copious respiratory secretions	Minimal respiratory secretions
	Frequent cough or sneeze	Infrequent cough or sneeze
	Poor compliance with respiratory hygiene	Compliance with respiratory hygiene practices
	Early stage of illness	Convalescent stage of illness
	Not capable of self-care	Capable of self-care
	Infants and children (potential prolonged viral shedding and environmental contamination)	Adults
	Immunocompromised (potential prolonged viral shedding)	Immunocompetent
	Inadequate patient placement or cohorting	Adequate patient placement, cohorting
Environment	High patient/nurse ratio	Low patient/nurse ratio
	Prolonged/frequent contact to infected source	Limited contact with infected source
	Shared room, washroom	Single room and washroom
	Inadequate housekeeping	Appropriate housekeeping
	Shared patient care equipment without cleaning between episodes of patient care	Dedicated equipment or cleaning and disinfection of equipment between uses
	Inadequate spatial separation between infected source and susceptible host (less than two metres)	Adequate spatial separation between infected source and susceptible host (at least two metres)
	Non-compliance with cleaning and disinfections standards	Compliance with cleaning and disinfection standards
Susceptible host (patient)	Not capable of self-care	Capable of self-care
	Underlying disease	No underlying disease
	Susceptible	Immunized or recovered from disease
	Immunocompromised	Immunocompetent
Susceptible host (HCWs or other staff)	Inadequate application of engineering, administrative and PPE controls	Performs PCRA and chooses PPE appropriate to risk
	Inadequate hand hygiene	Compliance with appropriate hand hygiene
	Infected source actively coughing and sneezing unable to contain secretions	Compliance with respiratory hygiene
	Not immunized against the circulating strain of influenza virus	Immunized against the circulating influenza virus more than two weeks prior to exposure
	Immunocompromised	Immunocompetent

Applying control measures following point-of-care risk assessment

Additional precautions are to be applied as per the organizational policies and procedures. The PCRA of the circumstances of the patient, the environment and the task to be performed determine the control measures that should be used. Control measures are at the level of HCW patient care practices and PPE in the hierarchy of controls, and may include:

- hand hygiene, ensuring point-of-care ABHR is available and used (expected as the standard of care for all HCWs in all healthcare settings)
- patient placement and accommodation, prioritizing patients with uncontained wound drainage or uncontained diarrhea into a single room or placing a patient with suspected or confirmed airborne infection into an AIIR with the door closed
- treatment of active infection
- roommate selection for shared rooms or for transport in shared ambulances (and other types of transportation, such as air ambulances, taxis), considering the immune status of patients who will potentially be exposed to certain infections (e.g., measles, mumps, rubella, varicella)
- patient flow, restricting the movement of symptomatic patients within the specific patient care area/facility or outside the facility, as appropriate, for the suspected or confirmed microbial etiology
- work assignment, considering the immune status of HCWs who will potentially be exposed to certain infections (e.g., measles, mumps, rubella, and varicella)
- personal protective equipment selection, applying PPE appropriate to the suspected or confirmed infection or colonization
- cleaning and disinfecting non-critical patient care equipment and the patient environment
- handling of linen and waste
- restricting visitor access where appropriate
- reassessing the need for continuing or discontinuing additional precautions

2. Healthcare worker control measures to reduce exposure to and transmission of infectious agents

Routine practices

Routine practices are a comprehensive set of IPC measures that have been developed for use in the routine care of all patients at all times in all healthcare settings. Routine practices aim to minimize or prevent HAIs in all individuals in the healthcare setting, including patients, HCWs, visitors and contractors. Routine practices address infectious

agent/infected source control, susceptible host protection and environmental hygiene utilizing aspects from all components of the hierarchy of controls.

All HCWs (e.g. physicians, nurses, allied HCWs, students, volunteers and others) are responsible for complying with routine practices and for tactfully calling infractions to the attention of offenders. No one is exempt from complying with routine practices.

Patients and visitors have a responsibility to comply with routine practices where indicated. Teaching patients and visitors basic principles (e.g., hand hygiene, use of PPE) is the responsibility of all HCWs.

Routine practices—Hand hygiene

The efficacy of hand disinfection in reducing nosocomial infection, as recognized by Semmelweis in 1847, has been repeatedly reaffirmed[303;304]. Use of ABHR has been shown to reduce HAI rates[217;305]. Hand hygiene with point-of-care ABHR is the standard of care expected in all healthcare settings and of all HCWs.

A consistent trend demonstrating a reduction in infection rates related to improved hand hygiene has been reported[305-309]. However, sustaining improved hand hygiene rates and the reduction of HAIs is difficult, as a return to prestudy rates often occurs once the study is completed and interventions to promote hand hygiene are discontinued[310;311]. Refer to the PHAC IPC guideline *Hand Hygiene Practices in Healthcare Settings*[217] for further information.

Routine practices—Patient placement and accommodation

Accommodation of inpatients in single rooms facilitates IPC activities. Single rooms with a private toilet, designated patient handwashing sink and designated staff handwashing sink may reduce opportunities for cross-transmission between patients, particularly when the patient has poor hygiene, contaminates the environment, or cannot comply with IPC measures because of physical, behavioural and/or cognitive impairment(s)[201;202;289-302]. The HCW, in consultation with bed/accommodation coordinators and/or ICP professionals, as necessary, should select the most appropriate accommodation based on the PCRA and for prioritizing use of single rooms and AIIRs, if these are scarce.

Routine practices—Patient flow

Patient flow refers to patient transfer/transport within and outside of the facility and patient activity. There is a potential for exposure to and transmission of microorganisms as a result of patient activity and transport, due to inadvertent contact with other patients, patient care items and environmental surfaces. Patients should not be transported between patient care units, departments or facilities unless medically necessary. Frequent patient transfers should be avoided, as this increases the number of interactions with staff and other patients, providing opportunities for transmission to occur[25].

Routine practices—Aseptic technique for injections and intravascular and other invasive procedures

Aseptic technique is the purposeful prevention of transfer of microorganisms from the patient's body surface to a normally sterile body site or from one person to another by keeping the microbe count to an irreducible minimum. Aseptic techniques, sometimes referred to as sterile techniques, are measures designed to render the patient's skin, supplies and surfaces maximally free from microorganisms. Such practices are used when performing procedures that expose the patient's normally sterile sites (e.g., intravascular system, spinal canal, subdural space, urinary tract) in such a manner as to keep them free from microorganisms. Components of aseptic technique prior to a procedure may involve the following: preparing the patient's skin with an antiseptic; hand hygiene, preferably with ABHR or, if not accessible, an antimicrobial soap; sterile gloves, gowns, masks, equipment, and drapes; and maintaining a sterile field.

Infections may result from failure to use proper skin antisepsis prior to injection of medications, vaccines or venipuncture[312;313]. Chlorhexidine in alcohol inactivates microorganisms on the skin more effectively than most other antiseptics, and is the preferred antiseptic for skin preparation prior to insertion of central venous catheters and pulmonary artery catheters[314-317]. Evidence suggests maximal aseptic barriers (including a head cap, mask, long-sleeved sterile surgical gown, sterile gloves and large (full bed) sterile drape during insertion) reduce infection rates associated with insertion of central venous catheters[228;318-321]. As reported studies differ in their patient populations, research designs and healthcare settings, additional investigation is warranted.

Meningitis has been reported after myelography and other spinal procedures and is usually caused by respiratory flora of the person performing the procedure[322-329]. The failure of the operator to wear a face mask during the procedure[325;327;329;330], or to wear a mask properly[328], has been implicated. Aseptic technique for sterile procedures, such as placing a catheter or injecting material into the spinal canal or subdural space (e.g., during myelograms, lumbar puncture, intrathecal chemotherapy, and spinal or epidural anesthesia), includes hand hygiene with ABHR, preparation of the site with an antiseptic, the use of a mask[331], use of sterile gloves and maintaining a sterile field.

Drapes are used to prevent transferring microorganisms from the environment to the patient during the procedure being performed. Masks are worn to prevent microorganisms carried in the HCWs nose and mouth from contaminating the sterile field.

Appropriate aseptic technique for the insertion of urinary catheters includes sterile equipment (e.g., gloves, drapes, sponges and catheters), a sterile or antiseptic solution for cleaning the meatus and a single-use packet of sterile lubricant jelly for insertion[31] .

Aseptic technique for the withdrawal of medication or other sterile substances from any vial or other containers includes hand hygiene, the use of alcohol to prepare the rubber stopper or injection port (waiting for alcohol to dry), single-use sterile needles and syringes and following manufacturer's instructions. Transmission of hepatitis B and hepatitis C virus and other agents, has been related to the reuse of needles and/or syringes used to

withdraw agents from multiuse vials, inappropriate use of glucose monitoring equipment, and reusing a single needle and syringe to administer medications to multiple patients[92;167-174;332].

Recommendations for injection safety are as follows[333]:

- Do not administer medications from the same syringe to more than one patient, even if the needle is changed.
- Consider a syringe or needle to be contaminated after it has been used to enter or connect to a patient's intravenous infusion bag or administration set.
- Do not enter a vial or bag/bottle with a used syringe or needle.
- Do not use medications packaged as single-use vials for more than one patient.
- Assign medications packaged as multi-use vials to a single patient whenever possible.
- Follow proper IPC practices during the preparation and administration of injectable medications.

Routine practices—Personal protective equipment

Personal protective equipment consists of barriers worn by HCWs to protect the patient from transmission of microorganisms and to protect the HCW from exposure to bloodborne and other microorganisms (e.g., sprays of blood, body fluids, respiratory tract or other secretions or excretions). Healthcare organizations are responsible for ensuring that HCWs have access to the PPE appropriate to the work and patient care being provided and have received training on its use (as described in the role of the organization; refer to Part A, Section III, B).

Healthcare workers should be fully knowledgeable of the application and limitations of the specific PPE available for their use and be able to determine what is needed by assessing the risk of exposure to blood, body fluids, secretions and excretions, mucous membranes and non-intact skin[22;219] during patient care interactions. The PCRA identifies hazards and enables the HCW to select PPE compatible with the hazard likely to be encountered during the patient care interaction. The selected PPE should maximize protection, with considerations for dexterity and comfort.

Performing a PCRA to determine whether PPE is necessary is also important to avoid over-reliance on PPE, misuse or waste. Over-reliance on PPE may result in a false sense of security. Misapplication or incorrect removal of PPE can result in inadvertent exposure of the HCW[334] or the patient to infectious agents or contamination of the patient's environment[335]. Wasting PPE can be avoided by maximizing the provision of clinical care during each entry into the patient's room.

The effectiveness of PPE is highly dependent on appropriate and proper use. Appropriate and proper use of PPE includes:

- point-of-care risk assessment to determine need for PPE

- using the correct technique for putting on and taking off PPE (refer to Appendix X)
- using the correct technique when wearing PPE (e.g., not to self-contaminate)
- discarding PPE into designated receptacles immediately after use, followed by hand hygiene

Routine practices—Gloves (refer also to Appendix IX)

The use of gloves is not a substitute for hand hygiene, but is an additional measure of protection. For routine practices, glove use is dependent on a PCRA of the patient, the environment and the interaction[336]. Gloves are used to reduce the transmission of microorganisms from one patient to another or from one body site to another, and to reduce the risk of exposure of HCWs to blood, body fluids, secretions and excretions, mucous membranes, draining wounds and non-intact skin and for handling items or touching surfaces visibly or potentially soiled[22;219;337;338]. Gloves do not completely eliminate hand contamination[337], as hands can become contaminated during the wearing of gloves through glove defects or during glove removal[339-341]. Therefore, hand hygiene is necessary after the removal of gloves. Use of gloves may provide a false sense of security, leading to decreased hand hygiene[336;342-345].

It is important to assess and select the most appropriate glove to be worn for the circumstances. Glove selection should include assessment of its durability during use, the rigor and duration of the procedures being performed, the potential for exposure to infectious microorganisms or other hazardous substances and, ultimately, the safety of the user (e.g., latex allergies)[346] Factors such as comfort and fit are also important considerations.

Nonsterile disposable medical gloves for routine patient care are made from nitrile, latex or vinyl[347]. Powdered latex gloves have been associated with latex allergy[348]. Latex-free alternatives must be used by persons with type I hypersensitivity to natural rubber and for care of patients with this type of latex allergy[346].

The barrier quality of medical examination gloves is influenced by glove material, production quality and stress during use[346;347]. Higher failure rates have been observed with vinyl gloves than with latex or nitrile gloves when tested under simulated and actual clinical conditions[340;341;346;347].

The integrity of latex gloves may be affected by the use of petroleum-based lotions or creams[349;350]. Some ABHRs may interact with powder remaining on HCWs hands following the removal of powdered gloves and produce gritty particles on the hands[339;341]. Gloving hands that have not yet dried following the use of an ABHR may result in significant increase in glove perforations[351].

Single-use gloves must never be washed with soap, chlorhexidine gluconate or alcohol for reuse, as washing affects their integrity and has not been shown to be effective in removing inoculated microorganisms[339;352;353].

The use of gloves to prevent the transmission of bloodborne pathogens is discussed in the PHAC IPC guideline *Prevention and Control of Occupational Infections in Health Care*[219].

Routine practices—Long-sleeved gowns and other apparel

Long-sleeved gowns are worn for routine practices, as indicated by the risk assessment, to protect uncovered skin and clothing during procedures and patient care activities likely to produce soiling or generate splashes or sprays of blood, body fluids, secretions or excretions[22;219]. Gowns should be cuffed and cover the front and back of the HCW from the neck to mid-thigh. Gowns include isolation gowns (reusable/disposable, fluid repellent or sterile). The type of gown selected is based on the:

- anticipated degree of contact with infectious material
- potential for blood and body fluid penetration of the gown (fluid repellence when heavy liquid contamination is anticipated, such as in the operating theatre and during dialysis)
- requirement for sterility (e.g., operating theatre, central line insertion)

There is no evidence that the routine use of gowns for all patient care is beneficial in the prevention of HAIs, even in high-risk units (e.g., neonatal intensive care unit, ICU, haematopoietic stem cell transplant unit, burn unit)[354-357]. Universal gown use has had no effect on HAI rates in neonatal[358;359] or paediatric ICUs[360], or on rates of neonatal colonization on postpartum wards[361;362].

In the laboratory setting, wearing of laboratory coats is considered PPE. Outside of the laboratory, apparel such as uniforms, laboratory coats and scrub suits may be worn by HCWs for purposes of comfort, convenience or identity, but do not have a role in the prevention of infection (i.e., they are not considered PPE). For aesthetic purposes and professional etiquette, HCW apparel and uniforms should be clean. The safety of home laundering HCWs uniforms has been investigated and no increase in infection rates has been detected[363].

Routine practices—Facial protection

Transmission of hepatitis C has been reported by blood splash into the conjunctiva[364;365] and HIV has been transmitted by splashes of blood onto the face[366]. A study to investigate the risk of contamination of radiologists' eyes during invasive vascular procedures determined 6.7% of procedures resulted in splashes[367]. Facial protection includes masks and eye protection, or face shields or masks with visor attachment. Eye protection may include masks with built-in eye protection, safety glasses or face shields. The need for facial protection during routine patient care is determined by the PCRA of the patient interaction and the task to be performed. Interactions involving activities likely to generate coughing, splashes or sprays of blood, body fluids, secretions or excretions, and procedures that potentially expose the mucous membranes of the eyes, nose or mouth warrant facial protection[22;219].

Masks include surgical or procedure masks; no specific mask has been shown to be superior to another for achieving facial protection. Masks have several uses: as a barrier to protect from sprays or splashes[22;219]; as a barrier for infectious sources[368;369]; as a barrier when performing aseptic/sterile procedures[331]; and as a barrier to protect susceptible hosts when within two metres of patients on droplet precautions[135;213;368-376].

Routine practices—Management of visitors

Visitation policies should be developed and implemented to balance the risk of transmission of infectious diseases and the promotion of patient and family-centered care[377]. Visitors have been documented to transmit various infections, including TB[66;378], pertussis[64], and respiratory viruses, in healthcare settings[46;67;379-383]. Exclusion of those with signs and symptoms of transmissible infections should reduce this risk. For essential visits, the visitor with an infection should be instructed on measures to take to reduce the risk of transmission (e.g., wear a mask for a respiratory tract infection, perform appropriate hand hygiene, remain in the patient's room, avoid public areas, avoid contact with other patients or with patient care equipment).

Additional precautions

Additional precautions are applied when the natural transmission characteristics of specific microorganisms (e.g., epidemiologically significant microorganisms including *C. difficile*, antibiotic-resistant microorganisms, viral gastroenteritis and emerging respiratory infections; refer to Appendix VI) or syndromes are not fully managed by routine practices. Additional precautions may be required when medical procedures artificially increase the risk of transmission of a specific microorganism or because of the clinical situation (e.g., care of a young child, incontinent adult or cognitively impaired individual). Additional precautions are specific to the care setting (e.g., acute care, ambulatory care, prehospital care, LTC, and home care). Additional precautions are conventionally divided into:

- contact precautions, for microorganisms of very low infective dose and/or situations where heavy contamination of the patient's environment is anticipated (refer to List 3)
- droplet precautions, for microorganisms transmitted by the large droplet route (refer to List 4)
- airborne precautions, for microorganisms transmitted over extended time and distance by small particles (refer to List 5)

Additional precautions—Implementing and discontinuing additional precautions

Additional precautions should be implemented as soon as disease or risk factors are suspected or identified. A confirmed diagnosis is not necessary for additional precautions to be applied.

The organization is responsible for:

- designating the personnel responsible on a day-to-day basis for implementing additional precautions
- specifying the notification processes once precautions have been initiated
- identifying the person responsible for modifying or discontinuing precautions
- identifying the person who has ultimate authority to make decisions regarding precautions, outbreak management and bed allocation

The HCW is responsible for:

- ensuring that appropriate additional precautions are taken for specific patients
- ensuring patients are not subjected to unnecessary additional precautions
- ensuring that precautions are reviewed daily, adjusted if indicated by new information and discontinued when no longer indicated

To minimize the transmission of microorganisms, patients should be assessed for evidence of infection or potential infections on admission (if an inpatient setting) or at the initial point of patient encounter and regularly throughout their stay, as per the PCRA. The results of the assessment should be communicated to other personnel providing care and be documented in the patient record. In situations where a patient has or is suspected of having a disease requiring additional precautions above and beyond routine practices, these precautions should be implemented as soon as indicated by triggering mechanisms such as diagnosis, symptoms of infection, laboratory information and assessment of risk factors. It is not necessary to wait for a specific diagnosis or microbiologic confirmation before initiating additional precautions when PCRA clearly indicates a clinical syndrome or risk factors related to a potentially transmissible infection.

All HCWs are responsible for complying with additional precautions (in addition to routine practices) and for tactfully calling infractions to the attention of offenders. Patients and visitors also have a responsibility to comply where indicated. Teaching the basic principles of routine practices and additional precautions is the responsibility of all HCWs.

Additional precautions—Accommodation

When availability of single rooms is limited, priorities for placement of patients in single rooms are determined by the PCRA. Priority for single rooms goes to patients:

- requiring additional precautions[292;299-302]
- identified as high risk for transmission of microorganisms[69] (e.g., stool incontinence[290;291;384], uncontained secretions)[48;385]
- identified as being at higher risk of acquisition and adverse outcomes resulting from transmission of microorganisms (e.g., immunosuppression[*379;386;387*], open wounds, indwelling catheters, anticipated prolonged length of stay*)*[*388*]
- requiring dependence on HCWs for activities of daily living[288]

Factors to be considered with shared rooms (when single rooms are not available) include:

- selecting appropriate roommates
- avoiding placing patients at high risk of complications, if they become infected, in rooms with patients with transmissible infections, diarrhea or open wounds
- delineating the boundary of the potentially contaminated patient area within the shared room
- preventing transmission risks from sharing of sinks and toilets
- assessing activities of the roommates and their visitors

Assignment of patients known to be infected with the same microorganisms to the same room (cohorting), or assignment of infected and non-infected patients in separate wards or areas has been successful in controlling transmission of some microorganisms[285;389-394]. The benefit of using cohorting for managing ARO outbreaks, including MRSA[47;390] and VRE[395-397], Gram-negative-resistant organisms[53;398] and outbreaks due to other infectious agents[399-401], is difficult to determine, as multiple other control measure were implemented during these published outbreaks.

Additional precautions—Accommodation—Airborne infection isolation rooms

Airborne infection isolation rooms (AIIRs) with negative pressure ventilation (i.e., with air flow from the outside corridor into a room through the doorway and exiting directly to the exterior of the building or filtered before recirculation) are designed for patients suspected or confirmed to have an infection transmitted by the airborne route including:

- measles
- respiratory (including pleuropulmonary or laryngeal) TB
- smallpox, monkeypox
- varicella (chickenpox)
- disseminated zoster

An AIIR should also be used for performing AGMPs on patients with TB, SARS, viral hemorrhagic fever and respiratory infection with an emerging pathogen for which transmission routes are not yet fully known (refer to Appendix VI, item 4).

In settings where AIIRs are limited, patients with proven or suspected infectious respiratory TB have priority. For measles, varicella and disseminated zoster, risk of transmission may be assessed in relation to the presence of non-immune patients or HCWs. Non-immune HCWs should not work with patients with measles, varicella or disseminated zoster. Non-immune patients should not share rooms with patients with measles, varicella or zoster.

When AIIRs are not available, the patient should be temporarily housed in a single room with the door closed, away from high-risk patients. Patients should be transferred as soon as medically feasible to a facility with AIIRs.

- Prehospital care: Patients should wear a mask and be transported separately. When transporting multiple patients, the risk of transmission should be considered as noted above and control measures applied (e.g., personnel in the ambulance should be limited to those medically necessary; if possible, a window in ambulance should be open; if possible, the window between the driver and the patient area of the ambulance should be closed).
- Ambulatory care: Patients should defer their appointment if possible or enter through a separate entrance. Upon arrival, patients should be asked to wear a mask, perform hand hygiene and be moved to an examining room with the door closed as soon as possible.
- Home care settings: Family members who have not been exposed or are not immune should avoid sharing airspace with the patient. Natural ventilation (e.g., open windows) will help disperse the microorganisms from the room.

Additional precautions—Patient flow

When additional precautions are necessary, patients should leave their rooms for medically necessary purposes only. Communication between the transporting area and the receiving area is important to ensure consistency of precautions and to decrease unnecessary waiting time in public areas. Source control measures (e.g., requesting that the patient perform hand hygiene before leaving their room, cover skin lesions, wear a mask) should be applied.

Additional precautions—Personal protective equipment—Gloves

Gloves are used for all care of patients on contact precautions. When worn appropriately, evidence has confirmed the effectiveness of gloves in preventing contamination of HCWs' hands, thereby reducing the potential transfer of microorganisms from colonized or infected patients to HCWs and from patient to patient via HCWs' hands[130;337;342;402;403]. A prospective controlled trial of vinyl gloves to prevent the transmission of *C. difficile* demonstrated a significant decrease in the incidence of *C. difficile*–associated disease during a 6-month intervention period[338]. In one study, an outbreak of MRSA was controlled with the use of gloves for all contact with patients and their immediate environment[404].

Gloves become contaminated during use and, if used inappropriately, can result in transmission of microorganisms[98;343;345;405;406]. Transmission of *C. difficile*[86], MRSA and *Acinetobacter* spp.[407] has been associated with failure to change gloves between patients. Failing to change gloves between care activities and procedures with the same patient after contact with materials that may contain high concentrations of microorganisms (e.g.,

after handling an indwelling urinary catheter[408], or suctioning an endotracheal tube)[407] may result in contamination of clean body sites or the patient's environment[86].

Additional precautions—Personal protective equipment—Long-sleeved gowns

The benefits of using gowns as a control measure to prevent transmission is difficult to determine, as the use of gowns and multiple interventions (e.g., gloves, increased emphasis on hand hygiene, isolation/cohorting) are often implemented concurrently and the individual benefits of these measures could not be identified[403;409].

Gowns are used for contact precautions if direct contact of clothing with the patient or with contaminated environmental surfaces is anticipated. Although gowns may become contaminated with potential pathogens after caring for an infected or colonized patient (e.g., MRSA[70], VRE[98] and *C. difficile*[119]) there is no evidence that gowns have been involved in the transmission of these pathogens to others.

Additional precautions—Personal protective equipment—Facial protection

Facial protection includes masks and eye protection, or face shields or masks with visor attachment. Facial protection should be worn when within two metres of a coughing/sneezing patient with a suspected or confirmed transmissible respiratory infection[216;219].

The eye is an important portal of entry for some pathogens. Pathogens may be introduced into the eye directly via respiratory droplets generated during coughing or suctioning, or by self-inoculation if the eyes are touched with contaminated fingers[48]. Wearing eye protection during all care of children with RSV has been shown to reduce the acquisition of this infection by HCWs[410;411], probably by preventing hand-to-eye contact.

Additional precautions—Personal protective equipment—Respiratory protection

Respiratory protection from airborne infection includes the use of a respirator (refer to Appendix V, glossary) to prevent inhalation of airborne microorganisms[233]. Respiratory protection may be necessary as a component of airborne precautions or a recommendation for performing AGMPs on certain patients. The use of a respirator or the need for airborne precautions is determined by a PCRA. Factors to be considered are the specific infectious agent, known or suspected infection status of the patient involved, the patient care activity to be performed, the immune status of the HCW and the patient's ability to perform respiratory hygiene (refer to Part A, Section III, B, 3).

Additional precautions—Management of visitors

Visitors should not have conditions that put them at risk for serious diseases if they acquire the patient's infection (e.g., a visitor with chronic lung disease could acquire a respiratory virus or a non-immune visitor could acquire varicella), and should comply with necessary precautions to prevent indirect transmission to other patients (e.g., hand hygiene, no sharing of personal items).

Generally, visitors should have access to the same PPE as staff when providing direct patient care. Evidence to support the use of PPE by visitors is lacking. The following should be considered when requesting that visitors wear PPE:

- Personal protective equipment may not be necessary if they have likely been exposed to the infection preadmission.
- Personal protective equipment may be appropriate for visitors who visit multiple patients in the facility. If used by visitors, the PPE should be changed before visiting a different patient.

Additional precautions—Epidemiologically significant organisms requiring additional precautions include the following diseases/conditions (refer also to Appendix VI)

- C. difficile
- certain AROs
- viral gastroenteritis
- emerging respiratory infections

Part B: Recommendations for routine practices and additional precautions

Please note that the rating of these recommendations differ from those used in previous PHAC IPC guidelines (refer to Appendix II and Appendix III for further information).

I. Role of organization

A major responsibility of any healthcare organization is to minimize the risk of exposure to and transmission of infections within healthcare settings. The following should form the basis of policies, procedures and programs to achieve this responsibility, should be consistent across the organization, and be in compliance with current regulations.

1. Sufficient expert human resources (e.g., hospital epidemiologist, infection control professional(s), clerical staff) and sufficient financial resources to ensure an effective infection prevention and control program appropriate to the organization's mandate should be provided according to current publications[27;34;412-418]. [BII]
2. A comprehensive occupational health program that includes, but is not limited to, ensuring healthcare worker immunity to vaccine-preventable diseases (including annual influenza immunization), tuberculosis screening, provision of a respiratory protection program, sharps safety and prevention of exposure to bloodborne pathogens, management of ill healthcare workers and of healthcare workers exposed to communicable infections should be developed and implemented according to current publications[219;221;223;233;419-424]. [CII]
3. Ongoing organizational risk assessment should be performed to evaluate the workplace risk of exposure to microorganisms[202]. The organizational risk assessment should include, but is not limited to, facility healthcare design, renovation and construction; ventilation specifications; source control; occupational health; education of healthcare workers; cleaning, disinfection and sterilization of reusable patient care equipment; environmental cleaning; and management of waste and linen. Regular audits of the application of routine practices and additional precautions should be performed. [CII]
4. Hand hygiene recommendations[217] should be implemented and promoted. Multi-modal strategies (e.g., administrative support, role models, education, audit and feedback, patient/family involvement) should be used to improve adherence to hand hygiene. Alcohol-based hand rub should be used as the preferred method of hand

hygiene at the point-of-care and at other locations, unless exceptions apply (i.e., when hands are visibly soiled with organic material, if exposure to norovirus and potential spore-forming pathogens such as *Clostridium difficile* is strongly suspected or proven, including outbreaks involving these organisms), as indicated in the PHAC infection prevention and control guideline *Hand Hygiene Practices in Healthcare Settings.* [AI]

5. Point-of-care risk assessment prior to every patient interaction should be promoted as an organizational priority and expectation of all healthcare workers. [CII]
6. Policies and procedures should be developed and implemented for the application of routine practices for the care of all patients at all times in all healthcare settings and for additional precautions, including outbreak recognition, reporting and management, when indicated. [CII]
7. Adherence to aseptic technique should be promoted for invasive procedures, including, but not limited to, insertion of central lines, handling of intravenous systems, spinal procedures, and safe injection practices (including the use of multidose vials)[228;318-320;332;425-427]. [AI]
8. Policies and procedures should be developed and implemented for preventing the transmission of Creutzfeldt-Jakob disease, as outlined in relevant publications[248-250]. [CII]
9. Policies and procedures should be developed and implemented to ensure that patients colonized or infected with antibiotic-resistant microorganisms or other infectious agents are not denied appropriate care. [CII]
10. Personal protective equipment appropriate to the care setting should be available and sufficient supplies should be located in convenient and accessible areas. The selected personal protective equipment should maximize protection, dexterity and comfort[219]. [Regulation]
11. Policies and procedures should be developed and implemented to reduce latex exposure in healthcare workers and patients[348;428]. [CI]
12. Infection control professionals should be actively involved when designing newly constructed healthcare facilities or renovations to existing healthcare facilities[197;198;201-203]. [CI]
13. Facility design should follow the most current infection prevention and control specifications, as outlined by the Canadian Standards Association and/or the Facility Guidelines Institutes[198;199;201;202], including, but not limited to:
    i. Single rooms for the routine care of inpatients (with in-room private toilets, designated patient sinks, alcohol-based hand rub dispensers and designated staff handwashing sinks[201;202;288-302]). [BII]
    ii. Appropriate number and location of airborne infection isolation rooms (including critical care units, inpatient units, dialysis units, emergency

departments and ambulatory care clinics), according to the organizational risk assessment. [CII]

iii. Appropriate ventilation specifications (refer to items 14 and 15, below). [CII]

iv. Appropriate spatial separation and spacing specifications in clinical and waiting areas, including nurseries[429]. [CII]

v. Appropriate number and placement of hand hygiene product dispensers and designated handwashing sinks[217]. [AII]

vi. Selecting surfaces that are easy to clean[202]. [CII]

14. Ventilation systems should be maintained and operated as per the ventilation system's manufacturer and in accordance with current publications, including, but not limited to, a monitoring schedule for airborne infection isolation rooms (e.g., air changes per hour, pressure differentials and filtration efficiencies) and establishing an action plan to review and, where necessary, upgrade the ventilation systems of facilities to meet specifications[146;147]. [CII]

15. Airborne infection isolation rooms, bronchoscopy suites and rooms used for sputum induction should be designed and maintained according to the most current infection prevention and control specifications[146;147]. [CII]

i. Inward directional airflow from adjacent spaces to the room.

ii. Ideally, directional airflow within the room such that clean supply of air flows first to parts of the room where healthcare workers or visitors are likely to be present, and then flows across the infection source (i.e., patient area) to the exhaust.

iii. Non-aspirating diffusers (i.e., terminal devices that distribute conditioned air throughout a space and deliver air into a space in such a manner that room air is not mixed due to high velocity jets).

iv. Low-level exhaust near the head of the patient bed.

v. Air exhausted to the outdoors or use of a high-efficiency particulate air filter prior to recirculation; high-efficiency particulate air filtration of exhaust in cases where exhaust air is not discharged clear of building openings or where a risk of recirculation exists.

vi. Alarm indicating that the pressure relationship is not being maintained provided just outside the room and at the station or point of supervision.

vii. Monitoring of supply and exhaust system function.

viii. Exhaust fan supplied by emergency power.

ix. Washrooms connected to an airborne infection isolation room should be exhausted using the same exhaust system as the room itself.

x. Rooms are well sealed.

16. The air from both the anteroom and the patient room should be exhausted to the outdoors or filtered through a high-efficiency particulate air filter if an anteroom is

used[146]. (Note: An anteroom may assist in maintaining inward directional air flow but is not essential if the pressure differential is adequate). [CII]

17. Strategies to prevent overcapacity (i.e., providing care for more patients than current bed infrastructure normally permits) should be developed and implemented. If overcapacity is unavoidable for short periods, consideration should be given to appropriate triage of patients and choosing locations for overcapacity patient care areas that have convenient access to alcohol-based hand rub dispensers and appropriate personal protective equipment[218]. [CII]
18. Adequate resources should be provided to develop, implement and maintain a source control program[430] for the management of potentially infectious persons, including, but not limited to:
    - signage at initial points of patient encounter (e.g., entrances to hospitals, ambulatory care and LTC settings, reception areas in outpatient settings)
    - physical barriers at triage in emergency departments and acute assessment settings
    - spatial separation
    - respiratory hygiene (providing masks, tissues, hand hygiene products, designated handwashing sinks and no-touch waste receptacles)
    - airborne infection isolation rooms
    - strategies to reduce production of aerosols during aerosol-generating medical procedures[148]. [CI]
19. Systems should be developed, implemented and maintained to screen visitors who are not immune to chickenpox or measles and who visit defined high-risk populations (e.g., neonatal intensive care units, infants less than one year old, oncology patients, other severely immunocompromised patients) for recent contact with these and other transmissible infections[48;65;379]. [CII]
20. Infection control professionals should be actively involved in the selection of new patient care equipment and devices that require cleaning, disinfection and/or sterilization. [CII]
21. Standards for cleaning, disinfection and sterilization of reusable patient care equipment should be established, maintained and audited, as outlined in the most current published guidelines[239;241-245;248-250;431] or as regulated in some jurisdictions. Disposable single-use semi-critical devices should be provided when access to appropriate reprocessing is not available. [CII]
22. A process for evaluation and management of actual and potential disinfection and sterilization failures should be developed and implemented for disinfection and sterilization processes[432]. [CII]

23. Policies and procedures should be developed and implemented for routine scheduled environmental cleaning, including procedures for assigning responsibility and accountability for cleaning, as indicated by the level of patient contact and degree of soiling, including event-related cleaning of environmental surfaces and increased cleaning, as per additional precautions[239]. [CII]
24. Education and training programs should be developed and implemented for those responsible for environmental cleaning. Evaluation of policies, procedures and practices, including audits, should be performed to determine effectiveness of environmental cleaning[261;262;433]. [BII]
25. Policies and procedures, including assigning responsibility, should be developed and implemented for cleaning and disinfection of all non-critical patient care items that are moved in and out of patient care areas (e.g., mobile devices, multi-use electronics, intravenous poles, toys and electronic games)[93;105-110;434]. [BII]
26. Detergent disinfectants with a Drug Identification Number (DIN) that have microbiocidal (i.e., killing) activity against the pathogens most likely to contaminate the patient care environment should be used. The infection prevention and control program should approve the products purchased. The product should be used in accordance with manufacturer's instructions. [Regulated]
27. Standards for laundry should be developed and implemented as outlined in the most current publications[72]. If laundry chutes are used, they should be properly designed, maintained and used in a manner to minimize dispersion of aerosols from contaminated laundry (e.g., securely bagged)[72;201;202]. [CII]
28. Standards for waste management should be developed and implemented as outlined in the most current publications[72;275]. [CII]
29. Municipal or regional regulations and/or bylaws should be followed when developing and implementing treatment and disposal policies for biologic waste, including sharps[275]. [Regulated]
30. Policies and procedures should be developed and implemented for the safe delivery of any facility's pet therapy program[71;72]. [CII]

II. Role of healthcare workers

Healthcare workers have a responsibility to minimize the risk of exposure to and transmission of microorganisms within healthcare settings.

The following recommendations are applicable to all healthcare workers in all healthcare settings.

1. A point-of-care risk assessment before each patient interaction should be performed to determine the appropriate routine practices and additional precautions for safe patient care. Healthcare workers should have sufficient knowledge, skills and resources to perform a point-of-care risk assessment, taking into consideration the level of care they are providing, their level of education and their specific job/responsibilities. [CII]
2. Alcohol-based hand rub at the point-of-care should be used as the preferred method of hand hygiene to prevent the transmission of microorganisms in the healthcare setting unless exceptions apply (i.e., when hands are visibly soiled with organic material, if exposure to norovirus and potential spore-forming pathogens such as *Clostridium difficile* is strongly suspected or proven, including outbreaks involving these organisms)[217]. [AI]
3. Routine practices should be followed during the care of all patients at all times in all settings (refer to Part B Section III).
4. Aseptic technique (refer to Part B, Section III, 6), when indicated by the point-of-care risk assessment, should be followed along with routine practices. [Ratings as per Part B, Section III, 6]
5. Additional precautions (refer to Part B, Section IV), when indicated by the point-of-care risk assessment, should be followed along with routine practices. [CII]
6. The healthcare organization's policies and procedures related to routine practices and additional precautions that should be followed and who to contact for questions and concerns related to infection prevention and control should be known. [CII]
7. The applications, advantages and limitations of the personal protective equipment available within the organization/facility should be known. [CII]
8. Education should be provided to patients, their families and visitors regarding respiratory hygiene, hand hygiene and, when necessary, the reason for precautions necessary for their care. [CII]
9. The medical, psychological and safety needs of patients on additional precautions should be met[35;36;38;39;435;436]. [BII]
10. Pre-placement immunization recommendations/screening for vaccine-preventable infections, including hepatitis B, measles, mumps, rubella, pertussis, varicella, tetanus, diphtheria and annual influenza, should be followed unless valid medical contraindications exist[219;419]. Healthcare workers should be aware of their immune

status. Organizational tuberculosis protocols related to the assessment of healthcare workers' tuberculosis status should be followed[219;437]. [CII]

11. Policies and procedures related to the organization's respiratory protection program should be adhered to[233]. [CII]
12. Healthcare workers should stay away from work when infectious with a communicable disease, including, but not limited to, acute conjunctivitis, acute respiratory infection, gastroenteritis with vomiting or diarrhea, varicella, extensive zoster that cannot be kept covered, open infected skin lesions or herpetic skin lesions on the hands. The immediate supervisor/occupational health should be informed if the healthcare worker worked when symptomatic/infectious[219]. [CII]
13. Notification should be provided to occupational health services or delegate about personal infections that may be a risk to others[219]. [CII]
14. Potential occupational exposures to communicable infections should be reported to immediate supervisor and occupational health services or delegate[219]. [CII]
15. Policies and procedures should be followed regarding management of exposures to communicable infections (e.g., percutaneous or mucosal exposures to blood, body fluids, pulmonary tuberculosis, varicella)[219]. [CII]
16. Clusters of similar illnesses (i.e., occurring in the same time or place) in patients and/or healthcare workers should be reported to a supervisor and occupational health services or delegate as appropriate. [CII]
17. Policies and procedures should be followed for containing, transporting and handling used patient care equipment, medical instruments and devices, including, but not limited to, wearing personal protective equipment when handling used items if indicated by the point-of-care risk assessment[241]. [CII]
18. Non-critical patient care equipment and other items such as toys and electronic games should be identified and appropriately cleaned and disinfected before use with another patient[239;438]. [CII]
19. Personal care items (e.g., tissues, lotions, soaps, razors) and disposable equipment, such as containers used for blood collection or tourniquets left in the room following transfer and prior to discharge, or terminal cleaning should be discarded. [CII]
20. Single patient medications, such as multidose inhalers, sprays, topical anesthetics and other topical agents used on the skin, eye or other mucous membranes should be used only on one patient. [CII]
21. Taking the patient care record/chart into the patient room, or the cubicle or the designated bedspace in a shared room should be avoided[121]. Hand hygiene should be performed before and after handling the record/chart. [CI]
22. Semi-critical and critical items that need reprocessing (i.e., cleaning, disinfection, and/or sterilization) should be identified and not used until appropriately reprocessed[239;438]. [CII]

23. Eating or drinking should not occur in areas where direct patient care is provided or in reprocessing or laboratory areas[439-442]. [BII]

III. Recommendations for routine practices in all healthcare Settings

The recommendations that follow are for all healthcare settings unless otherwise stated.

1. Point-of-care risk assessment

a. Before each patient interaction, a point-of-care risk assessment should be performed to determine the appropriate routine practices for safe patient care. [CII]

2. Hand hygiene

a. Recommendations outlined in the PHAC infection prevention and control guideline *Hand Hygiene Practices in Healthcare Settings*[217] and specified by Accreditation Canada[418] should be followed.

3. Source control

The following source control measures should be applied[148;430]:

a. Triage

i. Emergency departments and acute assessment settings [CI]

- Signs to direct patients with symptoms of acute infection (e.g., cough, fever, vomiting, diarrhea, coryza, rash, conjunctivitis) should be posted in specific waiting areas.
- A physical barrier (e.g., plastic partition at triage desk) should be located between infectious sources (e.g., patients with symptoms of a respiratory infection) and susceptible hosts.
- Patients with respiratory infections should be placed directly into an examining room or an airborne infection isolation room, as indicated by the respiratory infection suspected.
- Patients with an acute diarrheal illness should be placed into a single examining room with dedicated toilet or commode whenever possible and as soon as possible.

ii. Community or outpatient settings

- When scheduling appointments for routine clinic visits, patients with symptoms of an acute infection should be identified and asked that, if possible, they defer routine clinic visits until symptoms of the acute infection have subsided.
- Patients who cannot defer their routine clinic visit (i.e., those who need assessment of symptoms/condition) should be informed to follow hand hygiene and/or respiratory hygiene recommendations as indicated by their symptoms. These patients should be directed into an examining room as soon as they arrive and/or schedule their appointment for a time when other patients are not present.
- Signs at the entrance to the clinic reminding symptomatic patients to perform hand hygiene and/or respiratory hygiene as indicated by their symptoms should be posted. [CI]

b. Early diagnosis and treatment

i. Symptomatic patients should be assessed in a timely manner and for any potential communicable infection (e.g., tuberculosis, norovirus, respiratory syncytial virus, pertussis)[65;138;210]. [CII]

c. Respiratory hygiene

i. Respiratory hygiene should be encouraged for patients and accompanying individuals who have signs and symptoms of an acute respiratory infection, beginning at the point of initial encounter in any healthcare setting (e.g., prehospital, triage, reception and waiting areas in emergency departments, outpatient clinics and physician's offices). Respiratory hygiene should include[216;368;369;376;443]:

- using tissues to contain respiratory secretions to cover the mouth and nose during coughing or sneezing, with prompt disposal into a no-touch waste receptacle
- covering the mouth and nose during coughing or sneezing against a sleeve/shoulder if a tissue is not available.
- wearing a mask when coughing or sneezing
- turning the head away from others when coughing or sneezing
- maintaining a spatial separation of two metres between patients symptomatic with an acute respiratory infection (manifested by new cough, shortness of breath and fever) and those who do not have symptoms of a respiratory infection. [BII]

d. Spatial separation

    i. A minimum two metre separation[122-124] should be maintained between patients who may have a respiratory infection and are symptomatic with a cough, fever or shortness of breath and those who do not have symptoms. [CII]

e. Strategies to reduce risk from aerosol generation of microorganisms [BII]

    i. Patients should be assessed for signs or symptoms of suspected or confirmed tuberculosis, severe acute respiratory syndrome or respiratory infection with an emerging pathogen for which the transmission characteristics are not yet known prior to performing an aerosol-generating medical procedure.

    ii. Strategies should be applied to reduce the level of aerosol generation, as listed in Part B, Section IV, subsection iii, 1b, for aerosol-generating medical procedures performed on patients with signs and symptoms of suspected or confirmed tuberculosis, severe acute respiratory syndrome or respiratory infection with an emerging pathogen for which the transmission characteristics are not yet known[150-156]. Strategies to reduce aerosol generation should also be implemented when aerosol-generating medical procedures are necessary on patients with viral hemorrhagic fevers[161].

    iii. Routine practices are sufficient for aerosol-generating medical procedures performed on patients with no signs or symptoms of suspected or confirmed tuberculosis, severe acute respiratory syndrome or respiratory infection with an emerging pathogen for which the transmission characteristics are not yet known.

4. Patient placement and accommodation

a. Options should be determined for patient placement and room sharing if single rooms are limited, as per the point-of-care risk assessment, based on: [BII]

    i. presence or absence of known or suspected infection (i.e., need for additional precautions)[201;202;289-295;297-302].

    ii. route(s) of transmission of the known or suspected infectious agents:

        - contact (single room is preferred)
        - droplet (single room is preferred)
        - airborne (airborne infection isolation room needed)

    iii. risk factors for transmission from the infected patient.

    iv. susceptibility of other patients in the room to adverse outcome from a healthcare-associated infection.

v. patient options for room sharing (e.g., cohorting patients infected with the same microorganism).
vi. ability of patient, roommate(s) and visitors to comply with infection prevention and control measures.

b. Patients should be prioritized for single room placement according to the potential for transmission of microorganisms[202;291;292;294;295;297-300]. The following patients should be given priority (in descending order)[289;291;293;301;302]: [BII]

i. patients on additional precautions:
- airborne (airborne infection isolation room needed)
- contact (single room is preferred)
- droplet (single room is preferred)

ii. patients who visibly soil the environment or who cannot maintain appropriate hygiene, including respiratory hygiene.
iii. patients with uncontained secretions or excretions.
iv. patients with wound drainage that cannot be contained by a dressing.
v. patients with fecal incontinence if stools cannot be contained in incontinent products or infant diapers.

In prehospital settings:

i. single patient transport is preferred.
ii. if multipatient transport is necessary, consider item b (i to v), above, to determine priority for single patient transport.

5. Patient flow

a. Transfer of patients within and between facilities should be avoided unless medically indicated. [CII]

6. Aseptic technique

a. Aseptic technique should be used when performing invasive procedures and handling injectable products. Aseptic technique generally includes[172;332;425;444]:

i. performing hand hygiene, preferably with alcohol-based hand rub prior to opening supplies[217]. [AI]
ii. performing hand hygiene with antimicrobial soap and water for invasive procedures (e.g., placing central intravascular catheters, placing catheters or injecting into the spinal canal or subdural spaces) when alcohol-based hand rub is not accessible[217;312;425;445-451]. [AI]
iii. opening tray and supplies only when ready to use to ensure a sterile field. [CII]

iv. performing hand hygiene prior to putting on single-use clean gloves, sterile gloves, sterile gown or mask, as indicated by the specific procedure[217]. [AI]

v. preparing the patient's skin with an appropriate antiseptic before performing an invasive procedure[312;313;425]. [AI]

vi. using the appropriate size drape, when a drape is needed, to maintain a sterile field. [CII]

vii. not administering medications or solutions from single-dose vials, ampules or syringes to multiple patients and not combining leftover contents for later use. [BII]

viii. using single-dose medication vials, prefilled syringes and ampules in clinical settings. If the product is only available as multi-dose vial, refer to item b, below. [BII]

ix. disinfecting the stoppers or injection ports of medication vials, infusion bags, etc., with alcohol before entering the port, vial or bag. [BII]

x. using a sterile, single-use disposable needle and syringe for each medication/fluid withdrawal from vials or ampules. [BII]

b. When a product is only available for purchase in multi-dose vials adhere to the following[167;168;170-173;332;333;452]:

i. the multi-dose vial should be restricted to single patient use whenever possible.

ii. syringes from multi-dose vials should be prepared from a centralized medication preparation area (e.g., do not take multi-dose vials to the patient bedside).

iii. the multi-dose vial should be stored in such a way as to restrict access (e.g., in a secure location away from the patient bedside or in a medication room or locked cart).

iv. a sterile single-use needle and syringe should be used each time the multi-dose vial is entered.

v. re-entering the multi-dose vial with a previously used needle or syringe should not be done.

vi. the multi-dose vial should be stored in accordance with manufacturer's recommendations.

vii. the multi-dose vial should be labeled with the date of first opening.

viii. the multi-dose vial should be discarded according to manufacturer's expiry date or organizational policy, whichever time is shorter.

ix. the multi-dose vial should be inspected for clouding or particulate contamination prior to each use and should be discarded if clouding or particulate contamination is present.

x. the multi-dose vial should be discarded if sterility or product integrity is compromised. [BII]

c. Single patient multi-use devices (e.g., glucose sampling devices, fingerstick capillary blood sampling devices) should be used for only one patient[92;131;132]. If not feasible to assign glucometers to individual patients, they should be cleaned and disinfected before use with another patient[332]. [CI]

d. Aseptic technique (as outlined in Part B, Section III, 6a) should be used, and should include the use of a mask and sterile gloves when placing a catheter or injecting material into the spinal canal or subdural space (e.g., during lumbar puncture, myelogram or spinal or epidural anesthesia)[322;326;327;329-331;453;454]. [BII]

e. Aseptic technique should be adhered to for storage, assembly and handling components of intravenous delivery systems[169;171;174;228;455]. [BII]

   i. Intravenous bags, tubing and connectors should be used for one patient only and disposed of appropriately after use.

   ii. A syringe, needle or cannula should be considered contaminated once it has been used to enter or connect to one patient's intravenous infusion bag or administration set and should not be reused.

   iii. Sterile components should not be assembled until time of need, with the exception of the emergency department, operating room, intensive care unit, and prehospital settings where it may be essential to maintain one system primed and ready for emergency use. The primed system should be stored in a clean and dry area, secure from tampering, and labeled with the date of priming. The primed system should be replaced if not used within 24 hours.

   iv. Sterile intravenous equipment components should be stored in a clean, dry and secure environment.

f. Maximal aseptic barriers (as outlined in Part B, Section III, 6a) that include a cap, mask, long-sleeved sterile surgical gown, sterile gloves and a large full body sterile drape[228;319;320;427] and skin preparation with chlorhexidine in alcohol or an equally effective alternative should be used for inserting central venous catheters and pulmonary arterial catheters[228;314-317]. [AI]

g. When inserting peripheral venous catheters or peripheral arterial lines, at a minimum, hand hygiene should be performed, the skin should be prepared with an antiseptic and clean disposable gloves should be worn[217;312;313]. [AII]

h. Skin antisepsis and single-use disposable needles should be used for acupuncture[456] and for the use of items such as lancets and blood sampling devices. [AII]

7. Use of personal protective equipment

The technique for putting on and taking off personal protective equipment, as outlined in Appendix X, should be followed[216;219;372].

a. Gloves (clean, single-use, non-sterile) [CII]

i. Gloves should not be a substitute for other elements of hand hygiene. [CII]

ii. Gloves are not required for routine patient care activities in which contact is limited to a patient's intact skin; gloves should be worn for routine patient care as determined by the point-of-care risk assessment. [CII]

iii. Gloves should be worn as determined by the point-of-care risk assessment[337;338;457]:

- for anticipated contact with blood, body fluids, secretions and excretions, mucous membranes, draining wounds or non-intact skin (including skin lesions or rash)
- for handling items or touching surfaces visibly or potentially soiled with blood, body fluids, secretions or excretions
- while providing direct care if the healthcare worker has an open cut or abrasions on the hands

Appropriate glove use:

- Hand hygiene should be performed prior to putting on gloves for tasks requiring clean, aseptic or sterile technique[130;402;408;450;458;459]. [AI]
- Gloves should be put on directly before contact with the patient or just before the task or procedure requiring gloves. [CII]
- Gloves with fit and durability appropriate to the task (refer to Appendix IX) should be worn. Use of powder-free gloves is preferred[347;460;461]. [CII]
- Disposable medical examination gloves or reusable utility gloves should be worn for cleaning the environment or cleaning and disinfecting patient care equipment. [CII]
- Gloves should be removed and hand hygiene performed immediately after patient care activities that involve contact with materials that may contain microorganisms (e.g., after contact with mucous membranes, after handling an indwelling urinary catheter, after open suctioning an endotracheal tube or changing a dressing), before continuing care of that patient[98;343;345;405-407]. If gloves are still indicated, they should be replaced with a clean pair. [AII]
- Gloves should be removed and discarded into a no-touch waste receptacle immediately following their intended use. Single-use gloves should not be reused, cleaned with alcohol-based hand rub or washed[339;353]. [BII]
- Hand hygiene should be performed following the removal of gloves, before leaving the patient's environment and before touching clean environmental surfaces[337;340;347;402;406;457]. [AI]

b. Long-sleeved gowns

i. Routine wearing of gowns to enter high-risk units (e.g., burn unit, intensive care unit, neonatal intensive care unit, hematopoietic stem cell unit) is not required[354;356-359]. [BI]

ii. Long-sleeved cuffed gowns should be worn as determined by the point-of-care risk assessment[70;98]; gowns should be cuffed and cover the front and back of the healthcare worker, from the neck to mid-thigh. [CI]

iii. The type of gown to be worn should be based on:

- anticipated degree of contact with infectious material
- potential for blood and body fluid penetration of the gown (fluid repellence when heavy liquid contamination is anticipated (e.g., operating theatre, dialysis)
- requirement for sterility (e.g., operating theatre, central line insertion) [CI]

iv. Organizational policy should be followed regarding the laundering of scrub suits and uniforms supplied by the organization[363;462]. [CII]

Appropriate gown use: [CI]

- Hand hygiene should be performed before gowning.
- The gown should be long enough to cover the front and back of the healthcare worker, from the neck to mid-thigh, and the sleeves no shorter than just above the wrist.
- The gown should be put on with the opening at the back and edges overlapping, covering as much clothing as possible.
- The cuffs of the gown should be covered by gloves.
- The gown should be tied at the neck and then at the waist.
- The gown should be removed by undoing the neck and then the waist ties, without touching the clothing or agitating the gown unnecessarily, then turned inside on itself and rolled up.
- The gown should be removed immediately after the indication for use and placed in a no-touch receptacle, followed by hand hygiene before leaving the patient's environment[70;98].
- Wet gowns should be removed immediately to prevent a wicking action, which facilitates the passage of microorganisms through the fabric.
- Gowns should not be reused once removed, even for repeated contacts with the same patient.
- The same gown should not be worn between successive patients.

c. Facial protection

i. Healthcare workers should be educated to avoid touching their faces with their hands during patient care[126;463]. [CII]

ii. Facial protection (i.e., masks and eye protection, or face shields or masks with visor attachment) should be worn as determined by the point-of-care risk assessment[135;365;367;371;410;411]:

- to protect the mucous membranes of the eyes, nose and mouth during procedures and patient care activities likely to generate splashes or sprays of blood, body fluids, secretions or excretions, including respiratory secretions [BII]

iii. Disposable eye protection or face shields should be worn only once to avoid self-contamination, and should not be positioned on the head or around the neck for later use. [CII]

iv. Eye protection or face shields should be removed immediately after use and placed promptly into a no-touch receptacle followed by hand hygiene. [CII]

v. If eye protection or face shields are reusable, they should be cleaned and disinfected as per organizational policy before reuse. [CII]

vi. Eye protection should be worn over prescription glasses, as prescription glasses are not adequate eye protection. [CII]

Appropriate use of facial protection:

- Hand hygiene should be performed prior to putting facial protection on. [CII]
- Facial protection should be worn as instructed by manufacturer.
- Facial protection should be worn and discarded appropriately to prevent self-contamination.
- Nose, mouth and chin should be covered when wearing a mask.
- Self-contamination should be avoided during use and disposal by not touching facial protection on its external surface.
- Facial protection should be removed carefully by the straps or ties.
- Facial protection should be discarded immediately after the intended use into a no-touch receptacle (i.e., as soon as removed from the face) followed by hand hygiene.
- Masks should not be dangled around the neck when not in use, and should not be reused.
- The mask should be changed if it becomes wet or soiled (from the wearer's breathing or an external splash).
- The mask should be changed if breathing becomes difficult.
- In cohort settings, facial protection may be worn for the care of successive patients.

8. Sharps safety and prevention of exposure to bloodborne pathogens

a. Provincial/territorial regulations should be followed regarding the use of safety-engineered sharp devices. [Regulated]

b. Safety-engineered sharp devices should be used wherever possible and the safety of patients and healthcare workers should be considered when selecting safety-engineered sharp devices[224;225;229;231]. [BII]

c. Needles should not be recapped; used needles and other used single-use sharp items should be disposed of immediately into designated puncture-resistant containers that are easily accessible at the point-of-care[219]. [CII]

d. Healthcare workers should cover open skin areas/lesions on hands or forearms with a dry dressing at all times while at work and should consult occupational health or designate if adherence to hand hygiene recommendations are impeded by the dressing[219]. [CII]

e. Eyes, nose and mouth should be protected using facial protection when splashes with blood and/or body fluids are anticipated. [CII]

f. First aid should be performed immediately if there has been exposure to blood or body fluids. The exposure should be reported immediately to employer and immediate medical attention should be obtained[219]: [CII]

   i. The site of a percutaneous injury should be thoroughly rinsed with running water, and any wound should be gently cleansed with soap and water.

   ii. Mucous membranes of the eyes, nose or mouth should be flushed with running water if contaminated with blood, body fluids, secretions or excretions.

   iii. Non-intact skin should be rinsed thoroughly with running water if contaminated with blood, body fluids, secretions or excretions.

9. Cleaning and disinfection of non-critical patient care equipment

a. Reusable non-critical equipment that has been in direct contact with a patient or in that patient's environment should be reprocessed with cleaning and low-level disinfection before use in the care of another patient[72;108;239;464]. [AII]

b. Items such as toys and electronic games that have been in direct contact with a patient or in that patient's environment should be reprocessed with cleaning and low-level disinfection before use by another patient[93;105;106;108-110;434]. [AII]

c. Non-critical patient care equipment dedicated to an individual patient should be cleaned and disinfected according to a regular schedule. [CII]

d. Bedpans and commodes should be provided for single patient use and labeled appropriately. Bedpans and commodes should be reprocessed with cleaning and low-level disinfection before use by another patient[129;130;465]. The use of single-patient-use disposable bedpans is acceptable. [CII]

e. Manufacturer's written instructions should be followed when using products for cleaning and disinfecting.

f. Sterile and clean supplies should be stored in a designated and separate clean, dry area protected from dust. Sterile and clean supplies should not be stored under sinks and/or near plumbing, as leaks may occur[242]. [CII]

In home care settings:

- patients should be educated about the importance of environmental cleaning
- the amount of disposable and non-disposable patient care equipment and supplies brought into the home should be limited
- patients should be advised to purchase items such as thermometers and scissors for personal use
- whenever possible, reusable patient care equipment should be left in the home until the patient is discharged from home care services
- non-critical patient care equipment (e.g., stethoscope) that cannot remain in the home should be reprocessed with cleaning and low-level disinfection before taking them from the home
- alternatively, contaminated reusable items should be in a plastic bag for transport and reprocessed with cleaning and disinfection
- unused disposable equipment or supplies in the home should be discarded following discharge from home care services [CII]

In prehospital care:

- use of disposable items is preferred where practical
- patient care equipment touched or potentially touched by patients and personnel should be cleaned and disinfected following transport [CII]

10. Environmental cleaning

a. Surfaces that are likely to be touched and/or used frequently should be cleaned and disinfected on a more frequent schedule. This includes surfaces that are in close proximity to the patient (e.g., bedrails, overbed tables, call bells) and frequently touched surfaces in the patient care environment, such as door knobs, surfaces in the patient's bathroom and shared common areas for dining, bathing, toileting[72;129;130;239;263;293;466;467]. [AI]

In prehospital care:

- terminal cleaning should be performed following patient care and transport
- response bags should be cleaned and disinfected following use and, if heavily soiled or contaminated with blood and/or body fluids, removed from service and laundered as per organizational policy [CII]

11. Handling deceased bodies

a. Routine practices properly and consistently should be used when handling deceased bodies or preparing bodies for autopsy or transfer to mortuary services. Provincial/territorial specified communicable disease regulations should be followed. [Regulated]

12. Handling of linen, waste, dishes and cutlery

a. Linen

i. Patient bed linen should be changed regularly and when soiled, upon discontinuation of contact precautions and following patient discharge.

ii. Soiled linen from healthcare settings should be handled in the same way for all patients without regard to their infection status. Soiled linen should be placed in a no-touch receptacle at the point-of-use.

iii. Soiled linen should be handled with a minimum of agitation to avoid contamination of air, surfaces and persons[278;279].

iv. Soiled linen should be sorted and rinsed outside of patient care areas, except specialized items (e.g., antiembolic stockings) and personal clothing in specific healthcare settings.

v. Heavily soiled linen should be rolled or folded to contain the heaviest soil in the centre of the bundle. Large amounts of solid soil (e.g., feces or blood clots) should not be removed by spraying with water. A gloved hand and toilet tissue should be used to place the solid soil into a bedpan or toilet for flushing.

vi. Hand hygiene should be performed after handling soiled linen.

vii. Clean linen should be transported and stored in a manner that prevents its contamination and ensures its cleanliness.

viii. Clean and soiled linen should be separated during transport and storage.

ix. Reusable linen bags should be washed after each use; they may be washed in the same cycle as the linen contained in them. [CII]

In ambulatory care:

- patient linen should be changed following every patient treatment/procedure. [CII]

In prehospital care:

- patient linen should be changed following every patient treatment/transport [CII]

b. Waste

i. Biomedical waste (e.g., sponges, dressings and surgical drapes soaked with blood or secretions) should be contained in impervious waste-holding bags or double bags according to municipal/regional regulations[275]. [Regulated]

ii. Blood, suctioned fluids, excretions and secretions should be disposed of in a sanitary sewer or septic system according to municipal/regional regulations[275]. [Regulated]

iii. Used needles and other sharp instruments should be handled with care to avoid injuries during disposal. Used medical sharps should be disposed of immediately in designated puncture-resistant containers located at the point-of-use. [CII]

In home care settings:

- patients should be advised to dispose of medical sharps (e.g., hypodermic needles used by patients) in accordance with municipal or regional regulations
- patients should be informed to place sharps into an impervious container. Some local pharmacies provide sharps containers [CII]

c. Dishes

i. There are no indications for the use of disposable dishes except in the circumstance of non-functioning dishwashing equipment. [CII]

13. Education of patients, families and visitors

a. Healthcare workers should provide instructions to patients, families and visitors regarding hand hygiene and respiratory hygiene. [CII]

14. Visitor management

a. Visitors with symptoms of acute infection (e.g., cough, fever, vomiting, diarrhea, coryza, rash, conjunctivitis) should not visit unless the visit is essential (e.g., parent, guardian or primary caretaker), in which case they should be instructed and supervised in precautions to minimize transmission of infection. [CII]

IV. Recommendations for additional precautions in all healthcare settings and modifications for precautions in specific healthcare settings

Subsection i: Contact precautions for all care settings and modifications for specific healthcare settings

Routine practices properly and consistently applied should prevent transmission by the contact route. For certain situations that may result in extensive contamination of the environment or for microorganisms with a very low infectious dose, contact precautions may be indicated. Contact precautions should be used for the conditions/clinical presentations and specific etiologies listed in List 3 below. In addition to routine practices for the care of all patients in all settings, the recommendations that follow List 3 apply to the care of patients on contact precautions in all care settings. Modifications for specific healthcare settings follow. Certain diseases require public health notification; check local regulations.

List 3: Conditions and/or clinical presentations and specific etiologies requiring contact precautions

3a. Conditions and/or clinical presentation (Refer to Table 4 for details)	3b. Specific etiologies (Refer to Table 5 for details)	
Acute viral respiratory infections ■ bronchiolitis ■ cold ■ croup ■ cough, fever, acute upper respiratory infection ■ febrile respiratory illness ■ fever without focus, acute, children ■ influenza-like illness ■ pharyngitis Conjunctivitis Dermatitis Desquamation, extensive Diarrhea,[i] unless continent with good hygiene Draining wounds, major wound infection, abscess, infected pressure ulcer or other skin infection if drainage cannot be contained by dressings Encephalitis, paediatric Endometritis with signs of toxic shock Food poisoning[i] Gastroenteritis[i] Gingivostomatitis, primary Hand, foot and mouth disease, children Hemolytic uremic syndrome, contact Hemorrhagic fever Hepatitis of unknown origin, children Herpangina, children Meningitis Necrotizing enterocolitis, children Pleurodynia, children Pseudomembranous colitis Rash, compatible with scabies Rash, vesicular with fever Rash, vesicular/pustular, with epidemiologic context of viral hemorrhagic fever	Adenovirus[i] Adenovirus, conjunctivitis Amebiasis, children Antibiotic-resistant organisms Astrovirus, children Bocavirus Brucellosis, major draining lesions Burkholderia cepacia Campylobacter[i] Cholera, children *Clostridium difficile* Coronavirus Cryptosporidiosis, children Diphtheria, cutaneous Enteroviral infections,[i] children Enteroviral conjunctivitis *Escherichia coli*[i] (enteropathogenic and enterohemorrhagic strains) Giardia[i] Hepatitis A, E, children Herpes simplex virus ■ encephalitis, children ■ neonatal ■ neonatal or mucocutaneous Human metapneumovirus Influenza seasonal, avian (refer to Table 5 for pandemic influenza) Monkeypox	Norovirus Parainfluenza virus Poliomyelitis, acute infantile Respiratory syncytial virus Rhinovirus Rotavirus Rubella, congenital Salmonella[i] Scabies Severe acute respiratory syndrome Shigella[i] Smallpox *Staphylococcus aureus*, major draining wound *Streptococcus*, Group A, major draining wound invasive disease or toxic shock syndrome Vaccinia Vancomycin resistant enterococci Vancomycin-resistant *Staphylococcus aureus* Varicella-zoster virus ■ varicella ■ herpes zoster, disseminated or localized in immunocompromised host, localized in normal host if not contained Viral hemorrhagic fevers (Crimean congo, Ebola, Lassa, Marburg) Yersinia enterocolitica[i]

[i]Use contact precautions:

- only for children with diarrhea who are incontinent or unable to comply with hand hygiene
- for children with skin lesions/exudates who are unable to comply with hand hygiene or appropriate handling and disposal of purulent discharges and maintaining dressings in place
- only for adults with diarrhea who are incontinent if diarrhea cannot be contained in incontinence products or for adults with poor hygiene that contaminate their environment

1. Source control

a. A system should be developed to identify patients with known or suspected infections that warrant contact precautions.

   i. Contact precautions should be implemented empirically for patients with conditions/clinical presentations as listed in List 3. above, rather than waiting for the etiology to be determined.

   ii. Refer to specific etiologies in List 3 if the etiology has been established.

   iii. Note that indications for contact precautions may differ for certain children (e.g., children who are incontinent or unable to comply with hygiene) and other adult patients (e.g., incontinent or cognitively impaired adults).

   iv. Note that some diseases/conditions need two precautions categories (e.g., contact and droplet).

   v. A sign should be placed at the entrance to the patient room, cubicle or designated bedspace or other visible locations to identify contact precautions.

   vi. Patients on contact precautions should be restricted from participating in pet therapy programs[71]. [CI]

b. Contact precautions in addition to routine practices are sufficient for aerosol-generating medical procedures performed on patients on contact precautions who have no signs or symptoms of suspected or confirmed tuberculosis, severe acute respiratory syndrome or respiratory infection with an emerging pathogen for which the transmission characteristics are not yet known. (Refer to Part A Section II, C, 2c)

2. Hand hygiene

a. Hand hygiene using soap and water, instead of alcohol-based hand rub should be used during outbreaks or in settings with high transmission of norovirus or *Clostridium difficile* infection[265;266;269-271]. or with suspected or documented exposure to *B. anthracis*-contaminated items[468].

3. Patient placement and accommodation

a. Single room

   i. Patients requiring contact precautions should be placed into a single room with a private toilet (or designated commode chair), designated patient sink and a designated staff handwashing sink[48;95;201;289;293;302;469]. It may be difficult to maintain physical separation related to shared spaces and equipment (e.g., toilets, sinks) in a shared room[201]. [BII]

   ii. The room door may remain open. [CII]

b. When single patient rooms are limited, a point-of-care risk assessment should be performed to determine patient placement and/or suitability for cohorting.

   i. Prioritize patients with conditions that may facilitate cross-transmission of microorganisms (e.g., uncontained drainage, stool incontinence, young age, and cognitive impairment) for single patient room placement. Use prioritization as in routine practices. [CI]

   ii. Cohort patients who are infected or colonized with the same microorganism and are suitable roommates[395;396;470;471]. [CI]

   iii. Roommates should be selected for their ability and the ability of their visitors to comply with necessary precautions. [CII]

c. When cohorting is not feasible:

   i. Placing a patient requiring contact precautions in the same room as a patient who is at high risk for complications if infection occurs or with conditions that may facilitate transmission (e.g., those who are immunocompromised, have open wounds) should be avoided. [CII]

   ii. In a shared room, a patient with diarrhea should not share a toilet with another patient. A designated toilet or commode should be assigned to the patient with diarrhea. [CII]

   iii. In shared rooms, roommates and all visitors should be aware of the precautions to follow. Roommates should be selected for their ability and the ability of their visitors to comply with necessary precautions. [CII]

   iv. If possible, the privacy curtain between beds should be closed to minimize opportunities for direct contact. [CII]

   v. Contact precautions should be applied in nursery settings including providing the necessary spacing between infant stations to minimize opportunities for direct contact[429]. If multiple infants are kept in a single room, a 1.2-2.4 metre space should be maintained between infant stations (depending on care needs)[472] and family members or designated visitors should comply with the necessary precautions. [CII]

4. Patient flow

a. The patient should perform hand hygiene with assistance as necessary before leaving the room. [AII]

b. The patient should be allowed out of the room as indicated in the care plan. Supervision of the patient should be provided if compliance with precautions is inadequate. [CII]

c. When transfer or movement in healthcare facilities is necessary, the patient should be provided with clean bedclothes and bedding, draining wounds should be

contained with clean dressings, infected areas of the patient's body should be covered and body substances should be contained. [CII]

d. Personnel in the area to which the patient is to be transported should be informed of precautions to follow and requested to see the patient efficiently to minimize time in waiting areas and reduce time spent outside of the patient room. [CII]

e. Transfer within facilities should be avoided unless medically indicated. If a medically indicated transfer is unavoidable, the transferring service, receiving unit, or facility or home care agency should be advised of the necessary precautions. [CII]

f. Personal protective equipment should be removed and disposed of and hand hygiene should be performed, prior to transporting patients. [AII]

g. Clean personal protective equipment should be put on if necessary, to handle the patient during transport and at the transport destination. [CII]

5. Personal protective equipment

a. Personal protective equipment for contact precautions should be provided outside the patient room (or when available, in the anteroom), cubicle or patient's designated bedspace in shared rooms. [CII]

b. In addition to the use of personal protective equipment as per routine practices[22;219]:

   i. Gloves

      - Gloves should be worn to enter the patient room, cubicle or patient's designated bedspace in shared rooms.
      - Gloves should be removed and discarded into a no touch waste receptacle and hand hygiene should be performed on exit from the room or patient bedspace[337;339;407]. [AII]

   ii. Long-sleeved gowns

      - A long-sleeved gown should be worn if it is anticipated that clothing or forearms will be in direct contact with the patient or with environmental surfaces or objects in the patient care environment.
      - If a gown is to be worn it should be put on prior to entry into the room, cubicle or patient's designed bedspace in shared rooms[48;70;95;473].
      - The gown should be removed and discarded into a no touch receptacle immediately after the indication for use and hand hygiene should be performed before leaving the patient's environment[129;130]. [BII]

c. The same personal protective equipment should not be worn for more than one patient. Personal protective equipment should be changed and hand hygiene performed between contacts with all patients in the same room[337;339;405;407;474]. [BII]

6. Cleaning and disinfection of non-critical patient care equipment

a. All equipment/supplies should be identified and stored in a manner that prevents use by or for other patients. [CII]

b. Non-critical patient-care equipment (e.g., thermometers, blood pressure cuff, pulse oximeter) should be dedicated to the use of one patient and cleaned and disinfected as per Routine Practices before reuse with another patient or a single-use device should be used and discarded in garbage after use[42;70;95;260;289]. [BII]

c. Toys, electronic games or personal effects should not be shared between patients. [CI]

7. Cleaning of the patient environment

a. Additional cleaning measures or frequency may be warranted in situations where continued transmission of specific infectious agents is noted (e.g., *Clostridium difficile,* norovirus and rotavirus)[475]. The efficacy of disinfectants being used should be assessed and if indicated, a more effective disinfectant should be selected[239;264;265]. All horizontal and frequently touched surfaces should be cleaned at least twice daily and when soiled[82;239;264;476]. [BII]

b. In outbreak situations or when there is continued transmission, rooms of *Clostridium difficile* infection patients should be decontaminated and cleaned with chlorine-containing cleaning agents (at least 1,000 ppm) or other sporicidal agents[43;266-271]. [BII]

c. When precautions are discontinued or the patient is moved, terminal cleaning of the room/bedspace and bathroom, changing of privacy curtains and cleaning and disinfection or changing of string/cloth call bells or light cords should be done (refer to Appendix VII). [BII]

8. Education of patients, families and visitors

a. Patients, their visitors, families and their decision makers should be educated about the precautions being used, the duration of precautions, as well as the prevention of transmission of disease to others with a particular focus on hand hygiene. [CII]

b. Visitors who are participating in patient care should be instructed about the indications for and appropriate use of personal protective equipment (barriers). In the adult setting, visitors who assist with patient care should use the same personal protective equipment as healthcare workers. This may not be necessary for parents carrying out their usual care of young children. [CII]

9. Management of visitors

a. Visitors should be instructed to speak with a nurse before entering the patient room in order to evaluate the risk to the health of the visitor, and the ability of the visitor to comply with precautions. [CII]

b. The number of visitors should be minimized to essential visitors (e.g., parent, guardian or primary caretaker) only. Visitors should be restricted to visiting only one patient. If the visitor must visit more than one patient, the visitor should be instructed to use the same barriers as the healthcare workers and perform hand hygiene before going to the next patient room. [CII]

10. Duration of precautions

a. Contact precautions should be discontinued after signs and symptoms of the infection have resolved or as per the pathogen specific recommendations in Table 5. [CII]

b. The duration of precautions should be determined on a case-by-case basis when patient symptoms are prolonged or when the patient is immune suppressed[477-482]. The patient with persistent symptoms should be reevaluated for underlying chronic disease. Repeated microbiological testing may be warranted. [CII]

c. Precautions should be discontinued only after the room/bedspace and bathroom has been terminally cleaned. [CII]

11. Handling deceased bodies

a. Routine practices, properly and consistently applied should be used in addition to contact precautions, for handling deceased bodies, preparing bodies for autopsy or for transfer to mortuary services. Provincial/territorial specified communicable disease regulations should be followed. [Regulated]

12. Waste, laundry, dishes and cutlery

a. No special precautions are required; routine practices are sufficient. [CII]

Special considerations for antibiotic-resistant organisms in all healthcare settings [CII]

- In acute-care inpatient facilities (for the purpose of this document, acute care includes ambulatory care settings such as hospital emergency departments and free-standing or facility-associated ambulatory (day) surgery or other invasive day procedures [e.g., endoscopy units, hemodialysis, ambulatory wound clinics]), routine practices and contact precautions are recommended for infection or colonization (i.e., patient is asymptomatic) with microorganisms such as MRSA, vancomycin-resistant *Enterococcus* or other

microorganisms resistant to a wide spectrum of antibiotics (as determined by the infection prevention and control service of the facility) (refer to Table 5). In addition, some facilities may choose to include precautions for persons at risk of colonization pending screening results, particularly in outbreak situations.

- Although masks may protect the healthcare worker from nasal colonization, data are inconclusive on the need for masks, apart from their use for routine practice for persons caring for patients with MRSA[483]. Masks should be worn as indicated by routine practices.
- There are insufficient data at present on which to base recommendations for discontinuation of precautions for patients colonized with antibiotic-resistant microorganisms[484]. Decisions should be made locally, taking into consideration the specific microorganisms, the patient population and local experience with duration of colonization. These policies should be updated as data become available.
- Policies and practices that result in stigmatization of patients with antibiotic-resistant microorganisms (e.g., disease-specific signage) or increase the patient's sense of isolation should be avoided. Recognizing that patients on contact precautions may have fewer contacts with healthcare providers and that this may reduce their quality of care, steps should be taken to mitigate this impact on care.

Modifications for contact precautions in specific healthcare settings

Modification of contact precautions for long-term care

1. Routine practices (as per Part B, Section III) and contact precautions should be followed for all healthcare settings (as per Part B, Section IV, subsection i), and modified as noted below:

   a. Patient placement, accommodation and activities

   - A point-of-care risk assessment to determine patient placement, removal from a shared room or participation in group activities should be performed on a case-by-case basis, balancing infection risks to other patients in the room, the presence of risk factors that increase the likelihood of transmission and the potential adverse psychological impact on the symptomatic patient.
   - Participation in group activities should not be restricted if wound drainage or diarrhea is contained.
   - Patients should perform hand hygiene and be assisted as necessary before participation with group activities. [CII]

b. Use of personal protective equipment

- Gloves should be worn if direct personal care contact with the patient is necessary or if direct contact with frequently touched environmental surfaces is anticipated. [BII]

c. Cleaning of patient environment

- In outbreaks, consideration should be given to more frequent cleaning and/or cleaning with disinfectants. This includes bathing and toileting facilities, recreational equipment and horizontal surfaces in the patient room and, in particular, areas/items that are frequently touched (e.g., hand and bedrails, light cords). [BII]

Special considerations for the care of patients with antibiotic-resistant microorganisms in long-term care settings

In addition to routine practices (as per Part B, Section III) and contact precautions for all care settings (as per Part B, Section IV, subsection i) and modifications for contact precautions in LTC mentioned above, the following apply to antibiotic-resistant microorganisms in the LTC setting:

- Policies for managing antibiotic-resistant microorganisms, including initiation and discontinuation of precautions, should be in place, reflect the local experience with particular antibiotic-resistant microorganisms and should be flexible enough to accommodate the various characteristics of different antibiotic-resistant microorganisms[484]. It is important to collaborate with other local healthcare organizations to design a comprehensive control program.
- Management strategies should take into consideration the risk and benefits of both the patient and the facility, based on the point-of-care risk assessment[484].Controlling transmission is primarily the responsibility of direct caregivers through hand hygiene and appropriate use of gloves[484]. Ability to maintain hygiene by the patient and caregivers, individualized activity restrictions, selection of low-risk roommate, and environmental cleanliness are also factors that need consideration. [CII]

Modifications of contact precautions for ambulatory care

1. Routine practices (as per Part B, Section III) and contact precautions should be followed for all healthcare settings (as per Part B, Section IV, subsection i), and modified as noted below:

a. Source control

Triage

- Contact between symptomatic patients and others should be avoided by minimizing time spent in waiting rooms.
- Symptomatic patients should be scheduled at a time when they are less likely to encounter other patients.
- Placement in a separate room should be done as soon as possible. [CII]

b. Cleaning and disinfection of non-critical patient care equipment and patient environment

- Equipment and surfaces in direct contact with the patient or infective material (e.g., respiratory secretions, stool or skin exudates) should be cleaned and disinfected before the room is used for another patient. Contaminated reusable non-critical patient care equipment should be cleaned and disinfected before use with another patient.
- All horizontal surfaces and frequently touched surfaces in the room should be cleaned and disinfected if the patient is likely to cause extensive environmental contamination (diarrhea or fecal incontinence not contained by incontinence products or infant diapers, copious wound drainage, copious uncontrolled respiratory secretions or sputum) prior to use by another patient. [BII]

Special considerations for the care of patients with antibiotic-resistant microorganisms in ambulatory care settings

- Contact precautions should not be used for asymptomatic carriers (i.e., colonized only) of antibiotic-resistant microorganisms; routine practices, properly and consistently applied, are sufficient.
- Requiring proof of screening for antibiotic-resistant microorganisms before care is provided is not advised. Communicating (preferably with infection control personnel) when referring a patient known to have an antibiotic-resistant microorganism to a healthcare facility should be done to ensure appropriate precautions are implemented.
- Collaboration with local or regional public health departments and infection control professionals should be done to design a comprehensive infection and prevention control program. [CII]

Modifications of contact precautions for home care

1. Routine practices (as per Part B, Section III) and contact precautions should be followed for all healthcare settings (as per Part B, Section IV, subsection i) and modified as noted below:

a. Accommodation

Symptomatic patients should be advised to:

- rest away from others, in a separate room, if available
- use a designated bathroom, whenever possible
- clean the bathroom frequently, especially frequently touched surfaces
- not share towels or other personal items [CII]

b. Patient flow

- Asymptomatic patients should not be excluded from group/social activities.
- Symptomatic patients should be advised on how to contain secretions/excretions to minimize the risk of transmission to others (e.g., contain draining wounds with an intact dressing) and to perform hand hygiene prior to group activities.
- Symptomatic patients should be advised to exclude themselves from group/social activities when experiencing acute symptoms and when secretions/excretions cannot be contained.
- Care and services (e.g., appointments at foot care clinics, volunteer visiting and volunteer transportation) that are not medically necessary should be postponed until patients are asymptomatic. [CII]

c. Personal protective equipment

- Gloves and gowns should be worn when direct contact is anticipated with a symptomatic patient or equipment and environmental surfaces in the patient's immediate environment. [BII]

d. Duration of precautions

- Precautions should be discontinued when the patient is asymptomatic. [CII]

Special considerations for the care of patients with antibiotic-resistant microorganisms in home care

- Requiring proof of screening for antibiotic-resistant microorganisms before care is provided is not advised. Communicating (preferably with infection control personnel) when referring a patient known to have an antibiotic-resistant microorganism to a healthcare facility should be done to ensure appropriate precautions are implemented.
- Contact precautions should not be used for patients who are asymptomatic, including asymptomatic carriers of antibiotic-resistant organisms; routine practices, properly and consistently applied, are sufficient.
- Collaboration with local or regional public health departments and infection control professionals should be done to design a comprehensive infection prevention and

control program. In some jurisdictions, such collaboration may be appropriate with the local funder of home care services. [CII]

Modifications of contact precautions for prehospital care

1. Routine practices (as per Part B, Section III) and contact precautions should be followed for all healthcare settings (as per Part B, Section IV, subsection i), and modified as noted below:
    a. The number of personnel attending the patient should be limited, when possible.
    b. Gloves/gowns should be put on at the point-of-care.
    c. Gloves/gown should be removed when patient care is completed, immediately discarded, and hand hygiene should be performed.
    d. When transfer to healthcare facilities is necessary, the patient should be provided with clean bedclothes and bedding, draining wounds should be contained with clean dressings, infected areas of the patient's body should be covered and body substances should be contained.
    e. Single patient transport is preferred.
    f. A point-of-care risk assessment should be done when considering multi-transport; conditions, as listed in routine practices, for priority for single transport should be considered.
    g. The receiving hospital/facility should be notified if precautions are indicated.
    h. Equipment and surfaces should be cleaned and disinfected and linen should be changed after every patient. [CII]

Special considerations for the care of patients with antibiotic-resistant microorganisms in prehospital care

- Modifications of contact precautions for prehospital care (mentioned above) should be followed.
- Contact precautions for patients who are asymptomatic, including asymptomatic carriers of antibiotic-resistant microorganisms, should not be used; routine practices, properly and consistently applied, are sufficient. [CII]

Subsection ii: Droplet precautions in all care settings and modifications for specific healthcare settings

Droplet precautions should be used for the conditions/clinical presentations and specific etiologies listed in List 4. In addition to routine practices applied properly and consistently for the care of all patients in all settings, the recommendations that follow List 4 apply to the care of patients on droplet precautions in all care settings. Modifications for specific healthcare settings follow. Certain diseases require public health notification; check local regulations.

List 4: Conditions/clinical presentations and specific etiologies requiring droplet precautions

4a. Conditions and/or clinical presentations (Refer to Table 4 for details)	4b. Specific etiologies (Refer to Table 5 for details)
Bronchiolitis Cellulitis, in child <5 years old if *Haemophilus influenzae* type B possible Cold Cough, fever, acute respiratory tract infection Croup Epiglottis in child <5 years old Febrile respiratory illness Hemorrhagic fever in epidemiologic context Influenza-like illness Meningitis Osteomyelitis, in children if *H. influenzae* possible Paroxysmal cough, suspected pertussis Pharyngitis Pneumonia, in children Rash, macupapular with fever and one of coryza, conjunctivitis or cough Rash, petechial/purpuric with fever Rash, vesicular, pustular with epidemiologic context of viral hemorrhagic fever Septic arthritis, in children if *H. influenzae* possible Toxic shock syndrome, if Group A *Streptococcus* possible	Adenovirus, respiratory strains Bocavirus Coronavirus Diphtheria, pharyngeal *H. influenzae*, in children Human metapneumolvirus Influenza, seasonal, avian (refer toTable 5 for pandemic influenza) Meningococcus Monkeypox Mumps Mycoplasma pneumoniae Parainfluenza virus Parvovirus B-19, aplastic crisis or chronic infection in immunocompromised patient Pertussis Plague, pneumonic Respiratory syncytial virus Rhinovirus Rubella Severe acute respiratory syndrome Smallpox *Staphylococcus aureus* in children with pneumonia Streptococcus, Group A ▪ scarlet fever or pharyngitis in children ▪ invasive disease Viral hemorrhagic fevers (Crimean -Congo, Ebola, Lassa, Marburg)

1. Source control

a. A system to identify patients with known or suspected acute infections that warrant droplet precautions should be developed.

   i. Droplet precautions should be implemented empirically for patients with conditions/clinical presentations listed in List 4, rather than waiting for the etiology to be determined.

ii. Refer to specific etiologies in List 4 if the etiology has been established. (Note: some indications for droplet precautions may differ for certain children [e.g., epiglottitis or cellulitis in children <5 years, scarlet fever] and adult patients.).

iii. Note: Some conditions/specific infections warrant two categories of precautions: contact and droplet.

iv. Patients should be instructed to adhere to respiratory hygiene. When a mask is worn, the patient can remove the mask once accommodated in the room.

v. Patients with acute respiratory symptoms should be directed to a separate waiting area or placed into a single room; in a multi-bed room, the privacy curtain should be pulled (refer to Part B, Section IV, subsection ii, 3).

vi. A sign should be placed at the entrance to the patient room or other visible locations to identify droplet precautions. [CI]

b. Droplet precautions in addition to routine practices are sufficient for aerosol-generating medical procedures performed on patients on droplet precautions who have no signs or symptoms of suspected or confirmed tuberculosis, severe acute respiratory syndrome or respiratory infection with an emerging pathogen for which transmission characteristics are not yet known.

2. Personnel restrictions

a. Healthcare workers, to prevent self-contamination, should avoid touching the mucous membranes of their eyes, nose and mouth with their hands. [CII]

b. Healthcare workers who are not immune to mumps or rubella should not provide direct care for patients with these infections[219]. [CII]

3. Patient placement and accommodation

a. In inpatient facilities, a single room with in-room designated toilet and sink is preferable, as it may be difficult to maintain the recommended spatial separation of two metres between patients[122-124].

i. The room door may remain open.

ii. When single patient rooms are limited, a point-of -care risk assessment should be performed to determine suitability for patient placement.

iii. Patients who cannot be confined to their bed or bed area should be prioritized for single patient room placement. [CI]

b. When sufficient single rooms are not available, patients should be cohorted if they are known to be infected with the same pathogen and if they are suitable roommates[385;391-393;401;485]. [CI]

c. When a room must be shared and cohorting patients with the same pathogen is not possible:

i. Avoid placing patients on droplet precautions in the same room with patients who, if they were to become infected, would be at high risk for complications or who may facilitate transmission (e.g., elderly, patients with cardiopulmonary disease, immunocompromised).
ii. Roommates and all visitors should be aware of the precautions to be followed.
iii. Roommates should be selected for their ability and that of their visitors to comply with precautions.
iv. Patients should be physically separated (i.e., at least two metres apart) from each other. The privacy curtain between beds should be drawn to minimize opportunities for droplet spread.
v. Droplet precautions should be applied in nursery settings, including the necessary spacing between infant stations to minimize opportunities for droplet contact[429]. Family members and/or designated visitors should comply with the necessary precautions. [CII]

4. Patient flow

a. The patient should perform hand hygiene (with assistance as necessary) before leaving the room. [AII]
b. The patient should be allowed out of the room as indicated in their care plan. Supervision of the patient should be provided if compliance with precautions is inadequate.
    i. The patient should wear a mask[368;369;373-376] if tolerated and follow respiratory hygiene during transport. [CI]
    ii. Personnel in the area to which the patient is to be transported should be aware of the status of the patient and of the precautions to follow. [CII]

5. Personal protective equipment

a. Personal protective equipment for droplet precautions should be provided outside the room or in the anteroom. [CII]
b. Transport personnel should wear facial protection if the patient cannot follow respiratory hygiene. [CII]
c. Facial protection should be worn and discarded as outlined in routine practices to prevent self-contamination. [BII]
d. In addition to the use of personal protective equipment as per routine practices:
    i. Facial protection (i.e., masks and eye protection, or face shields, or masks with visor attachment)[410;411] should be worn:
        - for care of patients with symptoms of acute respiratory viral infection,

- when within two metres of patient who is coughing at the time of interaction, or
- if performing procedures that may result in coughing[122;123;219]

ii. For care of patients with rubella or mumps, facial protection is not needed if the healthcare worker is immune. Non-immune personnel (rubella, mumps) should not enter the room unless it is essential, at which time facial protection should be worn. [CI]

e. In a cohort where patients have the same microorganisms, facial protection may be used for successive patients (gloves should be changed and hand hygiene performed between patients). [CII]

6. Cleaning and disinfection of patient care equipment

a. As per routine practices unless contact precautions are also in use, then as per contact precautions.

7. Cleaning of patient environment

a. As per routine practices unless contact precautions are also in use, then as per contact precautions.

8. Education of patient and family

a. Patients, their visitors, families and their decision makers should be educated about the precautions being used, the duration of precautions, as well as the prevention of transmission of disease to others, with a particular focus on hand hygiene. [CII]

b. Visitors who are participating in patient care should be instructed about the indications for and appropriate use of personal protective equipment (barriers). In the adult setting, visitors who assist with patient care should use the same personal protective equipment as healthcare workers. This may not be necessary for parents carrying out their usual care of young children. [CII]

9. Management of visitors

a. The number of visitors should be kept to a minimum. Visitors should be instructed to speak with a nurse before entering the patient room. In the case of acute viral respiratory infection, household members need not wear facial protection (as they may have already been exposed). On a case-by-case basis, other visitors should be instructed in the appropriate use of a mask and other precautions. [CII]

b. Exceptions to the need for facial protection include the following:

i. For patients with suspected or confirmed *Haemophilus influenzae* type B infection, visitors should wear facial protection only if they will have extensive close contact with children <5 years of age.

ii. For patients with rubella or mumps, facial protection is not needed if the visitor is immune. Non-immune visitors should only enter the room when it is absolutely necessary; if they enter the room, they should wear facial protection. [CII]

10. Duration of precautions

a. Droplet precautions should be discontinued after signs and symptoms of the infection have resolved or as per the disease-specific recommendations in Table 5. [CII]

b. The duration of precautions should be determined on a case-by-case basis when patient symptoms are prolonged or when the patient is immune suppressed. The patient with persistent symptoms should be re-evaluated for underlying chronic disease. Repeat microbiological testing may sometimes be warranted. [CII]

11. Handling deceased bodies

a. Routine practices, properly and consistently applied, should be used for handling deceased bodies and preparing bodies for autopsy or transfer to mortuary services. Droplet precautions are not necessary. Adhere to provincial/territorial specified communicable disease regulations. [Regulated]

12. Waste, laundry, dishes and cutlery

a. No special precautions; routine practices are sufficient.

Modifications for droplet precautions in specific healthcare settings

Modifications of droplet precautions in long-term care

1. Routine practices (as per Part B, Section III) and droplet precautions should be followed for all healthcare settings (as per Part B, Section IV, subsection ii) and modified as noted below:

   a. In long-term care and other residential settings, a point-of-care risk assessment should be performed to determine patient placement. Infection risks to other patients in the room and available alternatives should be considered.

   b. Participation in group activities may need to be restricted while the patient is symptomatic.

c. During an outbreak in a facility, restriction to social activities in wards/units/areas should be considered.

d. Restriction of visitors should be considered during community or facility outbreaks of respiratory infections. [CII]

Modifications of droplet precautions in ambulatory care

1. Routine practices (as per Part B, Section III) and droplet precautions should be followed for all healthcare settings (as per Part B, Section IV, subsection ii) and modified as noted below:

   a. Patients should be placed directly into single rooms, especially if he or she has known or suspected influenza, meningococcal infection, rubella, mumps or pertussis. If this is not possible, patients should be placed in an area of the waiting room separated from other patients by at least two metres, and the time spent in waiting room should be minimized.

   b. Consider separate waiting rooms or areas for well-child visits and for children with acute respiratory infection, especially during community outbreaks. [CII]

Modifications of droplet precautions in home care

1. Routine practices (as per Part B, Section III) and droplet precautions for all healthcare settings (as per Part B, Section IV, subsection ii) and modified as noted below:

   a. Patients should be instructed to self-screen for acute respiratory illness and to inform the home care agency prior to the healthcare worker visit, scheduled appointment or attendance at a group program.

   b. Patients should be advised to exclude themselves from group programs when experiencing acute symptoms of respiratory illness.

   c. Healthcare workers should screen patients for febrile illness by phone, prior to the homecare visits, whenever possible. Healthcare workers should screen patients upon entry into clinics or group programs and for home visits if advance telephone screening is not possible.

   d. Medically necessary care should be provided. Care (e.g., foot care clinics) and services (e.g., volunteer visitors and volunteer transportation) that are not medically necessary should be deferred when patients are experiencing acute respiratory symptoms. [CII]

Modifications of droplet precautions in prehospital care

1. Routine practices (as per Part B, Section III) and droplet precautions for all healthcare settings (as per Part B, Section IV, subsection ii) and modified as noted below:

   a. A system should be developed to identify patients with known or suspected infections that warrant droplet precautions.

b. The number of personnel attending to the patient should be limited.

c. Single patient transport is preferred.

d. A mask should be placed on the patient if the patient is able to tolerate it.

e. The receiving facility should be notified of precautions indicated.

f. If the disease is known to be of droplet transmission, then a procedure/surgical mask should be used. However, if on assessment disease caused by airborne transmission cannot be ruled out, then airborne precautions should be used. [CII]

Subsection iii: Airborne precautions in all care settings and modifications for specific healthcare settings

Airborne precautions should be used for the conditions/clinical presentations and specific etiologies listed in List 5. In addition to routine practices for the care of all patients in all settings, the recommendations that follow List 5 apply to the care of patients on airborne precautions in all care settings. Modifications for specific healthcare settings follow. Certain diseases require public health notification; check local regulations.

List 5: Conditions and/or clinical presentations and specific etiologies requiring airborne precautions

5a. Conditions and/or clinical presentation
(Refer to Table 4 for details)

- Cough, fever, pulmonary infiltrate in person at risk for TB (pleuropulmonary or laryngeal TB)
- Rash, maculopapular with fever and one of coryza, conjunctivitis or cough
- Rash, vesicular with fever

5b. Specific etiologies
(Refer to Table 5 for details)

- Measles (rubeola)
- Monkeypox
- Tuberculosis (pleuropulmonary or laryngeal)
  - nonpulmonary lesions, during procedures that may aerosolize tuberculi bacilli
- Smallpox
- Varicella zoster virus
  - varicella (chicken pox)
  - zoster, disseminated
  - zoster in immunocompromised patient
  - zoster in immunocompetent patient that cannot be contained

1. Source control

a. A system should be developed to identify patients with known or suspected infection that warrant airborne precautions (i.e., infectious tuberculosis, measles, varicella and disseminated zoster).

   i. Airborne precautions should be implemented empirically for patients with suspected airborne conditions/clinical presentations, as listed in List 5. above; do not wait for the etiology to be determined.

   ii. Refer to specific etiologies in List 5 if etiology has been established.

   iii. Note that some airborne diseases/infections warrant two precaution categories: airborne and contact.

   iv. Patients should be directed to put on a mask, if tolerated (not a respirator), when not in an airborne infection isolation room[209;368;486].

   v. Patients known or suspected to have an airborne infection should be placed directly into an airborne infection isolation room with the door closed[21;72;138;207;210;437] and with exhaust vented to the outside or filtered through a high-efficiency particulate filter if recirculated[72;146;207;486].

   vi. The patient should be allowed to remove the mask once in an airborne infection isolation room (refer to Part B, Section IV, subsection iii, 2)[207;486].

   vii. The patient should be placed into a single room if an airborne infection isolation room is unavailable; the patient should be instructed to keep the mask on and the door should remain closed.

   viii. When airborne isolation rooms are unavailable, the patient should be transferred to a facility with an available airborne infection isolation room as soon as medically stable for transport[21;207;486].

   ix. A sign should be placed at the entrance to the patient room or other visible location to identify airborne precautions. [CI]

b. The following strategies should be applied to reduce the level of aerosol generation when performing aerosol-generating medical procedures for patients with suspected or confirmed tuberculosis, severe acute respiratory syndrome and an emerging pathogen for which transmission characteristics are not yet known[150-154;156;157]. Strategies to reduce aerosol generation should also be implemented when aerosol-generating medical procedures are necessary on patients with viral hemorrhagic fevers[161]. [BII]

   i. Aerosol-generating medical procedures should be limited to those that are medically necessary.

   ii. Aerosol-generating medical procedures should be anticipated and planned for.

   iii. Appropriate patient sedation should be used.

iv. The number of personnel in the room should be limited to those required to perform the aerosol-generating medical procedure.

v. Aerosol-generating medical procedures should be performed in airborne infection isolation rooms whenever feasible.

vi. Appropriate ventilation (e.g., level of air filtration and direction of air flow) should be maintained.

vii. Single rooms (with the door closed and away from high-risk patients), should be used in settings where airborne infection isolation rooms are unavailable.

viii. Respirators should be worn by all personnel in the room during the procedure.

ix. Closed endotracheal suction systems should be used wherever possible.

Note: When responding to a code (cardiac arrest) on a patient with an airborne infection who is not in an airborne infection isolation room, and if transfer to a single room or airborne infection isolation room is not feasible, the privacy curtain should be pulled and all personnel in the room or within the privacy curtain area should wear appropriate personal protective equipment. Visitors and other patients should be removed from the room/area (if feasible).

c. Intubated and ventilated patients[437]: [CII]

i. An appropriate bacterial filter should be placed on the endotracheal tube to prevent contamination of the ventilator and the ambient air.

ii. Endotracheal suctioning should be performed using a closed suction apparatus, where possible.

2. Patient placement and accommodation (refer to Part B, Section IV, subsection iii, 1a)

a. The airborne infection isolation room should have an in-room toilet, sink and bathing facility for the patient, and a designated handwashing sink for healthcare workers[201;202;209;289-302]. [BII]

b. Patients known to be infected with the same virus (measles or varicella) may share a room. [CII]

c. Patients with tuberculosis should not share rooms, as strains and levels of infectivity may be different. [CII]

d. Monitoring[72;207;487;488] [CI]

i. The pressure differential should be checked prior to placing a patient requiring airborne isolation in an airborne infection isolation room, using visual indicators (smoke tubes or flutter strips) or portable manometers.

ii. Visual indicators or portable manometers should be rechecked regularly, preferably daily, when airborne infection isolation rooms are in use, regardless of the presence of continuous differential pressure sensing devices.

iii. The results of monitoring should be documented.

iv. Visual or audible alarms should not be inactivated.

3. Patient flow

a. Patients should be restricted to their room, unless leaving the room for medically essential procedures. The patient should be accompanied by a healthcare worker whenever outside the room[209]. [CII]

b. A mask (not a respirator) should be placed on the patient (if tolerated) when the patient leaves the room[207;213;373-375]. If patient cannot wear a mask, refer to *c* and *d*, below. [CII]

c. If the patient needs transport for medically essential purposes and cannot wear a mask, transport should be planned to limit the exposure of other individuals (e.g., no waiting in the reception areas) and it should be communicated to receiving personnel that consistent precautions need to be ensured. If transport is in a confined space (e.g., ambulance), the transport personnel should wear a respirator during transport. [CI]

d. For other conditions (i.e., measles, varicella), immune transport personnel will not need a respirator. [CII]

e. Skin lesions due to varicella or smallpox, or nonrespiratory draining lesions due to *Mycobacterium tuberculosis* should be covered with a clean sheet to prevent aerosolization of the infectious agent if the patient leaves the room[138;207;489-491]. [CII]

4. Personnel[219;419]

a. Healthcare workers and other individuals (e.g., transport personnel) should be aware of their immune status to measles and varicella. [CII]

b. All healthcare workers should be immune to measles and varicella. A healthcare worker who is not immune should not provide care for a patient with measles, varicella or zoster, or for a susceptible exposed patient who is in the infectious stage/period. [CII]

c. Non-immune healthcare workers should not enter the rooms of patients known or suspected to have measles, varicella or disseminated zoster, or the room of a susceptible exposed patient in the infectious period/stage for these conditions. In circumstances where this is unavoidable, a respirator should be worn (refer to 7, below, Personal protective equipment). (Note: Gloves should be worn by non-immune healthcare workers caring for patients with varicella or disseminated zoster.) [CII]

d. Immune healthcare workers do not need respirators when caring for patients known or suspected to have measles (rubeola), varicella (chickenpox) or disseminated zoster. [CII]

5. Management of patients with airborne infections

a. For varicella:
   - The patient should remain in the room until all lesions have crusted.
   - Susceptible personnel and visitors should not enter the room. If exceptional circumstances make this necessary, they should wear a respirator and gloves.
   - The patient should leave the room for medically essential purposes only, unless it is established that all other patients and all healthcare workers are immune to varicella.
   - The patient should wear a mask, have skin lesions covered and clean bedclothes and bedding (as needed) when out of the room. [CII]

b. For measles:
   - The patient should remain in the room until four days after onset of rash or for the duration of illness, if immunocompromised.
   - Susceptible personnel and visitors should not enter the room. If exceptional circumstances make this necessary, a respirator should be worn.
   - The patient should leave the room for medically essential purposes only, unless it is established that all other patients and all healthcare workers are immune to measles. The patient should wear a mask when out of the room. [CII]

6. Management of exposed susceptible roommates and other close contacts

a. For varicella:
   - The immune status of exposed roommates and other close contacts should be determined.
   - Exposed susceptible contacts should be placed in single airborne infection isolation room from seven days after the first possible exposure until 21 days after the last exposure.
   - The most recent National Advisory Committee on Immunization recommendations should be used to determine whether varicella zoster immune globulin or varicella vaccination is recommended for exposed susceptible contacts at risk of severe disease; if given, precautions should be extended to 28 days after exposure[419].

- Varicella vaccine should be offered to exposed susceptible individuals (with no known contraindications) within 72 hours of first contact.
- Precautions for exposed individuals should be followed, regardless of the administration of varicella zoster immune globulin or varicella vaccine. [CII]

b. For measles:

- The immune status of exposed roommates and other close contacts should be determined.
- Susceptible contacts should be provided with prophylaxis (i.e., measles vaccine or immunoglobulin, as per the most recent National Advisory Committee on Immunization recommendations)[419].
- Exposed susceptible contacts should be placed in single airborne infection isolation rooms from five days after the first possible exposure until 21 days after the last exposure, regardless of vaccine administration[15;492] [CII]

7. Personal protective equipment

a. Healthcare workers should wear respirators when caring for a patient with suspected or confirmed respiratory tuberculosis. Healthcare workers should wear respirators when infectious tuberculosis skin lesions are present and procedures that would aerosolize viable tubercle bacilli organisms (e.g., irrigation) are performed[162-164]. [CII]

b. Healthcare workers should wear respirators when caring for a patient with vaccine preventable airborne infections (i.e., varicella, measles) to which they are not immune. [CII]

c. Healthcare workers should wear respirators when performing or assisting with aerosol-generating medical procedures (as per Part B, Section IV, subsection iii, 1b) on patients with signs and symptoms of severe acute respiratory syndrome or with a respiratory pathogen for which transmission characteristics are not yet known[150-156]. Strategies to reduce aerosol generation should also be implemented when aerosol-generating medical procedures are necessary on patients with hemorrhagic fevers[161]. For novel influenza viruses or emergence of new pathogens, refer to the PHAC website for specific guidance documents (http://www.phac-aspc.gc.ca/nois-sinp/guide/pubs-eng.php). [BII]

d. Healthcare workers should wear respirators when caring for a patient with suspect or confirmed monkeypox or smallpox. [CII]

e. Healthcare workers should adhere to policies and procedures related to the organization's respiratory protection program [Regulated]

f. Healthcare workers should remain clean shaven in the area of the respirator seal to ensure facial seal. [CII]

Appropriate respirator use [CII]

- Hand hygiene should be performed prior to putting on a respirator.
- A seal check should be performed.
- Self-contamination should be avoided by not touching the respirator on its external surface during use and disposal.
- Respirators should be carefully removed by the straps.
- A respirator should not dangle around the neck when not in use.
- The respirator should be changed if it becomes wet or soiled (from the wearer's breathing or an external splash).
- The respirator should be changed if breathing becomes difficult.
- The respirator should be discarded immediately after its use (i.e., dispose of when removed from the face) into a no-touch waste receptacle, followed by hand hygiene.
- In cohort settings, respirators may be used for successive patients.

8. Management of patient care equipment

a. As per routine practices unless contact precautions are also in use, then as per contact precautions.

9. Cleaning of patient environment

a. As per routine practices unless contact precautions are also in use, then as per contact precautions.

10. Education of patient, family and visitors

a. Patients, their visitors, families and their caretakers should be educated about the precautions being used, the duration of the precautions and the prevention of transmission of disease to others. [CII]

b. Patients with known or suspected airborne infections should be instructed to wear a mask and to cover skin lesions (due to varicella or smallpox or nonrespiratory draining lesions due to *Mycobacterium tuberculosi*s) with a dry dressing if, for medical reasons, they have to leave their airborne infection isolation room[207;213;219;373;374]. [CII]

c. Visitors who are participating in patient care should be instructed about the indications for and appropriate use of personal protective equipment. In the adult setting, visitors who assist with patient care should use the same personal protective equipment as healthcare workers, unless determined to already have had

prolonged exposure to that patient or if immune to the specific disease/condition the patient is on precautions for. Visitors should be instructed to perform a seal check if wearing a respirator. [CII]

11. Management of visitors

a. For tuberculosis:
   - Visitors should be restricted to immediate family or guardian.
   - Close contact visitors (e.g., household members, those who routinely have visited the patient's home) should be screened for the presence of cough. Coughing visitors should be sent for tuberculosis assessment as soon as possible and until assessed, they should visit only if it is essential and should wear a mask while in the facility. [CII]

b. For other airborne infections (varicella, measles):
   - Visitors should be instructed to speak with a nurse before entering the patient room.
   - Visitors should be restricted from visiting, unless confirmed to be immune to the specific infection for which the patient is on precautions for, or unless for compassionate reasons (contact, droplet) or the visit is essential (e.g., parent, guardian or primary caretaker).
   - If visit is essential, non-immune visitors may visit if appropriate personal protective equipment is worn. [CII]

12. Duration of precautions

a. Airborne precautions should be discontinued after signs and symptoms of the infection have resolved or as per the disease-specific recommendations in Table 5. [CII]

13. Handling deceased bodies

a. Routine practices, properly and consistently applied, in addition to airborne precautions, should be used for handling deceased bodies and preparing bodies for autopsy or transfer to mortuary services. Airborne precautions should be continued for the handling of a patient with infectious respiratory tuberculosis, measles or varicella until appropriate time has elapsed to remove airborne contaminants in the room (refer to Appendix VIII). Adhere to provincial/territorial specified communicable disease regulations. [Regulated]

14. Upon discharge or discontinuation of airborne precautions

a. Sufficient time should be allowed for the air to be free of aerosolized droplet nuclei (refer to Appendix VIII) before housekeeping performs terminal cleaning, or the housekeeper should wear a respirator. [CII]

Modifications for airborne precautions in specific healthcare settings

Modifications of airborne precautions for long-term care

1. Routine practices (as per Part B, Section III) and airborne precautions should be followed for all healthcare settings , including long term care (as per Part B, Section IV, subsection iii), and modified as noted below:
   a. Tuberculosis (infectious, respiratory [pleuropulmonary or laryngeal])[21;437;493-496]
      i. The tuberculosis infection status of patients in residential facilities should be determined at the time of admission. [CII]
      ii. If an airborne infection isolation room is not available in the long-term care setting, transfer to a facility with airborne infection isolation rooms should be arranged. If transfer is delayed:
         - place the patient in a single room with the door closed, preferably without recirculation of air from the room and as far away from the rooms of other patients as possible
         - limit the number of people entering the room (e.g., no non-essential visitors) [CII]
   b. Varicella or disseminated herpes zoster or localized herpes zoster that cannot be kept covered, or measles:
      i. The immune status (measles, varicella) of patients in residential facilities should be determined at the time of admission and immunization offered, if appropriate. [CII]
      ii. If an airborne infection isolation room is not available in the long-term care setting, transfer to a facility with airborne infection isolation rooms should be arranged. If transfer is delayed:
         - place the patient in a single room with the door closed, preferably without recirculation of air from the room and as far away from the rooms of other patients as possible
         - limit the number of people entering the room (e.g., no non-essential visitors) [CII]

If all personnel and all other residents in the facility are immune and if non-immune visitors can be excluded, transfer to a facility with an airborne infection isolation room may not be essential. [CII]

iii. Infectious patients should not be placed on units where there are susceptible immunocompromised patients. [CII]

Modifications of airborne precautions for ambulatory care

1. Routine practices (as per Part B, Section III) and airborne precautions should be followed for all healthcare settings (as per Part B, Section IV, subsection iii), and modified as noted below: [CII]
   a. A system should be developed to identify patients with known or suspected infection that warrant airborne precautions (i.e., infectious tuberculosis, measles, varicella or disseminated zoster).
   b. A system (e.g., triage, signage) should be developed at entry to ambulatory settings or when making telephone appointments to identify patients with known or suspected infection that warrants airborne precautions (i.e., infectious tuberculosis, measles, varicella or disseminated zoster). If feasible, the visit should be scheduled at a time to minimize exposure of other patients, such as at the end of the day.
   c. Patients with suspected airborne infection should be directed to put a mask on upon entry to the facility.
   d. Patients known or suspected to have airborne infection should be placed directly into an airborne infection isolation room.
   e. The patient may remove the mask once in an airborne infection isolation room.
   f. Patients should be placed into a single room if an airborne infection isolation room is unavailable; the patient should wear a mask and the door should remain closed.
   g. Recommendations for personnel, patient flow and personal protective equipment should be followed, as per recommendations for all care facilities.
   h. Upon discharge, sufficient time should be allowed for the air to be free of aerosolized droplet nuclei before using the room for another patient (tuberculosis) or for a non-immune patient (measles or varicella). The duration will depend on the rate of air exchange in the room (refer to Appendix VIII). [CII]

Modifications of airborne precautions for home care

1. Routine practices (as per Part B, Section III) and airborne precautions should be followed for all healthcare settings (as per Part B, Section IV, subsection iii), and modified as noted below:
   a. A system to screen patients prior to appointments should be developed to identify patients with known or suspected infection that warrants airborne precautions (i.e., infectious tuberculosis, measles, varicella or disseminated zoster).

b. Home care agencies should consult with public health to determine if the patient is infectious for respiratory tuberculosis and needs airborne precautions. [CII]

Modifications of airborne precautions for prehospital care

1. Routine practices (as per Part B, Section III) and airborne precautions should be followed for all healthcare settings (as per Part B, Section IV, subsection iii), and modified as noted below:

   a. A system to identify patients with known or suspected infection that warrant airborne precautions (i.e., infectious tuberculosis, measles, varicella or disseminated zoster) should be developed.

   b. Whenever possible, first responders should perform a point-of-care risk assessment and put on personal protective equipment, as needed, prior to entering the home or location of the patient.

   c. Where available, vehicle ventilation systems should be used to create a negative pressure environment; where not available, natural ventilation (e.g., open vehicle windows) should be used.

   d. Patient should wear a mask during transport, if tolerated. If the patient needs oxygen, a filtered oxygen mask should be used. [CII]

Part C: Transmission characteristics and precautions

Table 4: Transmission characteristics and precautions by condition/clinical presentation. Once specific etiology is known, refer to Table 5

Condition/ clinical presentation	Potential pathogens	Precautions	Infective material	Route of transmission	Duration of precautions	Comments
Abscess Refer to draining wound						
Bronchiolitis	RSV, human metapneumovirus parainfluenza virus, influenza, adenovirus	Droplet and contact	Respiratory secretions	Large droplet and direct and indirect contact	Duration of symptoms	Patient should not share room with high-risk roommates
Burns, infected Refer to draining wound						
Cellulitis Draining: Refer to draining wound Periorbital in child <5 years old without portal of entry	*H. influenzae* type B in non-immune child <2 years of age; *Streptococcus pneumoniae,* Group A *Streptococcus, S. aureus*, other bacteria	Droplet if *H. influenzae* type B is possible cause, otherwise routine practices	Respiratory secretions	Large droplet, direct contact	Until 24 hours of appropriate antimicrobial therapy received or if *H. influenzae* type B ruled out	
Cold	Rhinovirus, RSV, human metapneumovirus, parainfluenza, adenovirus, coronavirus	Droplet and contact	Respiratory secretions	Large droplet and direct and indirect contact	Duration of symptoms	Patient should not share room with high-risk roommates
Conjunctivitis	Adenovirus, enterovirus, chlamydia, *Neisseria gonorrhea*, other microbial agents	Contact[a]	Eye discharge	Direct and indirect contact	Until viral etiology ruled out; duration of symptoms, up to 14 days if viral	[a]Routine if non-viral

Condition/ clinical presentation	Potential pathogens	Precautions	Infective material	Route of transmission	Duration of precautions	Comments
Cough, fever, acute upper respiratory tract infection	Rhinovirus, RSV, human metapneumovirus parainfluenza, influenza, adenovirus, coronavirus, pertussis	Droplet and contact	Respiratory secretions	Large droplet, direct and indirect contact	Duration of symptoms or until infectious etiology ruled out	Consider fever and asthma in child <2 years old as viral infection Patient should not share room with high-risk roommates
Cough, fever, pulmonary infiltrates in person at risk for TB	*Mycobacterium tuberculosis*	Airborne	Respiratory secretions	Airborne	Until infectious TB is ruled out Until patient has received 2 weeks of effective therapy, and is improving clinically, and has 3 consecutive sputum smears negative for acid fast bacilli collected 8–24 hours apart If multi-drug-resistant TB, until sputum culture negative	TB in young children is rarely transmissible Assess visiting family members for cough http://www.phac-aspc.gc.ca/tbpc-latb/pubs/tb-canada-7/index-eng.php
Croup	Parainfluenza, influenza, human metapneumovirus, RSV, adenovirus	Droplet and contact	Respiratory secretions	Large droplet, direct and indirect contact	Duration of symptoms or until infectious cause ruled out	Patient should not share room with high-risk roommates
Decubitius (pressure ulcer, draining) Refer to draining wound						
Dermatitis Refer to draining wound	Many (bacteria, virus, fungus)	Contact	Pus	Direct and indirect contact	Until infectious etiology ruled out	If compatible with scabies, take appropriate precautions pending diagnosis
Desquamation, extensive Refer to draining wound	*S. aureus*	Contact	Pus	Direct and indirect contact	Until contained or infection ruled out	
Diarrhea Refer to gastroenteritis Acute diarrhea of likely infectious cause						

Condition/ clinical presentation	Potential pathogens	Precautions	Infective material	Route of transmission	Duration of precautions	Comments
Draining wounds	*S. aureus*, Group A *Streptococcus*, many other bacteria	Routine Contact:[b] Major wound, droplet[c]	Pus	Direct and indirect contact	Duration of drainage	[b]Major: drainage not contained by dressing [c]Droplet for first 24 hours of antimicrobial therapy if invasive group A streptococcal infection suspected
Encephalitis	Multiple microbial agents including herpes simplex virus (HSV), enterovirus, arbovirus (West Nile virus)	ADULT: Routine[d] PAEDIATRIC: Contact[d]	Feces, respiratory secretions	Direct and indirect contact (fecal/oral)	Until specific etiology established or until enterovirus ruled out	[d]May be associated with other agents including measles, mumps, varicella. If identified, take appropriate precautions for associated disease
Endometritis	Group A *Streptococcus*; many other bacteria	Routine unless signs of toxic shock[e]				[e]Contact and droplet for the first 24 hours of antimicrobial therapy if invasive group A *Streptococcus* suspected.
Enterocolitis Refer to diarrhea						
Epiglottitis In child <5 years old	*H. influenzae* type B; **Possible in non-immune infant <2 years of age**, group A *Streptococcus*, *S. aureus*	Droplet if *H. influenzae* type B is possible cause, otherwise routine	Respiratory secretions	Large droplet, direct contact	Until 24 hours of appropriate antimicrobial therapy received or until *H. influenzae* type B ruled out	
Erysipelas Draining: Refer to draining wound	Group A *Streptococcus*	Routine				
Febrile respiratory illness Usually present with symptoms of a fever greater than 38 °C *and* new or worsening cough or shortness of breath	Wide range of droplet-spread respiratory infections, such as colds, influenza, influenza-like illness and pneumonia	Contact and droplet precautions	Respiratory secretions			Note: elderly people and people who are immunocompromised may not have a febrile response to a respiratory infection. Refer to *Ontario Best Practices for Preventing Acute Respiratory Infection in All Health Care Settings*

Condition/ clinical presentation	Potential pathogens	Precautions	Infective material	Route of transmission	Duration of precautions	Comments
Fever without focus (acute, in children)	Enterovirus and other pathogens	ADULT: Routine[f] PAEDIATRIC: Contact	Feces, respiratory secretions	Direct or indirect contact (fecal/oral)	Duration of symptoms or until enteroviral infection ruled out	[f]If findings suggest a specific transmissible infection, take precautions for that infection pending diagnosis
Food poisoning	*Bacillus cereus*, *Clostridium perfringens*, *S. aureus*, *Salmonella*, *Vibrio parahaemolyticus*, *Escherichia coli O157*, *Listeria* and others	ADULT: Routine[g] PAEDIATRIC: Contact	Food; feces if *Salmonella* or *Escherichia coli* O157	Foodborne, or direct and indirect contact (fecal/oral)		[g]Consider contact precautions for incontinent adults if stool cannot be contained or for adults with poor hygiene who contaminate their environment. Contact precautions apply to children who are incontinent or unable to comply with hygiene
Furuncles Refer to draining wound	*S. aureus*					
Gas gangrene Draining: Refer to draining wound	*Clostridium* spp.					
Gastroenteritis	Diarrhea and/or vomiting due to infection or toxin	ADULT: Contact[h] PAEDIATRIC: Contact	Feces	Direct and indirect contact (fecal/oral)	Duration of symptoms for *C. difficile*, norovirus, rotavirus until ruled out. In pediatrics, until normal stools or infectious etiology ruled out	[h]Use contact precautions until *C. difficile*, norovirus, rotavirus ruled out. Consider contact precautions for incontinent adults if stool cannot be contained or for adults with poor hygiene who contaminate their environment Contact precautions apply to children who are incontinent or unable to comply with hygiene Refer to Table 5 for specific etiologies
Gingivostomatitis	HSV, other causes including radiation therapy, chemotherapy, idiopathic (aphthous)	Contact if primary and extensive HSV related. Otherwise routine	Mucosal lesions	Direct contact	While lesions present	

Condition/ clinical presentation	Potential pathogens	Precautions	Infective material	Route of transmission	Duration of precautions	Comments
Guillain-Barré syndrome	Some cases associated with infection (e.g., campylobacter)[i]					[i]Take precautions as appropriate for known or suspected associated infection
Hand, foot and mouth disease	Enterovirus	ADULT: Routine PAEDIATRIC: Contact	Feces, respiratory secretions	Direct and indirect contact (fecal/oral)	Duration of symptoms	Contact precautions apply to children who are incontinent or unable to comply with hygiene
Hemolytic-uremic syndrome	Some associated with *E. coli* O157	ADULT: Routine[j] PAEDIATRIC: Contact	Feces	Direct and indirect contact (fecal/oral)	Until *E. coli* O157 ruled out	[j]Consider contact precautions for incontinent adults if stool cannot be contained or for adults with poor hygiene who contaminate their environment Contact precautions apply to children who are incontinent or unable to comply with hygiene
Hemorrhagic fever acquired in appropriate endemic or epidemic area	Ebola, Lassa, Marburg, Crimean-Congo and others	Contact and droplet AGMP[k]	Blood and bloody body fluids; respiratory secretions; skin if Ebola and urine if Lassa	Direct and indirect contact; possibly aerosol if pneumonia Lassa: Sexual contact	Duration of symptoms or until hemorrhagic fever virus ruled out	Local public health authorities should be notified immediately [k]If AGMP necessary, refer to strategies to reduce aerosol generation, refer to Part B, Section IV, subsection iii, 1b
Hepatitis of unknown etiology	Hepatitis A, B, C, E viruses, Epstein-Barr virus and others	ADULT: Routine[l] PAEDIATRIC: Contact	Feces; blood and certain body fluids	Mucosal or percutaneous exposure to infective body fluids Sexual transmission Vertical; mother to child Direct and indirect contact (fecal/oral) for hepatitis A, E	For 7 days after onset of jaundice or until hepatitis A and E epidemiologically excluded	[l]Consider contact precautions for incontinent adults if stool cannot be contained or for adults with poor hygiene who contaminate their environment unless hepatitis A and E are epidemiologically excluded Contact precautions apply to children who are incontinent or unable to comply with hygiene
Herpangina	Enterovirus	ADULT: Routine PAEDIATRIC: Contact	Feces, respiratory secretions	Direct and indirect contact (fecal/oral)	Duration of symptoms	Contact precautions apply to children who are incontinent or unable to comply with hygiene
Impetigo Refer to draining wound	Group A *Streptococcus*, *S. aureus*					

Condition/ clinical presentation	Potential pathogens	Precautions	Infective material	Route of transmission	Duration of precautions	Comments
Influenza-like illness	Influenza, other respiratory viruses	Contact and droplet	Respiratory secretions	Large droplet, direct and indirect contact	Duration of symptoms or until infectious etiology ruled out	
Kawasaki disease (mucocutaneous lymph node syndrome)	Unknown	Routine				Not known to be transmissible
Meningitis	Bacterial: *Neisseria meningitidis, H. influenzae* type B possible in non-immune infant <2 years of age, *Streptococcus pneumoniae*, Group B *Streptococcus*, *Listeria monocytogenes*, *E. coli* and other Gram-negative rods	ADULT: Droplet until *Neisseria meningitidis* ruled out, otherwise routine PAEDIATRIC: Droplet and contact[m]	Respiratory secretions	Large droplet, direct contact	Until 24 hours of appropriate antimicrobial therapy received	[m]Pediatrics: precautions for both bacterial and viral until etiology established. Droplet if viral etiology established Contact precautions apply to children who are incontinent or unable to comply with hygiene
	Mycobacterium tuberculosis	Routine[n]				[n]Rule out associated respiratory TB
	Viral: enterovirus, arboviruses	ADULT: Routine[o] PAEDIATRIC: Contact[o]	Feces, respiratory secretions	Direct or indirect contact	Until enterovirus ruled out	[o]May be associated with measles, mumps, varicella, HSV. If identified, take appropriate precautions for associated disease
	Fungus	Routine				
Necrotizing enterocolitis	Unknown, probably many organisms	Routine[p]			Duration of symptoms	[p]Unknown if transmissible Take precautions if outbreak suspected
Osteomyelitis	*H. influenzae* type B possible in non-immune infant <2 years of age, *S. aureus*, other bacteria	ADULT: Routine PAEDIATRIC: Droplet if *H. influenzae* type B possible; otherwise routine			Until 24 hours of effective antimicrobial therapy or until *H. influenzae* type B ruled out	
Otitis, draining Refer to draining wound						

Condition/ clinical presentation	Potential pathogens	Precautions	Infective material	Route of transmission	Duration of precautions	Comments
Paroxysmal cough, suspected pertussis	*Bordetella pertussis, Bordetella parapertussis*	Droplet	Respiratory secretions	Large droplets	Until pertussis ruled out or 3 weeks after onset of paroxysmals if not treated or until 5 days of antimicrobial therapy received	Close contacts (household and HCWs) may need chemoprophylaxis and/or immunization If HCWs immunization not up to date, refer to OH and/or delegate Refer to Canadian Immunization Guide for specific information available at: http://healthycanadians.gc.ca/healthy-living-vie-saine/immunization-immunisation/canadian-immunization-guide-canadien-immunisation/index-eng.php
Pharyngitis	Group A *Streptococcus*, viral, *Corynebacterium diphtheriae*	Droplet and contact	Respiratory secretions	Direct and indirect contact; large droplets	Duration of symptoms; if Group A *Streptococcus* until 24 hours of antimicrobial therapy received	If diphtheria suspected, refer to Table 5.
Pleurodynia	Enterovirus	ADULT: Routine PAEDIATRIC: Contact	Feces, respiratory secretions	Direct and indirect contact (fecal/oral)	Duration of symptoms	Contact precautions apply to children who are incontinent or unable to comply with hygiene
Pneumonia	Viruses, pertussis, *Mycoplasma, Streptococcus pneumoniae, H. influenzae* type B, *S. aureus,* group A *Streptococcus*, Gram-negative enteric rods, *Chlamydia, Legionella, Pneumocystis*, other fungi; other agents	ADULT: Routine[q] PAEDIATRIC: Droplet and contact	Respiratory secretions	Large droplets, direct and indirect contact	Until etiology established, then as for specific organism; no special precautions for pneumonia unless ARO, then use Contact	[q]Routine for adults unless clinical, epidemiologic or microbiologic data to necessitate contact and droplet precautions (i.e., on contact and droplet for viral etiologies) Minimize exposure of immunocompromised patients, patients with chronic cardiac or lung disease, neonates
Pseudomembranous colitis	*C. difficile*	Contact	Feces	Direct and indirect contact (fecal/oral)	Duration of symptoms	Until 72 hours after stool is normal.

Condition/ clinical presentation	Potential pathogens	Precautions	Infective material	Route of transmission	Duration of precautions	Comments
Rash compatible with scabies	*Sarcoptes scabiei*	Contact	Mites	Direct and indirect contact	If confirmed, until 24 hours after initiation of appropriate therapy	For typical scabies, routine (use gloves and gown for direct patient contact only) Refer to scabies, Table 5
Rash (maculopapular) with fever and one of coryza, conjunctivitis or cough	Measles	Airborne	Respiratory secretions	Airborne	If confirmed, until 4 days after onset of rash	Refer to measles, Table 5
Rash (petechial/purpuric) with fever	*Neisseria meningitidis*	Droplet if *N. meningitidis* suspected, otherwise routine	Respiratory secretions	Large droplets, direct contact	Discontinue if *Neisseria meningitidis* ruled out If *N. meningitidis* confirmed, until 24 hours of appropriate antimicrobial therapy received	
Rash (vesicular) with fever	Varicella	Airborne and contact	Respiratory secretions, skin lesion drainage	Airborne, direct and indirect contact	If confirmed, until all lesions are dry	Refer to varicella, Table 5
Rash, vesicular/pustular in appropriate epidemiologic context until smallpox, disseminated vaccinia and monkeypox ruled out	Smallpox, disseminated vaccinia, monkeypox	Contact, droplet and airborne	Lesions and respiratory secretions (monkeypox) Skin lesion exudate, oropharyngeal secretions (smallpox, disseminated vaccinia)			
Reye's syndrome	May be associated with viral infection, especially influenza, varicella					Precautions for known or suspected associated viral infection
Scalded skin syndrome (Ritter`s Disease)		Routine				

Condition/ clinical presentation	Potential pathogens	Precautions	Infective material	Route of transmission	Duration of precautions	Comments
Septic arthritis	*H. influenzae* type B possible in non-immune infant <2 years of age; *S. aureus, Streptococcus pneumoniae,* group A *Streptococcus*, *N gonorrhoea*, other bacteria	ADULT: Routine PAEDIATRIC: Droplet if *H. influenzae* type B possible; otherwise routine	Respiratory secretions for *H. influenzae* type B	Large droplet, direct contact *H. influenzae* type B	Until 24 hours of appropriate antimicrobial therapy received or until *H. influenzae* type B ruled out	
Severe respiratory illness Refer to febrile respiratory illness						
Skin infection Refer to cellulitus						
Toxic shock syndrome	*S. aureus,* Group A *Streptococcus*	Droplet[r] Routine				[r]Droplet for first 24 hours of antimicrobial therapy if invasive group A streptococcal infection suspected Refer to draining wound if drainage or pus
Urinary tract infection	Many	Routine[s]				[s]Contact if ARO
Vincent's angina, Trench mouth	Multiple bacteria	Routine				
Wound infection Refer to draining wound						

Table 5: Transmission characteristics and precautions by specific etiology[15;492;497]

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Actinomycosis (*Actinomyces* sp.)	Cervicofacial, thoracic or abdominal infection	Routine			Variable	Not person to person		Normal flora; infection usually secondary to trauma.
Adenovirus Respiratory strains	Respiratory tract infection (pneumonia)	Droplet and contact	Respiratory secretions	Large droplets; direct and indirect contact	1–10 days	Shortly before and until symptoms cease	Duration of symptoms	Different strains responsible for respiratory and gastrointestinal disease Patient should not share room with high-risk roommates Minimize exposure of immunocompromised patients, patients with chronic cardiac or lung disease, neonates. Symptoms may be prolonged in immunocompromised patients
	Conjunctivitis	Contact	Eye discharge	Direct and indirect contact	5–12 days	Late in incubation period until 14 days after onset	Duration of symptoms, up to 14 days	Careful attention to aseptic technique and reprocessing of ophthalmology equipment to prevent epidemic keratoconjunctivitis
Enteric strains	Diarrhea	ADULT: Routine[a] PAEDIATRIC: Contact	Feces	Direct and indirect contact (fecal/oral)	3–10 days	Until symptoms cease	Duration of symptoms	[a]Consider contact precautions for incontinent adults if stool cannot be contained or for adults with poor hygiene who contaminate their environment Contact precautions apply to children who are incontinent or unable to comply with hygiene

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Amebiasis (*Entamoeba histolytica*)	Dysentery and liver abscess	ADULT: Routine[b] PAEDIATRIC: Contact	Feces	Direct and indirect contact (fecal/oral)	2–4 weeks	Duration of cyst excretion	Duration of symptoms	[b]Consider contact precautions for incontinent adults if stool cannot be contained or for adults with poor hygiene who contaminate their environment Contact precautions apply to children who are incontinent or unable to comply with hygiene
Anthrax (*Bacillus anthracis*)	Cutaneous, pulmonary	Routine			1–7 days; maybe up to 60 days	Not person-to-person		Acquired from contact with infected animals and animal products Inhalation anthrax may occur as a result of occupational exposure to anthrax spores or as a result of bioterrorism Decontamination and postexposure prophylaxis necessary for exposure to aerosols in laboratory exposures or biological terrorism

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Antimicrobial-resistant organisms (AROs) Includes MRSA, VRE,-resistant Gram-negative rods and other organisms, as per ICP	Infection or colonization (i.e., asymptomatic) of any body site	Contact[c]	Infected or colonized secretions, excretions	Direct and indirect contact	Variable	Variable	As directed by ICP	[c]Contact precautions for acute care (for the purpose of this document, acute care includes ambulatory care settings such as hospital emergency departments, and free-standing or facility-associated ambulatory (day) surgery or other invasive day procedures (e.g., endoscopy units, hemodialysis, ambulatory wound clinics) When symptomatic, precautions should be determined on a case by case basis as per ICP When asymptomatic, precautions not necessary in LTC, ambulatory, prehospital and home care Refer to Appendix VI, 2. ARO Refer to IP&C Measures for HCWs in All Healthcare Settings – Carbapenaemase-resistant Gram-negative bacilli at: http://www.phac-aspc.gc.ca/nois-sinp/guide/pubs-eng.php

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Arthropod borne virus[d] (arboviruses)	Encephalitis, fever, rash, arthralgia, meningitis	Routine	Blood, tissues	Vector-borne (spread by mosquitoes, ticks)	3–21 days (varies with different arboviruses)	Not person to person except rarely by blood transfusion or organ transplantation		[d]Over 100 different viruses, most limited to specific geographic areas In North America: West Nile is most common; others include California, St. Louis, Western equine, Eastern equine, Powassan, Colorado tick, Snowshoe hare, Jamestown Canyon
Ascariasis (*Ascaris lumbricoides*) (roundworm)	Usually asymptomatic	Routine				Not person to person		Ova must hatch in soil to become infective.
Aspergillosis (*Aspergillus* spp.)	Skin, lung, wound or central nervous system infection	Routine				Not person to person		Spores in dust; infections in immunocompromised patients may be associated with construction
Avian influenza Refer to influenza								
Astrovirus	Diarrhea	ADULT: Routine[e] PAEDIATRIC: Contact	Feces	Direct and indirect contact (fecal/oral)	3–4 days	Duration of symptoms	Duration of symptoms	[e]Consider contact precautions for incontinent adults if stool cannot be contained or for adults with poor hygiene who contaminate their environment Contact precautions apply to children who are incontinent or unable to comply with hygiene
Babesiosis		Routine	Blood	Tick borne		Not person to person, except rarely by blood transfusion from asymptomatic parasitaemic donors		

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Bacillus cereus	Food poisoning Nausea, vomiting, diarrhea, abdominal cramps	Routine		Foodborne				
Bed bugs (*Cimex lectularius*)	Allergic reactions and itchy welts.	Routine						Not known to transmit disease If necessary, consult professional pest control for infestation For information Refer to: https://www.epa.gov/bedbugs
Blastomycosis (*Blastomyces dermatitidis*)	Pneumonia, skin lesions	Routine				Not person to person		Acquired from spores in soil
Bocavirus Respiratory tract infection		Droplet and contact						May cohort if infected with same virus Patient should not share room with high-risk roommates
Botulism (*Clostridium botulinum*)	Flaccid paralysis; cranial nerve palsies	Routine		Foodborne		Not person to person		
Brucellosis (*Brucella sp.)* Undulant, Malta or Mediterranean fever	Systemic bacterial disease of acute or insidious onset	Routine			Weeks to months	Not transmitted person to person, except rarely via banked spermatozoa and sexual contact		Acquired from contact with infected animals or from contaminated food, mostly dairy products Brucella is hazardous to laboratory workers. Notify laboratory if diagnosis is suspected Prophylaxis necessary following laboratory exposure

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
	Draining lesions	MINOR: Routine MAJOR: Contact[f]	Drainage from open lesions	Possibly direct contact			Duration of drainage	[f]MAJOR: Contact precautions necessary only if wound drainage cannot be contained by dressings
Burkholderia cepacia	Exacerbation of chronic lung disease in patients with cystic fibrosis	Contact[g]					Until organism cleared as directed by ICP	B. cepacia can result in respiratory tract colonization or infection in patient with cystic fibrosis [g]If other cystic fibrosis patients are on the unit All interactions with other cystic fibrosis patients should be avoided
Caliciviruses Refer to Noroviruses								
Campylobacter	Gastroenteritis	ADULT: Routine[h] PAEDIATRIC: Contact	Contaminated food, feces	Direct and indirect contact (fecal/oral)	2–5 days	Duration of excretion Person–to-person uncommon	Duration of symptoms	[h]Consider contact precautions for adults if stool cannot be contained or for adults with poor hygiene who contaminate their environment Treatment with effective antimicrobial shortens period of infectivity Contact precautions apply to children who are incontinent or unable to comply with hygiene
Candidiasis (*Candida* sp.)	Many	Routine						Normal flora
Cat scratch disease *(Bartonella henselae)*	Fever, lymphadenopathy	Routine			16–22 days	Not person to person		Acquired from animals (cats and others)

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Chancroid (*Haemophilus ducreyi)*	Genital ulcers	Routine		Sexual transmission	3–5 days	Until healed and as long as infectious agent persists in the original lesion		
Chickenpox Refer to Varicella zoster								
Chlamydia trachomatis	Urethritis, cervicitis, pelvic inflammatory disease; neonatal conjunctivitis, infant pneumonia; trachoma	Routine	Conjunctival and genital secretions	Sexual transmission Mother to child at birth Trachoma: direct/indirect contact	Variable	As long as organism present in secretions		
Chlamydia pneumoniae	Pneumonia	Routine	Respiratory secretions	Unknown	Unknown	Unknown		Rare outbreaks of pneumonia in institutionalized populations
Chlamydia (*Chlamydophila) psittaci* (Psittacosis, Ornithosis)	Pneumonia, undifferentiated fever	Routine	Infected birds		7–14 days	Not person to person		Acquired by inhalation of desiccated droppings, secretions and dust of infected birds
Cholera (*Vibrio cholerae* 01, 0139)	Diarrhea	ADULT: Routine[i] PAEDIATRIC: Contact	Feces	Direct and indirect contact (fecal/oral)	2–3 days	Duration of shedding	Duration of symptoms	[i]Consider contact precautions for adults if stool cannot be contained or for adults with poor hygiene who contaminate their environment Contact precautions apply to children who are incontinent or unable to comply with hygiene

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Clostridium difficile	Diarrhea, pseudo-membranous colitis	Contact	Feces	Direct and indirect contact (fecal/oral)	Variable	Duration of shedding	Duration of symptoms	Bacterial spores persist in the environment Ensure scheduled environmental cleaning During outbreaks, special attention should be paid to cleaning; hypochlorite solutions may be required if continued transmission Refer to Appendix VI. 3. Viral Gastroenteritis Dedicate patient care equipment Relapses are common
Clostridium perfringens	Food poisoning	Routine		Foodborne	6–24 hours	Not person to person		
	Gas gangrene, abscesses, myonecrosis	Routine			Variable	Not person to person		Found in normal gut flora, soil; infection related to devitalized tissue
Coccidioido-mycosis (Coccidioides immitis)	Pneumonia, draining lesions	Routine			1–4 weeks	Not person to person		Acquired from spores in soil, dust in endemic areas
Colorado tick fever Refer to Dengue Fever (Arbovirus)	Fever	Routine		Tick-borne	3–6 days	Not person to person		
Congenital rubella Refer to Rubella								

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Coronavirus (CoV) (other than SARS-CoV) For SARS CoV, refer to Severe acute respiratory syndrome	Common cold	Droplet and contact	Respiratory secretions	Direct and indirect contact Possible large droplet	2–4 days	Until symptoms cease	Duration of symptoms	May cohort if infected with same virus Patient should not share room with high-risk roommates
Coxsackievirus Refer to Enteroviral infections								
Creutzfeldt-Jakob disease (CJD)	Chronic encephalopathy	Routine[J]	Contaminated neurosurgical instruments; tissue grafts from infected donors					[J]PHAC guidelines for precautions for surgery and other procedures may be accessed at: http://www.phac-aspc.gc.ca/nois-sinp/guide/pubs-eng.php Notification of a suspected or diagnosed case of CJD should be made to the CJD surveillance system (1-888-489-2999)
Crimean-Congo fever Refer to Viral hemorrhagic fevers								
Cryptococcosis (*Cryptococcus neoformans*)	Pneumonia, meningitis, adenopathy	Routine			Unknown	Not person to person		

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Cryptosporidosis (*Cryptosporidium parvum*)	Diarrhea	ADULT: Routine[k] PAEDIATRIC: Contact	Feces	Direct and indirect contact (fecal/oral)	1–12 days	From onset of symptoms until several weeks after resolution	Duration of symptoms	[k]Consider contact precautions for incontinent adults if stool cannot be contained or for adults with poor hygiene who contaminate their environment Contact precautions apply to children who are incontinent or unable to comply with hygiene
Cysticercosis (*Taenia solium larvae*)	T. solium larval cysts in various organs	Routine	Ova in feces	Direct contact (fecal/oral)	Months to years	While eggs present in feces		Transmissible only from humans with T. solium adult tapeworm in gastrointestinal tract (autoinfection occurs)
Cytomegalovirus	Usually asymptomatic; congenital infection, retinitis, mononucleosis, pneumonia, disseminated infection in immuno-compromised host	Routine	Saliva, genital secretions, urine, breast milk, transplanted organs or stem cells, blood products	Direct[l] Sexual transmission; vertical mother to child in utero, at birth or through breast milk Transfusion, transplantation	Unknown	Virus is excreted in urine, saliva, genital secretions, breast milk for many months; may persist or be episodic for life		No additional precautions for pregnant HCWs [l]Close direct personal contact necessary for transmission Disease is often due to reactivation in the patient rather than transmission of infection
Dengue (arbovirus)	Fever, arthralgia, rash	Routine		Mosquito-borne	3–14 days	Not person to person		
Dermatophytosis Refer to Tinea								

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Diphtheria (*Corynebacterium diphtheriae*)	Cutaneous (characteristic ulcerative lesion)	Contact	Lesion drainage	Direct or indirect contact	2–5 days	If untreated, 2 weeks to several months	Until 2 cultures[m] from skin lesions are negative	[m]Cultures should be taken at least 24 hours apart and at least 24 hours after cessation of antimicrobial therapy. Close contacts should be given antimicrobial prophylaxis, as per most recent NACI recommendations available at: http://healthycanadians.gc.ca/healthy-living-vie-saine/immunization-immunisation/canadian-immunization-guide-canadien-immunisation/index-eng.php
	Pharyngeal (adherent greyish membrane)	Droplet	Nasopharyngeal secretions	Large droplets,	2–5 days;	If untreated, 2 weeks to several months	Until 2 cultures[n] from both nose and throat are negative	[n]Cultures should be taken at least 24 hours apart and at least 24 hours after cessation of antimicrobial therapy Close contacts should be given antimicrobial prophylaxis
Ebola Refer to Viral hemorrhagic fever								
Echinococcosis (hydatidosis) (*E. granulosis, E. multilocularis*)	Cysts in various organisms	Routine			Months to years	Not person to person		Acquired from contact with infected animals
Echovirus Refer to Enterovirus								

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Enterobiasis Oxyuriasis, pinworm (*Enterobius vermicularis*)	Perianal itching	Routine	Ova in stool, perianal region	Direct, indirect contact	Life cycle requires 2–6 weeks	As long as gravid females discharge eggs on perianal skin; eggs remain infective indoors about 2 weeks		Direct transfer of infective eggs by hand from anus to mouth of the same or another person; indirectly through clothing, bedding or other contaminated articles Close household contacts may need treatment
Enterococcus species (vancomycin-resistant only) Refer to Vancomycin-resistant enterococci								
Enteroviral infections Echovirus, Coxsackievirus A Coxsackievirus B Enterovirus Poliovirus - Refer to poliomyelitis	Acute febrile symptoms, aseptic meningitis, encephalitis, pharyngitis, herpangina, rash, pleurodynia, hand, foot and mouth disease	ADULT: Routine PAEDIATRIC: Contact	Feces, respiratory secretions	Direct and indirect contact (fecal/oral)	3–5 days		Duration of symptoms If poliovirus, refer to Poliomyelitis	Contact precautions apply to children who are incontinent or unable to comply with hygiene
	Conjunctivitis	Contact	Eye discharge	Direct and indirect contact	1–3 days		Duration of symptoms	
Epstein-Barr virus	Infectious mononucleosis	Routine	Saliva, transplanted organs or stem cells	Direct oropharyngeal route via saliva; transplantation	4–6 weeks	Prolonged; pharyngeal excretion may be intermittent or persistent for years		

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Erythema infectiosum Refer to Parvovirus B19								
Escherichia coli (enteropathogenic and enterohemorrhagic strains)	Diarrhea, food poisoning, hemolytic-uremic syndrome, thrombotic thrombocytopenic purpura	ADULT: Routine[o] PAEDIATRIC: Contact	Feces	Direct and indirect contact (fecal/oral) Foodborne	1–8 days	Duration of shedding	Duration of symptoms If hemolytic-uremic syndrome: until 2 stools negative for E. coli O157:H7 or 10 days from onset of diarrhea	[o]Consider contact precautions for incontinent adults if stool cannot be contained or for adults with poor hygiene who contaminate their environment Contact precautions apply to children who are incontinent or unable to comply with hygiene
Fifth disease Refer to Parvovirus								
German measles Refer to Rubella								
Giardia (*Giardia lamblia*)	Diarrhea	ADULT: Routine[p] PAEDIATRIC: Contact	Feces	Direct and indirect contact (fecal/oral)	3–25 days	Entire period of infection; often months	Duration of symptoms	[p]Consider contact precautions for incontinent adults if stool cannot be contained or for adults with poor hygiene who contaminate their environment Contact precautions apply to children who are incontinent or unable to comply with hygiene
Granuloma inguinale (Donovanosis) (*Calymmatobacterium granulomatis*)	Painless genital ulcers, inguinal ulcers, nodules	Routine		Sexual transmission	Unknown; probably between 1 and 16 weeks	Unknown; probably for the duration of open lesions on the skin or mucous membranes		

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Haemophilus influenzae type B (invasive infections)	Pneumonia, epiglottitis, meningitis, bacteremia, septic arthritis, cellulitis, osteomyelitis in a child	ADULT: Routine PAEDIATRIC: Droplet	Respiratory secretions	Large droplets, direct contact	Variable	Most infectious in the week prior to onset of symptoms and during the symptoms until treated	Until 24 hours of appropriate antimicrobial therapy has been received	Close contacts <48 months old and who are not immune may need chemoprophylaxis Household contacts of such children should also receive prophylaxis
Hand foot and mouth disease Refer to Enteroviral infections								
Hansen's disease Refer to Leprosy								
Hantavius (Hantavirus pulmonary syndrome)	Fever, pneumonia	Routine	Rodent excreta	Presumed aerosol transmission from rodent excreta	A few days to 6 weeks	Not well defined, person to person is rare (person to person documented for South American strains)		Infection acquired from rodents
Helicobacter pylori	Gastritis, duodenal ulcer disease	Routine		Probable ingestion of organisms; presumed fecal/oral or oral/oral	5–10 days	Unknown		

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Hepatitis A, E	Hepatitis, anicteric acute febrile symptoms	ADULT: Routine[q] PAEDIATRIC: Contact	Feces	Direct and indirect contact (fecal/oral)	A: 28–30 days E: 26–42 days	A: 2 weeks before to 1 week after onset of jaundice Shedding is prolonged in the newborn E: not known; at least 2 weeks before onset of symptoms	1 week after onset of jaundice; duration of hospitalization if newborn	[q]Consider contact precautions for incontinent adults if stool cannot be contained or for adults with poor hygiene who contaminate their environment Contact precautions apply to children who are incontinent or unable to comply with hygiene Postexposure prophylaxis indicated for non-immune household contacts with significant exposure to hepatitis A if within 2 weeks of exposure Refer to Canadian Immunization Guide for specific information: http://healthycanadians.gc.ca/healthy-living-vie-saine/immunization-immunisation/canadian-immunization-guide-canadien-immunisation/index-eng.php Outbreaks of HAV in HCWs have been associated with eating and drinking in patient care areas

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Hepatitis B, C, D, G viruses	Hepatitis, often asymptomatic; cirrhosis, hepatic cancer	Routine	Blood, genital secretions, and certain other body fluids	Mucosal or percutaneous exposure to infective body fluids Sexual transmission; Vertical mother to child	B: 2–3 months C: 2 weeks–6 months D: 2–8 weeks	B: all persons who are hepatitis B surface-antigen-positive are infectious C: indefinite D: indefinite		Refer to Canadian Immunization Guide for specific information, available at: http://healthycanadians.gc.ca/healthy-living-vie-saine/immunization-immunisation/canadian-immunization-guide-canadien-immunisation/index-eng.php Contact OH or delegate if HCW has percutaneous, non-intact skin or mucous membrane exposure. Refer to CDC dialysis recommendations available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5005a1.htm
Herpes simplex virus	Encephalitis	ADULT: Routine PAEDIATRIC: Contact						
	Neonatal	Contact	Skin or mucosal lesions; possibly all body secretions and excretions	Direct contact	Birth to 6 weeks of age		Duration of symptoms	Contact precautions are also indicated for infants delivered vaginally (or by C-section if membranes have been ruptured more than 4–6 hours) to women with active genital HSV infections, until neonatal HSV infection has been ruled out
	Mucocutaneous: disseminated or primary and extensive (gingivostomatitis, eczema herpeticum)	Contact	Skin or mucosal lesions Sexual transmission Mother to child at birth	Direct contact	2 days–2 weeks	While lesions present	Until lesions are dry and crusted	

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
	Recurrent	Routine						
Herpes zoster Refer to Varicella zoster								
Histoplasmosis *(Histoplasma capsulatum*)	Pneumonia, lymphadenopathy, fever	Routine			3–17 days	Not person to person		Acquired from spores in soil
Hookworm (*Necator americanus, Ancyclostoma duodenale*)	Usually asymptomatic	Routine		Percutaneous; fecal/oral	Few weeks to many months	Not person to person		Larvae must hatch in soil to become infectious
Human herpesvirus 6 (HHV-6) Refer to Roseola								
Human immuno-deficiency virus (HIV)	Asymptomatic; multiple clinical presentations	Routine	Blood, genital secretions, breast milk and certain other body fluids	Mucosal or percutaneous exposure to infective body fluids Sexual transmission, vertical mother to child	Weeks to years	From onset of infection		Contact OH or delegate immediately if HCW has percutaneous, non-intact skin or mucous membrane exposure
Human meta-pneumovirus	Respiratory tract infection	Droplet and contact	Respiratory secretions	Large droplets Direct and indirect contact	3–5 days		Duration of symptoms	May cohort if infected with same virus Patient should not share room with high-risk roommates

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Human T-cell leukemia virus, human T-lymphotrophic virus (HTLV-I, HTLV-II)	Usually asymptomatic, tropical spastic, paraperisis, lymphoma	Routine	Breast milk, blood and certain other body fluids	Vertical mother to child; mucosal or percutaneous exposure to infective body fluids	Weeks to years	Indefinite		
Infectious mononucleosis Refer to Epstein-Barr virus								
Influenza - Seasonal	Respiratory tract infection	Droplet and contact	Respiratory secretions	Large droplets, direct and indirect contact	1–3 days	Generally 3–7 days from clinical onset Prolonged shedding may occur in immuno-compromised individuals.	Duration of symptoms	If private room is unavailable, consider cohorting patients during outbreaks Patient should not share room with high-risk roommates Consider antiviral for exposed roommates Refer to Guidance: IP&C Measures for HCWs in Acute Care and Long-term Care Settings at: http://www.phac-aspc.gc.ca/nois-sinp/guide/pubs-eng.php For further information for all types of influenza refer to: http://healthycanadians.gc.ca/diseases-conditions-maladies-affections/disease-maladie/flu-grippe/index-eng.php

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Pandemic Novel influenza viruses	Respiratory tract infection	Pandemic influenza precautions[r]	As seasonal	As seasonal	Unknown; possibly 1–7 days	Unknown, possibly up to 7 days	Duration of symptoms	[r] Refer to Canadian Pandemic Plan Annex F - Prevention and Control of Influenza During a Pandemic for All Healthcare Settings, available at: http://www.phac-aspc.gc.ca/cpip-pclcpi/ Refer to PHAC website for specific infection prevention and control guidance documents, available at: http://www.phac-aspc.gc.ca/nois-sinp/guide/pubs-eng.php and the Government of Canada website for influenza, available at: http://healthycanadians.gc.ca/diseases-conditions-maladies-affections/disease-maladie/flu-grippe/index-eng.php
Avian	Respiratory tract infection, conjunctivitis	Droplet and contact	Excreta of sick birds, possibly human respiratory tract secretions					For current information on Avian influenza, refer to Human Health Issues Related to Domestic Avian Influenza in Canada, available at: http://www.phac-aspc.gc.ca/publicat/daio-enia/9-eng.php and http://healthycanadians.gc.ca/diseases-conditions-maladies-affections/disease-maladie/flu-grippe/index-eng.php

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Lassa fever Refer to Viral hemorrhagic fever								
Legionella (*Legionella* spp.) Legionnaires' disease	Pneumonia, Legionnaires' disease, Pontiac fever	Routine			2–10 days;	Not person to person		Acquired from contaminated water sources (inhalation not ingestion)
Leprosy (Hansen's disease) (*Mycobacterium leprae*)	Chronic disease of skin, nerves, nasopharyngeal mucosa	Routine	Nasal secretions, skin lesions	Direct contact	9 months to 20 years			Transmitted between persons only with very prolonged extensive close personal contact Household contacts should be assessed and may be given prophylaxis
Leptospirosis (*Leptospira sp*.)	Fever, jaundice, aseptic meningitis	Routine			2–30 days	Direct person to person transmission is rare		Acquired from contact with animals
Lice (pediculosis) Head Body Pubic (crab) (*Pediculus capitas, Pediculus corporis, Pediculus humanus, Phthirus pubis*)	Scalp or body itch, itchy rash	Routine, plus gloves for direct patient contact only	Louse	Head and body lice: direct and indirect contact Pubic lice: usually sexual contact	6–10 days	Until effective treatment to kill lice and ova	Until 24 hours after application of appropriate pediculicide; applied as directed	Apply pediculicides as directed on label. If live lice found after therapy, repeat Head lice: wash headgear, combs, pillowcases, towels with hot water or dry clean or seal in plastic bag and store for 10 days. Body lice: as above, for all exposed clothing and bedding

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Listeriosis (*Listeria monocytogenes*)	Fever, meningitis Congenital or neonatal infection	Routine		Foodborne; Vertical mother to child in utero or at birth	mean 21 days; 3–70 days following a single exposure to an implicated food product			Pregnant women and immunocompromised persons should avoid cheese made with unpasteurized milk, cold cuts and uncooked meat products, including hot dogs Listeria grows well at low temperatures and is able to multiply in refrigerated foods that are contaminated Nosocomial outbreaks reported in newborn nurseries due to contaminated equipment or materials
Lyme disease (*Borrelia burgdorferi)*	Fever, arthritis, rash, meningitis	Routine		Tickborne	To initial rash: 3–32 days; mean 7–10 days	Not person to person		
Lymphocytic choriomeningitis virus	Aseptic meningitis	Routine	Urine of rodents		6–21 days	Not person to person		Acquired from contact with rodents
Lympho-granuloma venereum (*C. trachomatis serovars* L1, L2, L3)	Genital ulcers, inguinal adenopathy	Routine		Sexually transmitted	Range of 3–30 days for a primary lesion			
Malaria (*Plasmodium sp.)*	Fever	Routine	Blood	Mosquito-borne; rarely transplacental from mother to fetus; blood transfusion	Variable; 9–14 days for *P. falciparum*	Not normally person to person		Can be transmitted via blood transfusion

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Marburg virus Refer to Viral haemorrhagic fever								
Measles (Rubeola)	Fever, cough, coryza, conjunctivitis, maculopapular skin rash	Airborne	Respiratory secretions	Airborne	7–18 days to onset of fever; rarely as long as 21 days	5 days before onset of rash (1–2 days before onset of initial symptoms) until 4 days after onset of rash (longer in immuno-compromised patients)	4 days after start of rash; duration of symptoms in immuno-compromised patients	Only immune HCWs, caretakers and visitors should enter the room Respirator needed for non-immune persons who must enter Precautions should be taken with neonates born to mothers with measles infection at delivery Immunoprophylaxis is indicated for susceptible contacts Refer to Canadian Immunization Guide for specific information available at: http://healthycanadians.gc.ca/healthy-living-vie-saine/immunization-immunisation/canadian-immunization-guide-canadien-immunisation/index-eng.php

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
	Susceptible contact	Airborne	Respiratory secretions	Airborne		Potentially communicable during last 2 days of incubation period	From 5 days after first exposure through 21 days after last exposure regardless of postexposure prophylaxis	Only immune HCWs, caretakers and visitors should enter the room Respirator needed for non-immune persons who must enter Precautions should be taken with neonates born to mothers with measles infection at delivery Immunoprophylaxis is indicated for susceptible contacts
Melioidosis (*Pseudomonas pseudomallei*)	Pneumonia, fever	Routine	Contaminated soil		Variable			Organism in soil in Southeast Asia Person-to-person has not been proven
Meningococcus (*Neisserria meningitidis*)	Rash (petechial/purpuric) with fever Meningococcemia meningitis, pneumonia	Droplet	Respiratory secretions	Large droplet, direct contact	Usually 2–10 days		Until 24 hours of effective antimicrobial therapy has been received	Close contacts may need chemopropylaxis as per most recent NACI recommendations available at: http://www.phac-aspc.gc.ca/naci-ccni/index-eng.php and http://healthycanadians.gc.ca/publications/healthy-living-vie-saine/4-canadian-immunization-guide-canadien-immunisation/index-eng.php?page=13
Methicillin-resistant *Staphylococcus aureus* (MRSA) Refer to ARO								

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Molluscum contagiosum	Umbilicated papules	Routine	Contents of papules	Direct contact	2 weeks to 6 months	Unknown		Close direct personal contact needed for transmission
Monkeypox	Resembles smallpox; lymphadenopathy is a more predominant feature	Contact,[s] droplet and airborne	Lesions and respiratory secretions	Contact with infected animals; possible airborne transmission from animals to humans			[s]Contact: until all lesions crusted	[s]Transmission in hospital settings is unlikely. Refer to http://www.cdc.gov/ncidod/monkeypox for current recommendations
Mucormycosis (*phycomycosis; zygomycosis)* (Mucor, Zygomycetes)	Skin, wound, rhinocerebral, pulmonary, gastrointestinal, disseminated infection[t]	Routine	Fungal spores in dust and soil	Inhalation or ingestion of fungal spores	Unknown	Not person to person	Unknown	Acquired from spores in dust, soil [t]Infections in immunocompromised patients
Mumps	Swelling of salivary glands, orchitis, meningitis	Droplet	Saliva	Large droplets, direct contact	Usually 16–18 days; range 14–25 days	Viral excretion highest 2 days before to 5 days after onset or parotitis	Until 5 days after onset of parotitis	Droplet precautions for exposed susceptible patients/HCWs should begin 10 days after first contact and continue through 26 days after last exposure For outbreaks, refer to: http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/10vol36/36s1/index-eng.php
Mycobacterium non-TB (atypical)	Lymphadenitis; pneumonia; disseminated disease in immuno-compromised host	Routine			Unknown	Not person to person		Acquired from soil, water, animal, reservoirs

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Mycobacterium tuberculosis including *M. tuberculosis* subsp. canetti, *M. bovis, M. bovis* BCG, *M.africanum, M. caprae, M. microti and M. pinnipedii*	Confirmed or suspected respiratory (including pleural, laryngeal)	Airborne[u]	Respiratory secretions	Airborne	Weeks to years	While organisms is viable in sputum	Until deemed no longer infectious If confirmed, until patient has received 2 weeks of effective therapy, and is improving clinically, and has 3 consecutive sputum smears negative for acid fast bacilli, collected 8–24 hours apart with at least 1 early morning specimen If multi-drug-resistant TB, until sputum culture negative	TB in young children is rarely transmissible; due to lack of cavitary disease and weak cough Assess visiting family members for cough Canadian Tuberculosis Standards, http://www.phac-aspc.gc.ca/tbpc-latb/pubs/tb-canada-7/index-eng.php [u]AGMP, refer to strategies to reduce aerosol generation Part B, Section IV, subsection iii, 1b
	Nonpulmonary: meningitis, bone or joint infection with no drainage	Routine						Most patients with nonpulmonary disease alone are noncontagious; it is important to assess for concurrent pulmonary TB
	Nonpulmonary: skin or soft tissue draining lesions	Routine, Airborne[v]	Aerosolized wound drainage				While viable micro organisms are in drainage	[v]Airborne precautions if procedures that may aerosolize drainage are being performed

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
	PPD skin test positive with no evidence of current pulmonary disease	Routine		Non communicable				
Mycoplasma pneumoniae	Pneumonia	Droplet	Respiratory secretions	Large droplets	1–4 weeks	Unknown	Duration of symptoms	
Neisseria gonorrhoeae	Urethritis, cervicitis, pelvic inflammatory disease, arthritis, ophthalmia neonatorum, conjunctivitis	Routine		Sexual transmission Mother to child at birth Rarely: direct/indirect contact	2–7 days	May extend for months if untreated		
Neisseria meningitidis Refer to Meningococcus								
Nocardiosis (*Nocardia sp.)*	Fever, pulmonary or CNS infection or disseminated disease	Routine			Unknown	Not person to person		Acquired from organisms in dust, soil
Noroviruses (Norwalk-like agents, caliciviruses)	Nausea, vomiting, diarrhea	Contact	Feces	Direct and indirect contact (fecal/oral)	Usually 24–48 hours; range of 10–50 hours	Duration of viral shedding; usual 48 hours after diarrhea resolves	48 hours after resolution of illness	During outbreaks, special attention should be made to cleaning; hypchlorite solutions may be required if continued transmission Refer to Appendix VI 3. Viral Gastroenteritis
Orf (poxvirus)	Skin lesions	Routine			Generally 3–6 days	Not person to person		Acquired from infected animals.

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Parainfluenza virus	Respiratory tract infection	Droplet and contact	Respiratory secretions	Large droplets, direct and indirect contact	2–6 days	1-3 weeks	Duration of symptoms	May cohort if infected with same virus Patient should not share room with high-risk roommates
Parvovirus B-19 Human parvovirus	Erythema infectiosum (fifth disease), aplastic or erythrocytic crisis	Routine: fifth disease Droplet: aplastic crisis or chronic infection in immuno-compromised patient	Respiratory secretions	Large droplets, direct contact Vertical mother to fetus	4–21 days to onset of rash	Fifth disease: no longer infectious by the time the rash appears Aplastic crisis: up to 1 week after onset of crisis Immuno-compromised with chronic infection: months to years	Aplastic or erythrocytic crisis: 7 days Chronic infection in immuno-compromised patient: duration of hospitalization	
Pediculosis Refer to lice								
Pertussis (*Bordetella pertussis, Bordetella parapertussis*)	Whooping cough, non-specific respiratory tract infection in infants, adolescents and adults	Droplet	Respiratory secretions	Large droplets	Average 9–10 days; range 6–20 days	To 3 weeks after onset of paroxysms if not treated	To 3 weeks after onset of paroxysms if not treated; or until 5 days of appropriate antimicrobial therapy received	Close contacts (household and HCWs) may need chemoprophylaxis and/or immunization If HCWs immunization not up to date, refer to OH and/or delegate Refer to Canadian Immunization Guide for specific information available at: http://healthycanadians.gc.ca/healthy-living-vie-saine/immunization-immunisation/canadian-immunization-guide-canadien-immunisation/index-eng.php

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Pinworms Refer to Enterobiasis								
Plague (*Yersinia pestis)*	Bubonic (lymphadenitis)	Routine	Rodents and their fleas		1–7 days			
	Pneumonic (cough, fever, hemoptysis)	Droplet	Respiratory secretions	Large droplets	1–4 days	Until 48 hours of appropriate antimicrobial therapy received	Until 48 hours of appropriate antimicrobial therapy received	Close contacts and exposed HCWs may need prophylaxis
Pneumocystis jiroveci (carinii)	Pneumonia in immuno-compromised host	Routine		Unknown	Unknown			Ensure roommates are not immunocompromised
Poliomyelitis Infantile paralysis	Fever, aseptic meningitis, flaccid paralysis	Contact	Feces, respiratory secretions	Direct and indirect contact	3–35 days	Virus in the throat for approximately 1 week and in feces for 3–6 weeks	Until 6 weeks from onset of symptoms or until feces viral culture negative	Most infectious during the days before and after onset of symptoms Close contacts who are not immune should receive immunoprophylaxis
Prion disease Refer to Creutzfeldt-Jakob disease								
Psittacosis Refer to Chlamydia psittace								

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Q Fever (*Coxiella burnetii*)	Pneumonia, fever	Routine	Infected animals, milk	Direct contact with infected animals; raw milk Airborne from aerosolized contaminated dust	14–39 days	Not person to person		Acquired from contact with infected animals or from ingestion of raw milk
Rabies	Acute encephalomyelitis	Routine	Saliva	Mucosal or percutaneous exposure to saliva; corneal, tissue and organ transplantation	Usually 3–8 weeks, rarely as short as 9 days or as long as 7 years	Person-to-person transmission is theoretically possible, but rare and not well documented		Acquired from contact with infected animals Postexposure prophylaxis is recommended for percutaneous or mucosal exposure to saliva of rabid animal or patient
Rat bite fever Actinobacillus (formerly *Streptobacillus moniliformis)* *Spirillum minus*	Fever, arthralgia	Routine	Saliva of infected rodents; contaminated milk	Rodent bite, ingestion of contaminated milk	A. moniliformis days 3–10 days, rarely longer; S. minus 1–3 weeks	Not person-to-person		A. moniliformis: rats and other animals, contaminated milk S. minus: rats, mice only
Relapsing fever (*Borellia recurrentis*, other Borellia species)	Recurrent fevers	Routine		Vector-borne		Not person to person		Spread by ticks or lice
Respiratory syncytial virus (RSV)	Respiratory tract infection	Droplet and contact	Respiratory secretions	Large droplets, direct and indirect contact	2-8 days	Shortly before and for the duration of active disease	Duration of symptoms	May cohort if infected with same virus Patient should not share room with high-risk roommates
Rhinovirus	Respiratory tract infection, common cold	Contact and droplet	Respiratory secretions	Direct and indirect contact, possibly large droplets	2–3 days	Until symptoms cease	Duration of symptoms	May cohort if infected with same virus Patient should not share room with high-risk roommates
Rickettsialpox *(Rickettsia akari)*	Fever, rash	Routine		Mite-borne	9–14 days	Not person to person		Transmitted by mouse mites

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Ringworm Refer to Tinea								
Rocky Mountain spotted fever *(Rickettsia rickettsii)*	Fever, petechial rash, encephalitis	Routine		Tick-borne	3–14 days	Not transmitted from person to person, except rarely through transfusion		
Roseola infantum (HHV-6)	Rash, fever	Routine	Saliva	Direct contact	10 days	Unknown		Close direct personal contact needed for transmission
Rotavirus	Diarrhea	Contact	Feces	Direct and indirect contact (fecal/oral)	1–3 days	Duration of viral shedding	Duration of symptoms	
Roundworm Refer to Ascariasis								

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Rubella, acquired	Fever, maculopapular rash	Droplet	Respiratory secretions	Large droplets, direct contact	14–21 days	For about 1 week before and after onset of rash.	Until 7 days after onset of rash	Only immune HCWs, caretakers and visitors should enter the room Pregnant HCWs should not care for rubella patients, regardless of their immune status If it is essential for a non-immune person to enter the room, facial protection should be worn Droplet precautions should be maintained for exposed susceptible patients from 7 days after first contact through to 21 days after last contact Administer vaccine to exposed susceptible non-pregnant persons within 3 days of exposure Refer to Canadian Immunization Guide for specific information available at: http://healthycanadians.gc.ca/healthy-living-vie-saine/immunization-immunisation/canadian-immunization-guide-canadien-immunisation/index-eng.php Exclude susceptible HCWs from duty from day 7 after first exposure to day 21 after last exposure, regardless of postexposure vaccination

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Rubella, congenital	Congenital rubella syndrome	Droplet and contact	Respiratory secretions, urine	Direct and indirect contact; large droplets		Prolonged shedding in respiratory tract and urine; can be up to one year	Until one year of age, unless nasopharyngeal and urine cultures done after 3 months of age are negative	As per Rubella, acquired
Rubeola Refer to Measles								
Salmonella (including *Salmonella Typhi)*	Diarrhea, enteric fever, typhoid fever, food poisoning	ADULT: Routine[w] PAEDIATRIC: Contact	Feces	Direct and indirect contact (fecal/oral); foodborne	6–72 hours	Variable	Duration of symptoms	[w]Consider contact precautions for incontinent adults if stool cannot be contained or for adults with poor hygiene who contaminate their environment Contact precautions apply to children who are incontinent or unable to comply with hygiene
Scabies (*Sarcoptes scabiei)*	Itchy skin rash	Contact	Mite	Direct and indirect contact	Without previous exposure, 2–6 weeks; 1–4 days after re-exposure	Until mites and eggs are destroyed by treatment, usually after 1 or occasionally 2 courses of treatment, 1 week apart	Until 24 hours after initiation of appropriate therapy	Apply scabicide as directed on label. Wash clothes and bedding in hot water, dry clean or seal in a plastic bag, and store for 1 week Household contacts should be treated
Scarlet fever Refer to Group A Streptococcus								
Schistosomiasis (bilharziasis) (*Schistosoma sp.)*	Diarrhea, fever, itchy rash Hepatospleno-megaly, hematuria	Routine				Not person to person		Contact with larvae in contaminated water.

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Shigella	Diarrhea	ADULT: Routine[x] PAEDIATRIC: Contact	Feces	Direct and indirect contact (fecal/oral)	1–3 days	Usually 4 weeks if not treated	Duration of symptoms	[x]Consider contact precautions for incontinent adults if stool cannot be contained or for adults with poor hygiene who contaminate their environment Contact precautions apply to children who are incontinent or unable to comply with hygiene Treatment with effective antimicrobial shortens period of infectivity
Severe acute respiratory syndrome (SARS coronavirus)	Malaise, myalgia, headache, fever, respiratory symptoms (cough, increasing shortness of breath), pneumonia, acute respiratory distress syndrome	Contact and droplet [y] AGMP	Respiratory secretions, feces	Droplet, direct and indirect contact Aerosols during AGMP	3–10 days	Not yet determined; suggested to be less than 21 days	10 days following resolution of fever if respiratory symptoms have also resolved	[y]AGMP, Refer to strategies to reduce aerosol generation, refer to Part B, Section IV, subsection iii, 1b May cohort if infected with same virus Patient should not share room with high-risk roommates
Shingles Refer to Varicella zoster								

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Smallpox (variola virus) Generalized vaccinia, eczema vaccinatum Refer to Vaccinia for management of vaccinated persons	Fever, vesicular/pustular in appropriate epidemiologic context	Droplet, contact and airborne	Skin lesion exudate, oropharyngeal secretions	Airborne, direct and Indirect contact	7–10 days	Onset of mucosal lesions, until all skin lesions have crusted	Until all scabs have crusted and separated (3–4 weeks)	Immunization of HCWs was stopped in 1977 Refer to Canadian Immunization Guide for information regarding vaccine, http://healthycanadians.gc.ca/healthy-living-vie-saine/immunization-immunisation/canadian-immunization-guide-canadien-immunisation/index-eng.php NACI Statement on Smallpox Vaccination, http://www.collectionscanada.gc.ca/webarchives/20071122092132/http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/02vol28/index.html Care preferably should be provided by immune HCWs; non-vaccinated HCWs should not provide care if immune HCWs are available Respirator for all regardless of vaccination status
Sporotrichosis (*Sporothrix schenckii)*	Skin lesions, disseminated	Routine			Variable	Rare person to person		Acquired from spores in soil, on vegetation
Staphylococcus aureus (if methicillin-resistant, refer also to ARO)	Skin (furuncles, impetigo) wound or burn infection; abscess; scalded skin syndrome, osteomyelitis	MINOR: Routine MAJOR: Contact[z]	Drainage, pus	Direct and indirect contact	Variable	As long as organism is in the exudates or drainage	Until drainage resolved or contained by dressings	[z]MAJOR: drainage not contained by dressings

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
	Endometritis	Routine						
	Food poisoning	Routine		Foodborne				
	Pneumonia	ADULT: Routine PAEDIATRIC: Droplet	Respiratory secretions	Large droplets, direct contact	Variable		Until 24 hours of appropriate antimicrobial therapy received	
	Toxic shock syndrome	Routine						
Streptobacillus moniliformis disease Refer to Rat-bite fever								
Streptococcus pneumoniae	Pneumonia, meningitis and other	Routine			Variable			Normal flora
Streptococcus, Group A *(Streptococcus pyogenes)*	Skin (e.g., erysipelas, impetigo), wound or burn infection	MINOR: Routine MAJOR: Contact[aa]	Drainage, pus	Direct and indirect contact	1–3 days, rarely longer	As long as organism is in the exudates or drainage	Until 24 hours of appropriate antimicrobial therapy received	[aa]MAJOR: drainage not contained by dressings
	Scarlet fever, pharyngitis, in children	ADULT: Routine PAEDIATRIC: Contact and droplet	Respiratory secretions	Large droplets,	2–5 days	10–21 days if not treated	Until 24 hours of appropriate antimicrobial therapy received	
	Group A Streptococcus endometritis (puerperal fever)	Routine						

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
	Group A Streptococcus toxic shock, invasive disease (including necrotizing fasciitis, myositis, meningitis, pneumonia)	Droplet and contact	Respiratory secretions, wound drainage	Large droplets, direct or indirect contact			Until 24 hours of appropriate antimicrobial therapy received	Chemoprophylaxis may be indicated for close contacts of patients with invasive disease or toxic shock syndrome For further information refer to: http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/06vol32/32s2/index-eng.php
Streptococcus, Group B *(Streptococcus agalactiae)*	Group B Streptococcus newborn sepsis, pneumonia, meningitis	Routine		Mother to child at birth	Early onset: 1–7 days of age; late onset: 7 days to 3 months of age			Normal flora
Stronglyoides (*Stronglyoides stercoralis)*	Usually asymptomatic	Routine	Larvae in feces		Unknown	Rarely transmitted person to person		Infective larvae in soil May cause disseminated disease in immuno-compromised patient
Syphilis *(Treponema pallidum)*	Genital, skin or mucosal lesions, disseminated disease, neurological or cardiac disease; latent infection	Routine Gloves for direct contact with skin lesions	Genital secretions, lesion exudates	Direct contact with infectious exudates or lesions Sexual transmission, Intrauterine or intrapartum from mother to child	10–90 days; usually 3 weeks	When moist muco-cutaneous lesions of primary and secondary syphilis are present		

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Tapeworm *(Taenia saginata, Taenia solium, Diphyllobothrium latum)*	Usually asymptomatic	Routine	Larvae in food	Foodborne	Variable	Not transmissible person to person		Consumption of larvae in raw or undercooked beef or pork or raw fish; larvae develop into adult tapeworms in gastrointestinal tract Individuals with *T. solium* adult tapeworms may transmit cysticercosis to others
Tapeworm *(Hymenolepsis nana)*	Usually asymptomatic	Routine	Ova in rodent or human feces	Direct contact (fecal/oral)	2–4 weeks	While ova in feces		
Tetanus *(Clostridium tetani)*	Tetanus	Routine			1 day to several months	Not person to person		Acquired from spores in soil which germinate in wounds, devitalized tissue
Tinea (Dermatophytosis) *(Trichophyton sp., Microsporom sp., Epidermophyton sp., Malassezia furor)*	Ringworm (skin, beard, scalp, groin, perineal region); athletes foot; pityriasis versicolor	Routine	Organism in skin or hair	Direct skin-to-skin contact	Variable; 4–14 days	While lesion present		May be acquired from animals, shared combs, brushes, clothing, hats, sheets, shower stalls
Toxic shock syndrome Refer to S. aureus, Group A Streptococcus								
Toxocariasis (*Toxocara canis, Toxocara cati)*	Fever, wheeze, rash, eosinophilia	Routine	Ova in dog/cat feces		Unknown	Not person to person		Acquired from contact with dogs, cats

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Toxoplasmosis (*Toxoplasma gondii)*	Asymptomatic, fever, lymphadenopathy; retinitis, encephalitis in immuno-compromised host; congenital infection	Routine		Intrauterine transmission from mother to foetus; transplantation of stem cells or organs	5–23 days			Acquired by contact with infected felines or soil contaminated by felines, consumption of raw meat, contaminated raw vegetables or contaminated water
Trachoma Refer to *Chlamydia trachomatis*								
Transmissible spongiform encephalopathy Refer to Creutzfeld-Jacob disease								
Trench fever *(Bartonella quintana)*	Relapsing fevers, rash	Routine	Feces of human body lice	Louse-borne	7–30 days	Not person to person in the absence of lice		
Trichinosis *(Trichinella spiralis)*	Fever, rash, diarrhea	Routine	Infected meat	Food-borne	5–45 days	Not person to person		Acquired from consumption of infected meat
Trichomoniasis (*Trichomonas vaginalis)*	Vaginitis	Routine		Sexually transmitted	4–20 days	Duration of infection		
Trichuriasis (whipworm) *(Trichuris trichiura)*	Abdominal pain, diarrhea	Routine			Unknown	Not person to person		Ova must hatch in soil to be infective

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Tuberculosis (TB) Refer to *Mycobacterium tuberculosis*								
Tularemia *(Francisella tularensis)*	Fever, lymphadenopathy, pneumonia	Routine			1–14 days	Not person to person		Acquired from contact with infected animals *F. tularensis* is hazardous to laboratory workers; notify laboratory if diagnosis is suspected
Typhoid/ paratyphoid fever Refer to Salmonella								
Typhus fever *(Rickettsia typhi) Endemic flea-borne typhus*	Fever, rash	Routine	Rat fleas	Flea borne	From 1–2 weeks, commonly 12 days	Not transmitted person to person		
Rickettsia prowazekii Epidemic louse-borne fever	Fever, rash	Routine	Human body louse	Louse borne	1–2 weeks			Person-to-person through close personal contact, not transmitted in absence of louse

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Vaccinia	Range of adverse reactions to the smallpox vaccine (e.g., eczema vaccinatum, generalized or progressive vaccinia, other)	Contact	Skin exudates	Direct and indirect contact	3–5 days	Until all skin lesions resolved and scabs separated	Until all skin lesions dry and crusted and scabs separated	Vaccinia may be spread by touching a vaccination site before it has healed or by touching bandages or clothing that may have been contaminated with live virus from the smallpox vaccination site. Immunization of HCWs was stopped in 1977. Refer to Canadian Immunization Guide for information regarding vaccine, http://healthycanadians.gc.ca/healthy-living-vie-saine/immunization-immunisation/canadian-immunization-guide-canadien-immunisation/index-eng.php NACI Statement on Smallpox Vaccination, http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/02vol28/28sup/acs1.html
Vancomycin-resistant enterococci (VRE)	Infection or colonization of any body site	Contact	Infected or colonized secretions, excretions	Direct and indirect contact	Variable	Duration of colonization	As directed by ICP	Enterococci persist in the environment; pay special attention to cleaning Refer to Appendix VI, 2. ARO
Vancomycin-resistant S. aureus (VRSA) Theoretical; to date, not reported	Infection or colonization of any body site	Contact	Infected or colonized secretions, excretions	Direct and indirect contact	Variable	Duration of colonization	As directed by ICP	Local public health authorities should be notified immediately Refer to Appendix VI, 2. ARO.

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Varicella zoster virus Varicella (chickenpox)	Fever with vesicular rash	Airborne and contact	Skin lesion drainage, respiratory secretions	Airborne, direct and indirect contact	10–21 days	1–2 days before rash and until skin lesions have crusted May be prolonged in immuno-compromised patients	Until all lesions have crusted and dried	HCWs, roommates and caregivers should be immune to chickenpox No additional precautions for pregnant HCWs Respirators for non-immune persons that must enter Susceptible high-risk contacts should receive varicella zoster immunoglobulin as soon as possible, latest within 96 hours of exposure Varicella zoster immunoglobulin may extend the incubation period to 28 days Refer to Canadian Immunization Guide for specific information, available at: http://healthycanadians.gc.ca/healthy-living-vie-saine/immunization-immunisation/canadian-immunization-guide-canadien-immunisation/index-eng.php

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Herpes zoster (shingles), disseminated	Vesicular skin lesions	Airborne and Contact	Vesicle fluid, respiratory secretions	Airborne, direct and indirect contact		Until all lesions have crusted and dried	Until all lesions have crusted and dried	HCWs, roommates and caregivers should be immune to chickenpox Respirators for non-immune persons that must enter Susceptible high-risk contacts should receive varicella zoster immunoglobulin as soon as possible, latest within 96 hours of exposure Varicella zoster immunoglobulin may extend the incubation period to 28 days
Herpes zoster, localized Immuno-compromised host	Vesicular skin lesions in dermatomal distribution	Airborne and contact	Vesicle fluid	Direct and indirect contact, airborne		Until all lesions have crusted and dried and disseminated infection is ruled out	Until 24 hours after antiviral therapy started; then as for localized zoster in normal host	Localized zoster may disseminate in immunocompromised host if not treated HCWs, roommates and caregivers should be immune to chickenpox Susceptible high-risk contacts should receive varicella zoster immunoglobulin as soon as possible, latest within 96 hours of exposure Varicella zoster immunoglobulin may extend the incubation period to 28 days
Herpes zoster, localized Normal host	Vesicular skin lesions in dermatomal distribution	Routine Contact[bb] and airborne	Vesicle fluid	Direct and indirect contact, possibly airborne		Until all lesions have crusted and dried	Until all lesions have crusted and dried	[bb]Consider contact and airborne for cases of extensive localized zoster that cannot be covered, in situations where there are varicella susceptible patients/HCWs.

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Varicella or herpes zoster contact	Susceptible contact	Airborne	Respiratory secretions	Airborne	10–21 days	Potentially communicable during last 2 days of incubation period	From 8 days after first contact until 21 days after last contact with rash, regardless of postexposure vaccination (28 days if given varicella zoster immuno-globulin)	Airborne precautions should be taken with neonates born to mothers with varicella onset <5 days before delivery HCWs, roommates and caregivers should be immune to chickenpox
Variola Refer to smallpox								
Vibrio parahaemolyticus enteritis	Diarrhea, food poisoning	Routine	Contaminated food, especially seafood	Foodborne	Between 12 and 24 hours; range from 4–30 hours			
Vincent's angina (trench mouth)		Routine						
Viral hemorrhagic fevers (Lassa, Ebola, Marburg, Crimean-Congo viruses)	Hemorrhagic fever	Contact and droplet AGMP[cc]	Blood and bloody body fluids, respiratory secretions Lassa: urine	Direct and Indirect contact Lassa: Sexual contact	Lassa: 1–3 weeks Ebola: 2–21 days	Unknown, possibly several weeks Lassa virus may be excreted in urine for 3–9 weeks after onset	Until symptoms resolve	Local public health authorities should be notified immediately. [cc] AGMP necessary: refer to strategies to reduce aerosol generation, refer to Part B, Section IV, subsection iii, 1b
West Nile virus Refer to Arboviruses								
Whipworm Refer to Trichuriasis								

Microorganism	Clinical presentation	Precautions	Infective material	Route of transmission	Incubation period	Period of communicability	Duration of precautions	Comments
Whooping cough Refer to Pertussis								
Yersinia enterocolitica; Y. pseudotuberculosis	Diarrhea, mesenteric adenitis	ADULT: Routine[dd] PAEDIATRIC: Contact	Feces	Direct and indirect contact (fecal/oral); foodborne	3–7 days, generally under 10 days	Duration of excretion in stool	Duration of symptoms	[dd]Consider contact precautions for incontinent adults if stool cannot be contained or for adults with poor hygiene who contaminate their environment Contact precautions apply to children who are incontinent or unable to comply with hygiene
Zoster Refer to Varicella (Herpes zoster)								
Zygomycosis (Phycomycosis) Refer to Mucormycsis								

Part D: Appendices

Appendix I: PHAC infection prevention and control guideline development process

Literature search–inclusions/exclusions

A thorough literature search was performed by the Public Health Agency of Canada covering the period from 1999 onward. Details of the literature search are available upon request.

Formulation of recommendations

This guideline provides evidence-based recommendations that were graded to differentiate from those based on strong evidence to those based on weak evidence. Grading did not relate to the importance of the recommendation, but to the strength of the supporting evidence and, in particular, to the predictive power of the study designs from which that data were obtained. Assignment of a level of evidence and determination of the associated grade for the recommendation were prepared in collaboration with the chair and members of the Guideline Working Group. When a recommendation was not unanimous, the divergence of opinion, along with the rationale was formally recorded for the information audit trail. It is important to note that no real divergence of opinion occurred for this guideline; however, when a difference of opinion did occur, discussions took place and a solution was found and accepted.

Where scientific evidence was lacking, the consensus of experts was used to formulate a recommendation. The grading system is outlined in Appendix II and Appendix III.

External review by stakeholders

Opportunity for feedback on the quality and content of the guideline was offered to external stakeholder groups before its release. The list of stakeholders is as follows:

- Accreditation Canada
- Association des Infirmières en Prévention des Infections du Québec
- Association des Médecins Microbiologiste Infectiologues du Québec en Prévention des Infections du Québec
- Association for Emergency Medical Services

- Association of Medical Microbiology and Infectious Disease Canada
- Canadian Association of Schools of Nursing
- Canadian Federation of Nurses Unions
- Canadian College of Health Service Executives
- Canadian Healthcare Association
- Canadian Home Care Association
- Canadian Medical Association
- Canadian Nurses Association
- Canadian Occupational Health Nurses Association Incorporated
- Canadian Patient Safety Institute
- Canadian Public Health Association
- Community and Hospital Infection Control Association (CHICA) – Canada
- Community Health Nurses Association of Canada
- Emergency Medical Services Chiefs of Canada
- Victorian Order of Nurses

Editorial independence

This guideline was funded by the Public Health Agency of Canada.

All members of the Guideline Working Group have declared no competing interest in relation to the guideline. It was incumbent upon each member to declare any interests or connections with relevant pharmaceutical companies or other organizations if their personal situation changed.

This guideline is part of a series that has been developed over a period of years under the guidance of the 2008 Steering Committee on Infection Prevention and Control Guidelines. The following individuals formed the Steering Committee:

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Appendix II: Definition of terms used to evaluate evidence[498]

Criteria	Decision	Description
Strength of study design (Note: "x > y" means x is a stronger design than y)	Strong	Meta-analysis › Randomized controlled trial > controlled clinical trial = lab experiment > controlled before–after
	Moderate	Cohort > case–control > interrupted time series with adequate data collection points > cohort with non-equivalent comparison group
	Weak	Uncontrolled before-after > interrupted time series with inadequate data collection points > descriptive (cross-sectional > ecological)
Quality of the study	High	No major threats to validity (bias, chance and confounding have been adequately controlled and ruled out as alternate explanation for the results)
	Medium	Minor threats to validity that do not seriously interfere with ability to draw a conclusion about the estimate of effect
	Low	Major threat(s) to validity that interfere(s) with ability to draw a conclusion about the estimate of effect
Number of studies	Multiple	Four or more studies
	Few	Three or fewer studies
Consistency of results	Consistent	Studies found similar results
	Inconsistent	Some variation in results but overall trend related to the effect is clear
	Contradictory	Varying results with no clear overall trend related to the effect
Directness of evidence	Direct evidence	Comes from studies that specifically researched the association of interest
	Extrapolation	Inference drawn from studies that researched a different but related key question or researched the same key question but under artificial conditions (e.g., some lab studies)

Note: Some *outbreak investigations* and reports include a group comparison/study within the report, and thus are analytic studies. Such studies should be assigned a "strength of design" rating and appraised using the Analytic Study Critical Appraisal Tool Kit. The majority of outbreak studies do not involve group comparisons, and thus are descriptive studies. *Case series, case reports and outbreak reports* that do not include a group comparison are not considered studies and therefore are not assigned a "strength of design" rating when appraised. *Modelling studies* are not considered in this ranking scheme, but appraisers need to look at the quality of the data on which the model is based.

Appendix III: PHAC criteria for rating evidence on which recommendations are based[(498)]

Grade of Evidence		
Strength of evidence	Grades	Type of evidence
Strong	AI	Direct evidence from meta-analysis or multiple strong design studies of high quality, with consistency of results
	AII	Direct evidence from multiple strong design studies of medium quality with consistency of results or At least one strong design study with support from multiple moderate design studies of high quality, with consistency of results or At least one strong design study of medium quality with support from extrapolation from multiple strong design studies of high quality, with consistency of results
Moderate	BI	Direct evidence from multiple moderate design studies of high quality, with consistency of results or Extrapolation from multiple strong design studies of high quality, with consistency of results
	BII	Direct evidence from any combination of strong or moderate design studies of high/medium quality, with a clear trend but some inconsistency of results or Extrapolation from multiple strong design studies of medium quality or moderate design studies of high/medium quality, with consistency of results or One strong design study with support from multiple weak design studies of high/medium quality, with consistency of results
Weak	CI	Direct evidence from multiple weak design studies of high/medium quality, with consistency of results or Extrapolation from any combination of strong/moderate design studies of high/medium quality, with inconsistency of results
	CII	Studies of low quality, regardless of study design or Contradictory results, regardless of study design or Case series/case reports or Expert opinion

Appendix IV: List of abbreviations and acronyms

ABHR(s)	Alcohol-based hand rub(s)
ACH	Air changes per hour
AIIR(s)	Airborne infection isolation room(s)
AGMP(s)	Aerosol-generating medical procedure(s)
AMR	Antimicrobial resistance
ARO(s)	Antibiotic-resistant organism(s)
CDC	Centers for Disease Control and Prevention
CDI	*Clostridium difficile* infection
CJD	Creutzfeldt-Jakob disease
CNISP	Canadian Nosocomial Infection Surveillance Program
CoV	Coronavirus
HAI(s)	Healthcare-associated infection(s)
HCW(s)	Healthcare worker(s)
HHV-6	Human herpes virus 6
HIV	Human immunodeficiency virus
HSV	Herpes simplex virus
ICP(s)	Infection control practitioner/professional(s)
ICU(s)	Intensive care unit(s)
IPC	Infection prevention and control
LTC	Long-term care
MRSA	Methicillin-resistant *Staphylococcus aureus*
OH	Occupational Health
ORA	Organizational risk assessment
PCRA	Point-of-care risk assessment
PPE	Personal protective equipment
RSV	Respiratory syncytial virus
SARS	Severe acute respiratory syndrome
SUDs	Single use device(s)
VRE	Vancomycin-resistant enterococci

Appendix V: Glossary of terms

Acute care – A facility where a variety of inpatient services are provided, which may include surgery and intensive care. For the purpose of this document, acute care includes ambulatory care settings such as hospital emergency departments, and free-standing or facility-associated ambulatory (day) surgery or other invasive day procedures (e.g., endoscopy units, hemodialysis, ambulatory wound clinics).

Additional precautions – Extra measures, when routine practices alone may not interrupt transmission of an infectious agent. They are used in addition to routine practices (not in place of), and are initiated both on condition/clinical presentation (syndrome) and on specific etiology (diagnosis).

Aerosols – Solid or liquid particles suspended in the air, whose motion is governed principally by particle size, which ranges from 10 µm–100 µm. Stellman JM, editor. Encyclopaedia of occupational health and safety. 4th ed. Geneva:International Labour Office; 1998 (cited 2011 April 1). Available from: www.ilocis.org/en/contilo.html[499]. (Note: Particles less than 10 µm [i.e., droplet nuclei] can also be found in aerosols; however, their motion is controlled by other physical parameters).

Refer to Aerosol-generating medical procedures

Aerosol-generating medical procedures (AGMPs) – Aerosol-generating medical procedures are medical procedures that can generate aerosols as a result of artificial manipulation of a person's airway[148]. There are several types of AGMPs associated with a documented increased risk of TB or SARS transmission: Intubation and related procedures (e.g., manual ventilation, open endotracheal suctioning); cardiopulmonary resuscitation; bronchoscopy; sputum induction; nebulized therapy; non-invasive positive pressure ventilation (continuous or bi-level positive airway pressure).

There is debate about whether other medical procedures result in the generation of aerosols through cough induction and lead to transmission of infection. However, there is no published literature that documents the transmission of respiratory infections (including TB, SARS and influenza) by these methods. Examples of these procedures include: high-frequency oscillatory ventilation; tracheostomy care; chest physiotherapy; nasopharyngeal swabs, nasopharyngeal aspirates.

Airborne exposure – Exposure to aerosols capable of being inhaled.

Airborne infection isolation room (AIIR) – Formerly, negative pressure isolation room. An AIIR is a single occupancy patient care room used to isolate persons with a suspected or confirmed airborne infectious disease. Environmental factors are controlled in AIIRs to minimize the transmission of infectious agents that are usually transmitted from person to person by droplet nuclei associated with coughing or aerosolization of contaminated fluids. AIIRs should provide negative pressure in the room (so that no air flows out of the room

into adjacent areas) and direct exhaust of air from the room to the outside of the building or recirculation of air through a HEPA filter before returning to circulation[207].

Airborne transmission – Transmission of microorganisms via inhalation of aerosols that results in an infection in a susceptible host[124].

Alcohol – An organic chemical containing one or more hydroxyl groups. Alcohols can be liquids, semisolids or solids at room temperature[217].

Alcohol-based hand rub (ABHR) – An alcohol-containing preparation (liquid, gel or foam) designed for application to the hands to remove or kill microorganisms. Such preparations contain one or more types of alcohol (e.g., ethanol, isopropanol or *n*-propanol), and may contain emollients and other active ingredients. ABHRs with a concentration above 60% and up to 90% are appropriate for clinical care (refer to the PHAC IPC guideline *Hand Hygiene Practices in Healthcare Settings*)[217].

Ambulatory care – A location where health services are provided to patients who are not admitted to inpatient hospital units, including but not limited to outpatient diagnostic and treatment facilities (e.g., diagnostic imaging, phlebotomy sites, pulmonary function laboratories), community health centres/clinics, physician's offices and offices of allied health professionals (e.g., physiotherapy).

Antimicrobial-resistant organisms (AROs) – A microorganism that has developed resistance to the action of one or more antimicrobial agents of special clinical or epidemiologic significance. As such, microorganisms that are considered antimicrobial-resistant can vary over time and place. Examples of microorganisms included in this group are MRSA and VRE. Other microorganisms may be added to this list if antibiotic resistance is judged to be significant in a specific healthcare facility or patient population, at the discretion of the IPC program or local, regional or national authorities.

Asepsis – The absence of pathogenic (disease-producing) microorganisms[500].

Aseptic technique – The purposeful prevention of transfer of microorganisms from the patient's body surface to a normally sterile body site or from one person to another by keeping the microbe count to an irreducible minimum. Also referred to as sterile technique[500;501].

Biomedical waste – Waste generated within a healthcare facility that warrants special handling and disposal because it presents a particular risk of disease transmission.

Materials shall be considered biomedical waste if

a. they are contaminated with blood or body fluids containing visible blood and
b. when compressed, they release liquid[275].

Cleaning – The physical removal of foreign material (e.g., dust, soil, organic material such as blood, secretions, excretions and microorganisms). Cleaning physically removes rather than kills microorganisms. It is accomplished using water and detergents in conjunction with mechanical action[438].

Colonization – Presence of microorganisms in or on a host with growth and multiplication but without tissue invasion or cellular injury[216].

Cohort – Physically separating (e.g., in a separate room or ward) two or more patients exposed to, or infected with, the same microorganism from other patients who have not been exposed to, or infected with, that microorganism[502].

Cohort staffing – The practice of assigning specific personnel to care only for patients known to be exposed to, or infected with, the same microorganism. Such personnel would not participate in the care of patients who have not been exposed to, or infected with, that microorganism[502].

Complex continuing care – The individual's chronic and complex condition needs continuing medical management, skilled nursing, and a range of interdisciplinary, diagnostic, therapeutic and technological services. The individual requiring complex care will have failure of a major physiological system, which may lead to functional or acute medical problems. Chronicity describes the condition or conditions that are assessed to be long-standing, and recurrent or fluctuating through periods of exacerbation. In some cases, the condition will be progressive in nature. An acute condition may accompany the chronic condition.

Contact exposure – Contact exposure occurs when infectious agents are transferred through physical contact between an infected source and a host or through the passive transfer of the infectious agent to a host via an intermediate object.

Contact transmission (direct or indirect) – Contact transmission occurs when contact exposure leads to an infectious dose of viable microorganisms from an infected/contaminated source, resulting in colonization and/or infection of a susceptible host.

Refer to Direct contact, indirect contact.

Cough etiquette – Refer to Respiratory hygiene.

Critical items – Instruments and devices that enter sterile tissues, including the vascular system. Reprocessing critical items, such as surgical equipment or intravascular devices, involves meticulous cleaning followed by sterilization[246].

Decontamination – The removal of microorganisms to leave an item safe for further handling[438].

Designated hand washing sink – A sink used only for handwashing.

Direct contact – Transmission is the transfer of microorganisms via direct physical contact between an infected or colonized individual and a susceptible host (body surface to body surface). Transmission may result in infection.

Disinfectant – Product used on inanimate objects to reduce the quantity of microorganisms to an acceptable level. Hospital-grade disinfectants need a Drug Identification Number (DIN) for sale in Canada.

Disinfection – The inactivation of disease-producing microorganisms with the exception of bacterial spores[438]. Hospital-grade disinfectants are used on inanimate objects and need a drug identification number (DIN) for sale in Canada.

High-level disinfection is the level of disinfection needed when processing semi-critical items. High-level disinfection processes destroy vegetative bacteria, mycobacteria, fungi and enveloped (lipid) and non-enveloped (non-lipid) viruses, but not necessarily bacterial spores.

Low-level disinfection is the level of disinfection needed when processing non-critical items or some environmental surfaces. Low-level disinfectants kill most vegetative bacteria and some fungi, as well as enveloped (lipid) viruses (e.g., influenza, hepatitis B and C and HIV). Low-level disinfectants do not kill mycobacteria or bacterial spores.

Droplet – Solid or liquid particles suspended in the air, whose motion is governed principally by gravity and whose particle size is greater than 10 µm. Droplets are generated primarily as the result of an infected source coughing, sneezing or talking[24].

Droplet exposure – Droplet exposure may occur when droplets that contain an infectious agent are propelled a short distance (i.e., within two metres)[122-124] through the air and are deposited on the mucous membranes of the eyes, nose or mouth of a host.

Droplet nucleus – A droplet nucleus is the airborne particle resulting from a potentially infectious (microorganism-bearing) droplet from which most of the liquid has evaporated, allowing the particle to remain suspended in the air[503;507]. (Note: Droplet nuclei can also be found in aerosols; however, their motion is controlled by physical parameters including gravity and air currents).

Droplet transmission – Transmission that occurs when the droplets that contain microorganisms are propelled a short distance (within two metres) through the air and are deposited on the mucous membranes of another person, leading to infection of the susceptible host[24]. Droplets can also contaminate surfaces and contribute to contact transmission (Refer to Contact transmission).

Drug identification number – The number located on the label of prescription and over-the-counter drug products that have been evaluated by the Therapeutic Products Directorate and approved for sale in Canada.

Emerging respiratory infections – Acute respiratory infections of significant public health importance, including infections caused by either re-emergence of known respiratory pathogens (e.g., SARS) or emergence of as yet unknown pathogens (e.g., novel influenza viruses).

Eye Protection – Eye protection may include masks with built-in eye protection, safety glasses or face shields.

Exposure – The condition of being in contact with a microorganism or an infectious disease in a manner such that transmission may occur[219].

Facial protection – Facial protection includes masks and eye protection, or face shields, or masks with visor attachment.

Facilities – Refer to Healthcare facility.

Febrile respiratory illness – Febrile respiratory infection is a term used to describe a wide range of droplet and contact spread respiratory infections, which usually present with symptoms of a fever >38 °C and new or worsening cough or shortness of breath. Neonates, the elderly, and those who are immunocompromised may not have fever in association with a respiratory infection.

Fit check – Refer to Seal check.

Fit-testing – The use of a qualitative or quantitative method to evaluate the fit of a specific make, model and size of respirator on an individual[233] (Refer also to Seal check).

Fomites – Inanimate objects in the environment that may become contaminated with microorganisms and serve as vehicles of transmission[217].

Hand antisepsis – A process for the removal or killing of transient microorganisms on the hands[504] using an antiseptic; also referred to as antimicrobial or antiseptic handwash, antiseptic hand-rubbing or hand antisepsis/disinfection/decontamination.

Hand hygiene – A comprehensive term that refers to handwashing or hand antisepsis and to actions taken to maintain healthy hands and fingernails[217].

Handwashing – A process for the removal of visible soil/organic material and transient microorganisms from the hands by washing with soap (plain or antiseptic) and water[217].

Handwashing sink – Refer to designated handwashing sink.

Hazard – A term to describe a condition that has the potential to cause harm. Work-related hazards faced by HCWs are classified in categories: biologic and infectious, chemical, environmental, mechanical, physical, violence and psychosocial[283].

Healthcare-associated infection (HAI) – Infections that are transmitted within a healthcare setting (also referred to as nosocomial) during the provision of health care.

Healthcare facilities – Include but are not limited to acute-care hospitals, emergency departments, rehabilitation hospitals, mental health hospitals, and LTC facilities.

Healthcare organizations – The organizational entity that is responsible for establishing and maintaining health care services provided by HCWs and other staff in one or more healthcare settings throughout the healthcare continuum.

Healthcare setting – Any location where health care is provided, including emergency care, prehospital care, hospital, LTC, home care, ambulatory care and facilities and locations in the community where care is provided, (e.g., infirmaries in schools, residential or correctional facilities). (Note: Definitions of settings overlap, as some settings provide a variety of care, such as chronic care or ambulatory care provided in acute care, and complex care provided in LTC).

Refer to Acute care, Ambulatory care, Complex continuing care, Home care, Long-term care, Prehospital care.

Healthcare workers (HCWs) – Individuals who provide health care or support services, such as nurses, physicians, dentists, nurse practitioners, paramedics and sometimes emergency first responders, allied health professionals, unregulated healthcare providers, clinical instructors and students, volunteers and housekeeping staff. Healthcare workers have varying degrees of responsibility related to the health care they provide, depending on their level of education and their specific job/responsibilities.

Hierarchy of controls – There are three levels/tiers of IPC and OH controls to prevent illness and injury in the workplace: engineering controls, administrative controls, and PPE[505;506].

Home care – Home care is the delivery of a wide range of health care and support services to patients in a variety of settings for health restoration, health promotion, health maintenance, respite, palliation and to prevent/delay admission to long-term residential care. Home care is delivered where patients reside (e.g., homes, retirement homes, group homes and hospices).

Immunocompromised – This term refers to patients with congenital or acquired immunodeficiency or immunodeficiency due to therapeutic agents or hematologic malignancies.

Indirect contact – Transmission is a passive transfer of microorganisms to a susceptible host via an intermediate object, such as contaminated hands that are not cleaned between episodes of patient care, contaminated instruments that are not cleaned between patients/uses or other contaminated objects in the patient's immediate environment.

Infection – Situation in which microorganisms are able to multiply within the body and cause a response from the host's immune defences. Infection may or may not lead to clinical disease[507].

Infection control professional/practitioner (ICP) – A healthcare professional (e.g., nurse, medical laboratory technologist) with responsibility for functions of the IPC program. This individual, who should have specific IPC training, is referred to as an ICP[416].

Infectious agent – Terminology used to describe a microorganism or a pathogen capable of causing diseases (infection) in a source or a host. Synonymous with microorganism for the purposes of this document.

Infectious waste – Refer to Biomedical waste.

Influenza-like illness – A constellation of symptoms which may be exhibited by individuals prior to the confirmation of influenza.

Long-term care – A facility that includes a variety of activities, types and levels of skilled nursing care for individuals requiring 24-hour surveillance, assistance, rehabilitation, restorative and/or medical care in a group setting that does not fall under the definition of acute care. These units and facilities are called by a variety of terms from province to province and territory to territory, and include but are not limited to extended, transitional, subacute, chronic, continuing, complex, residential, rehabilitation, and convalescence care and nursing homes.

Mask – A barrier to prevent droplets from an infected source from contaminating the skin and mucous membranes of the nose and mouth of the wearer, or to trap droplets expelled by the wearer, depending on the intended use. The mask should be durable enough so that it will function effectively for the duration of the given activity. The term "mask" in this document refers to surgical or procedure masks, not to respirators.

Microorganisms – Refer to Infectious agent.

Mode of transmission – Mechanism by which an infectious agent is spread (e.g., by contact, droplets or aerosols).

N95 Respirator – A disposable, (Note: most respirators used for health care purposes are disposable filtering face pieces covering mouth, nose and chin) particulate respirator. Airborne particles are captured from the air on the filter media by interception, inertial impaction, diffusion and electrostatic attraction. The filter is certified to capture at least 95% of particles at a diameter of 0.3 microns; the most penetrating particle size. Particles of smaller and larger sizes are collected with greater efficiency. The "N" indicates a respirator that is not oil-resistant or oil-proof. N95 respirators are certified by the National Institute for Occupational Health and Safety (NIOSH - organization based in the United States) and must be so stamped on each respirator [National Institute for Occupational Health and Safety (NIOSH). NIOSH respirator selection logic 2004. 2004. Report No.: 2005-100][(508)] (Refer also to Respirator).

Natural ventilation – Natural ventilation uses natural forces to introduce and distribute outdoor air into a building. These natural forces can be wind pressure or pressure generated by the density difference between indoor and outdoor air[(148)].

Non-critical items – Items that touch only intact skin but not mucous membranes. Reprocessing of non-critical items involves thorough cleaning and/or low-level disinfection.

Nosocomial infection – Refer to Healthcare-associated infection.

Occupational health (OH) – For the purposes of this document, this phrase refers to the disciplines of Occupational Health medicine and nursing, Occupational Hygiene and Occupational Health and Safety.

Occupational health and safety – "Occupational Health and Safety" is a legal term that is defined in legislation, regulation and/or workplace (e.g., union) contracts that impact a variety of disciplines concerned with protecting the safety, health and welfare of people engaged in work or employment. The use of the phrase "Occupational Health and Safety" invariably refers back to legislation and or regulation that influences workplace safety practices. The definition, and therefore the content encompassed by "OHS" legislation varies significantly between and within jurisdictions in Canada.

Outbreak – An excess over the expected incidence of disease within a geographic area during a specified time period, synonymous with epidemic[216].

Organizational risk assessment (ORA) – The activity whereby a healthcare organization identifies:

a. hazard
b. the likelihood and consequence of exposure to the hazard and
c. the likely means of exposure to the hazard
d. and the likelihood of exposure in all work areas in a facility/office/practice setting; and then
e. evaluates available engineering, administrative and PPE controls needed to minimize the risk of the hazard.

Patient – For the purposes of this document, the term "patient" will include those receiving health care, including patients, clients and residents.

Patient environment – Inanimate objects and surfaces in the proximate environment of the patient that may be a source of or may be contaminated by microorganisms.

Patient zone – Concept related to the "geographical" area containing the patient and his/her immediate surroundings[504].

Personal protective equipment (PPE) – One element in the hierarchy of controls[505;506]. Personal protective equipment consists of gowns, gloves, masks, facial protection (i.e., masks and eye protection, face shields or masks with visor attachment) or respirators that can be used by HCWs to provide a barrier that will prevent potential exposure to infectious microorganisms.

Plain soap – Detergent-based cleansers in any form (bar, liquid, leaflet or powder) used for the primary purpose of physical removal of soil and contaminating or transient microorganisms. Such soaps work principally by mechanical action and have weak or no antimicrobial activity. Although some soaps contain low concentrations of antimicrobial ingredients, these are used as preservatives and have minimal effect on reducing colonizing flora[509].

Point-of-care – The place where three elements occur together: the patient, the healthcare worker and care or treatment involving contact with the patient or his/her surroundings (within the patient zone) Point-of- care products should be accessible without leaving the patient zone[504].

Point-of-care risk assessment (PCRA) – A PCRA is an activity whereby HCWs (in any healthcare setting across the continuum of care):

1) Evaluate the likelihood of exposure to an infectious agent
    a. for a specific interaction
    b. with a specific patient
    c. in a specific environment (e.g., single room, hallway)
    d. under available conditions (e.g., no designated handwashing sink)
2) Choose the appropriate actions/PPE needed to minimize the risk of exposure for the specific patient, other patients in the environment, the HCW, other staff, visitors, contractors, etc. (Note: Healthcare workers have varying degrees of responsibility related to a PCRA, depending on the level of care they provide, their level of education and their specific job/responsibilities).

Precautions (including source control measures) – Interventions to reduce the risk of transmission of microorganisms between persons in healthcare settings, including patients, HCWs, other staff, volunteers and contractors etc.

Prehospital care – Acute emergency patient assessment and care delivered in a variety of settings (e.g., street, home, LTC, mental health) at the beginning of the continuum of care. Prehospital care workers include paramedics, fire fighters, police and other emergency first responders.

Respirator – A device that is tested and certified by procedures established by testing and certification agencies recognized by the authority having jurisdiction and is used to protect the user from inhaling a hazardous atmosphere[233]. The most common respirator used in health care is a N95 half-face piece filtering respirator. It is a personal protective device that fits tightly around the nose and mouth of the wearer, and is used to reduce the risk of inhaling hazardous airborne particles and aerosols, including dust particles and infectious agents[508] (Refer also to N95 Respirator, Respiratory protection, Fit-testing, Seal check).

Respiratory hygiene/cough etiquette – A combination of measures to be taken by an infected source designed to minimize the transmission of respiratory microorganisms (e.g., influenza).

Respiratory protection – Respiratory protection from airborne infection needs the use of a respirator to prevent inhalation of airborne microorganisms. Respiratory protection may be warranted as a component of airborne precautions or needed for performing AGMPs on certain patients. The need for a respirator or for airborne precautions is determined by a PCRA. Factors to be considered are the specific infectious agent, the known or suspected infection status of the patient involved, the patient care activity to be performed, the immune status of the HCW and the patient's ability to perform respiratory hygiene.

Risk – The probability of an event and its consequences.

Routine practices – A comprehensive set of IPC measures that have been developed for use in the routine care of all patients at all times in all healthcare settings. Routine practices aim to minimize or prevent HAIs in all individuals in the healthcare setting, including patients, HCWs, other staff, visitors and contractors.

Seal check – A procedure the wearer performs each time a respirator is worn and is performed immediately after putting on the respirator to ensure that there is a good facial seal. Seal check has been called "fit check" in other IPC documents (Refer also to Fit-testing).

Semi-critical items – Items that come in contact with non-intact skin or mucous membranes but ordinarily do not penetrate them. Reprocessing semi-critical items involves meticulous cleaning followed by high-level disinfection.

Source – The person, animal, object or substance that may contain an infectious agent/microorganism that can be passed to a susceptible host.

Source control measures – Methods to contain infectious agents from an infectious source, including signage, separate entrances, partitions, triage/early recognition, AIIRs, diagnosis and treatment, respiratory hygiene (including masks, tissues, hand hygiene products and designated handwashing sinks), process controls for AGMPs and spatial separation.

Sterile technique – Refer to Aseptic technique.

Sterilization – The destruction of all forms of microbial life, including bacteria, viruses, spores and fungi.

Susceptible host – An individual not possessing sufficient resistance against a particular infectious agent to prevent contracting an infection or disease when exposed to the agent (synonymous with non-immune).

Terminal cleaning – Terminal cleaning refers to the process for cleaning and disinfecting patient accommodation that is undertaken upon discharge of any patient or on discontinuation of contact precautions. The patient room, cubicle, or bedspace, bed, bedside equipment, environmental surfaces, sinks and bathroom should be thoroughly cleaned before another patient is allowed to occupy the space. The bed linens should be removed before cleaning begins.

Transmission – The process whereby an infectious agent passes from a source and causes infection in a susceptible host.

Utility sink – A sink used for non-clinical purposes and not appropriate to use for handwashing.

Virulence – Virulence refers to the ability of the infectious agent to cause severe disease (e.g., the virulence of Ebola is high; of rhinovirus is low).

Zone – Refer to patient zone.

Appendix VI: Epidemiologically significant organisms requiring additional precautions

Note: Refer to recommendations for contact precautions for control measures (Part B, Section IV, subsection i).

1. Clostridium difficile

C. difficile infection (CDI), previously referred to as *C. difficile*–associated disease, is an important HAI, most often associated with antimicrobial therapy. It is the most frequent cause of infectious diarrhea in adults in healthcare settings in industrialized countries. The severity of CDI ranges from mild diarrhea to toxic megacolon[510]. In hospitals participating in the Canadian Nosocomial Infection Surveillance Program (CNISP), the overall incidence and incidence density rates of healthcare-associated CDI for a six-month period (November 1, 2004 to April 30, 2005) were 4.5 cases per 1,000 patient admissions and 6.4 per 10,000 patient-days. The rates were significantly higher in Quebec than in the rest of Canada (11.1 vs. 3.9 cases per 1,000 admissions and 11.9 vs. 5.7 per 10,000 patient-days)[511]. Subsequently, through multimodal interventions, Quebec rates fell (6.4/10,000 patient-days in 2008/2009)[512]. The 2004/2005 Canada-wide CNISP rates are similar to those found in a previous CNISP study reporting 6.4 vs. 6.6 cases per 10,000 days in 1997[513]. Detailed surveillance performed over a two-month period (March and April 2007) reported rates of 4.8 per 1,000 admissions and 7.2 per 10,000 patient-days, with the highest rates in British Columbia, Ontario and the Atlantic provinces[514]. Increased lengths of hospital stay, costs, morbidity and mortality[515;516] have been reported among adult patients with CDI. Studies have suggested that both the incidence and severity of CDI have increased since 2000. The elderly are especially vulnerable[516-519]. More severe disease and worse patient outcomes have been attributed to a hypervirulent strain. In one report, the authors noted that the lack of investment in hospital maintenance and cleaning may have facilitated the transmission of this spore-forming pathogen[516].

C. difficile infections have generally been considered to occur less frequently in children than in adults. Newborns are not susceptible to *C. difficile* disease, probably due to a lack of receptors, although colonization is common[520;521]. Langley et al.[522], in a review of nosocomial diarrhea over a decade of surveillance in a university-affiliated paediatric hospital, reported *C. difficile* to be a common cause of nosocomial diarrhea. The presence of diapers was identified as a risk factor for nosocomial *C. difficile*.

C. difficile and VRE share risk factors for transmission[523].

Any factor associated with alteration of the normal enteric flora increases the risk of *C. difficile* colonization after exposure to the organism[510]. Risk factors for *C. difficile* include exposure to antibiotics[524], chemotherapy or immunosuppressive agents[525-527], gastrointestinal surgery and the use of nasogastric tubes and possibly stool softeners,

gastrointestinal stimulants, antiperistaltic drugs and proton pump inhibitors. Antacids and enemas have also been associated with an increased risk of colonization[517;528;529].

The primary reservoirs of *C. difficile* include colonized[530] or infected patients and contaminated surfaces and equipment within hospitals and LTC facilities[82;90;458;517;531;532]. The appropriate use of gloves has been demonstrated to significantly reduce the spread of *C. difficile* in hospitals[338].

To reduce transmission of *C. difficile,* patients with diarrhea should be placed on contact precautions until the diarrhea is resolved or its cause is determined not to be infectious[266;269-271].

Concern has been raised regarding methods of hand hygiene and environmental disinfection[269;270;517], as *C. difficile* spores are resistant to commonly used hand hygiene products[217] and most hospital disinfectants[517;532;533]. Alcohols are thought to have little or no activity against bacterial spores[468;534]. *C. difficile* infection is spread by bacterial spores, and concern whether increased rates of CDI are associated with increased use of ABHR have been raised[269;535]. In a study to determine whether there is an association between the increasing use of ABHRs and the increased incidence of CDI, Boyce et al[535] reported that a ten-fold increase in the use of ABHR over three years in a 500-bed university-affiliated community teaching hospital did not alter the incidence of CDI. Others have reported similar findings over one-[536] and three-year periods[537]. In outbreak situations or when there is continued transmission, rooms of CDI patients should be decontaminated and cleaned with chlorine-containing cleaning agents (at least 1,000 ppm) or other sporicidal agents[43;266-271].

Wearing gloves for the care of a patient with CDI or for contact with the patient environment (including items in the environment) reduces the microbial load of *C. difficile* on the hands of HCWs[338]. Gloves should be removed prior to leaving the room and hand hygiene performed. Hand hygiene at the point-of-care (either with ABHR or soap and water) is necessary before leaving the room of the patient. If a point-of-care handwashing sink is not available, ABHR should be used and hands subsequently washed at the nearest handwashing sink.

It is difficult to determine the most appropriate measures for prevention and control of CDI, as most data published are from outbreak reports where several interventions were introduced at the same time[266;269-271]. There is strong evidence to support the importance of antimicrobial stewardship in addition to IPC interventions in controlling CDI[266;269-271;538-540].

Guidelines for the prevention and control of *C. difficile* have been published[266;269-271;540;541].

2. Antimicrobial-resistant microorganisms

Antimicrobial-resistant microorganisms are microorganisms that have developed resistance to the action of one or more antimicrobial agents and are of special clinical or epidemiologic significance. As the clinical or epidemiologic significance of an antimicrobial-resistant organism can vary over time, geographic location and healthcare setting, there is variability in which microorganisms are considered AROs. In Canada, currently MRSA is considered an ARO in almost all settings, and VREs are considered AROs in many. Certain resistant Gram-negative bacteria are emerging in Canada (e.g., extended spectrum ß-lactamase producers, carbapenemase producers), but there is variability in which are considered AROs.

Prevention and control of AROs

Siegel et al.[484] note that optimal control strategies for ARO are not yet known, and evidence-based control measures that can be universally applied in all healthcare settings have not been established. They also note that successful control of ARO transmission in healthcare facilities is a dynamic process that necessitates a systematic approach tailored to the problem and healthcare setting. Selection of interventions for controlling ARO transmission should be based on assessment of the local problem, the prevalence of various AROs and the feasibility of implementing the interventions.

Clinical microbiology support is a necessary element of ARO control. Identification and differentiation of resistant strains warrant the use of appropriate laboratory protocols. In some circumstances, active surveillance cultures requiring testing of at-risk but asymptomatic individuals for the presence of ARO colonization may be necessary to achieve control of spread of AROs within facilities. During outbreaks of AROs, an ability to distinguish quickly between spread of a single clone and spread of multiple clones, through use of molecular laboratory typing techniques, can be a key element in outbreak control.

Transmission of AROs occurs directly via HCW hand contact with infected or colonized patients and indirectly via HCW hand contact with contaminated equipment and/or environments, to other patients or other equipment and/or environments. Judicial selection and use of antibiotics may reduce the development of AROs. Preventing HAIs will reduce the prevalence of AROs [30-32;216;427;542;543].

Recommendations for the prevention and control of AROs can be found in the Ontario Ministry of Health and Long-Term Care Routine Practices and Additional Precautions in All Health Care Settings[541].

a. Methicillin-resistant *Staphylococcus aureus*

Methicillin-resistant *Staphylococcus aureus* has become endemic worldwide in many hospitals. A review of the epidemiology, healthcare resource utilization and cost data for MRSA in Canadian settings reported that the rate of MRSA in Canadian hospitals increased from 0.46 to 5.90 per 1,000 admissions between 1995 and 2004. Patients infected with

MRSA may need prolonged hospitalization (average of 26 days of isolation per patient), special control measures and expensive treatments. MRSA transmission in hospitals resulted in further extensive surveillance. Total cost per infected MRSA patient averaged $12,216, with hospitalization being the major cost driver (81%), followed by barrier precautions (13%), antimicrobial therapy (4%) and laboratory investigations (2%). The most recent epidemiological data suggest that direct healthcare costs attributable to MRSA in Canada, including costs for management of MRSA-infected and -colonized patients and MRSA infrastructure, was $82 million in 2004 and could reach $129 million in 2010[544].

During 2007, 47 sentinel hospitals from nine Canadian provinces participated in the CNISP for new MRSA cases. Results indicated no significant ($p = 0.195$) change in the rate of MRSA infections associated with healthcare, compared with the previous year, although there was an apparent slight increase, from 164 cases per 100,000 patient-admissions to 181[545]. Compared with 2007 MRSA CNISP results, the 2008 surveillance data from 48 sentinel hospitals showed a 16.1% increase ($p < 0.05$) in the incidence of MRSA infection and a 19.9% increase ($p < 0.05$) in the incidence of MRSA colonization. Although the overall incidence for community-associated MRSA remained virtually unchanged ($p = 0.46$) — 174 per 100,000 patient-admissions in 2007 and 171 in 2008 — there was a marginally significant ($p = 0.084$) 26.9% increase in its infection rate (personal communication, CNISP 2010).

Risk factors for MRSA acquisition have included previous hospitalization, admission to an ICU, prolonged hospital stay, proximity to another patient with MRSA, older age, invasive procedures, presence of wounds or skin lesions and previous antimicrobial therapy[546-548].

The inanimate hospital environment of patients with MRSA is frequently contaminated. Contamination can occur without direct patient contact and has been demonstrated after contact only with environmental surfaces in the patient's room[70]. This reinforces the need for routine practices, including hand hygiene and cleaning and disinfecting patient care equipment between patients.

Community-associated MRSA is an emerging cause of morbidity and mortality among individuals in the community setting. Community-associated MRSA has accounted for a high proportion of community-acquired skin and soft tissue infections in many American and Canadian cities. These strains differ from nosocomial strains, but can be introduced into the hospital and transmitted there or in other healthcare settings[549]. Transmission, prevention and control is not different from that of hospital strains[549].

b. Vancomycin-resistant enterococci

Enterococcus is part of the endogenous flora of the human gastrointestinal tract. Vancomycin-resistant enterococci are strains of *Enterococcus faecium* or *Enterococcus faecalis* that contain the resistance genes *vanA* or *vanB*.

Certain patient populations are at increased risk for VRE infection or colonization, including those with severe underlying illness or immunosuppression, such as ICU patients, patients with invasive devices (e.g., urinary or central venous catheters), previous antibiotic use and

prolonged length of hospital stay[550]. Since the inherent pathogenicity of *Enterococcus* species is low, the approach to containing the spread of VRE may vary, depending on presence or absence of patients with risk factors for infection.

In 2006, 50 sentinel hospitals from nine Canadian provinces participated in CNISP surveillance for 'newly identified' VRE. There was a significant decrease in the overall incidence of VRE acquisition, to 1.2 per 1,000 patient admissions from the 1.32 reported in 2005. This rate remains higher than the 2004 rate of 0.77 per 1,000 patient admissions[551].

The primary reservoirs of VRE include patients colonized or infected with VRE[550] and VRE-contaminated materials, surfaces and equipment. Examples of items that may be contaminated are patient gowns and linens, beds, bedside rails, overbed tables, floors, doorknobs, washbasins, glucose metres, blood pressure cuffs, electronic thermometers, electrocardiogram monitors, electrocardiograph wires, intravenous fluid pumps and commodes[88;95;130;355;397;473;552;553]. Environmental contamination of the patient room is more likely to be widespread when patients have diarrhea[95] or are incontinent.

VRE is most commonly spread via the transiently colonized hands of HCWs who acquire it from contact with colonized or infected patients or after handling contaminated material, surfaces or equipment.

Measures to prevent transmission of VRE include adherence to hand hygiene recommendations and environmental cleaning. Verifying procedures and responsibilities for scheduled cleaning and disinfection of environmental surfaces (including frequently touched surfaces) is very important. A persistent decrease in the acquisition of VRE in a medical ICU was reported after an educational and observational intervention with a targeted group of housekeeping personnel[554]. When patient care equipment cannot be dedicated to the use of one patient, it needs cleaning and disinfection prior to use on another patient.

c. Resistant Gram-negative microorganisms

Certain Gram-negative bacilli, such as *E. coli*, *Klebsiella*, *Pseudomonas* and *Acinetobacter* spp., have become increasingly resistant to commonly used antimicrobials[555]. Gram-negative bacilli-resistant to extended spectrum ß-lactams (penicillins and cephalosporins), fluoroquinolones, carbapenems and aminoglycosides have increased in prevalence[484;556]. Outbreaks have been reported in burn units[107;557-560], ICUs[407;561], surgical patients, soldiers returning from Afghanistan[26;562] and LTC settings. Carbapenemaseaemase producing *Klebsiella* organisms have emerged as major hospital problems in the US and elsewhere[563]. Other carbapenemase-producing Gram-negative bacilli, particularly *Acinetobacter* spp, are emerging outside Canada as important hospital pathogens, and may be seen in Canadian hospitals in the future. Other carbapenemase-producing Gram-negative bacilli spp., such as *Enterobacteriacae* carrying the New Delhi metallo-beta-lactamase (NDM)-1 carbapenemase (currently associated with South Asia, including hospitalization in India) and *Acinetobacter* spp., are emerging outside Canada as important hospital pathogens and may be seen in Canadian hospitals in the future[564]. For further information, refer to Infection Prevention and Control Measures for Healthcare Workers in

All Healthcare Settings: Carbapenem-Resistant Gram-negative Bacilli (http://www.phac-aspc.gc.ca/nois-sinp/guide/ipcm-mpci/ipcm-mpci-eng.php).

3. Viral gastroenteritis (Noroviruses, Calicivirus, Rotavirus)

Noroviruses (previously called Norwalk-like viruses) are a common cause of gastroenteritis. These viruses are part of a family called caliciviruses[264].

Many strains of noroviruses have been implicated in explosive outbreaks of gastroenteritis in various settings, including hospitals[565-568], LTC facilities[264;569;570] and rehabilitation centers[571;572]. Noroviruses are found in the stool or emesis of infected individuals when they are symptomatic and up to at least 3 or 4 days after recovery. The virus is able to survive relatively high levels of chlorine and varying temperatures, and can survive on hard surfaces for hours or days. Alcohol-based hand rubs are effective against norovirus, but the optimal alcohol concentration needs further evaluation[573-577]. One study suggests that norovirus is inactivated by alcohol concentrations ranging from 70% to 90%[573]. Transmission during facility outbreaks has been documented to result from person-to-person contact affecting patients and HCWs[578;579]. Environmental contamination may be a factor in outbreaks in healthcare facilities[264;572].

The identification of outbreaks is based on clinical and epidemiological factors, as there is a short incubation period with rapid onset of symptoms. In addition, diagnostic testing is technically difficult and not always readily available, except in a reference laboratory. A guideline for the prevention and control of a norovirus outbreak has been published[265].

Rotavirus is the most common cause of nosocomial gastroenteritis in paediatric settings[290;580;581]. Rotavirus can be a causative microbial agent of nosocomial infection, not only in children, but also in immunocompromised persons and the elderly[479;582].

The virus is present in extremely high concentrations in the stool, thus minimal environmental contamination may lead to transmission[80;81;583;584].

4. Emerging respiratory infections

Acute respiratory infections of significant public health importance include infections caused by either re-emergence of known respiratory pathogens (e.g., SARS) or emergence of as yet unknown pathogens (e.g., novel influenza strains) (Refer to Emerging Respiratory Infections [http://www.phac-aspc.gc.ca/eri-ire/index-eng.php]).

In situations of emerging respiratory infections, refer to the PHAC website for specific guidance documents (http://www.phac-aspc.gc.ca/nois-sinp/guide/pubs-eng.php).

For additional information regarding SARS coronavirus, refer to the PHAC IPC guideline for the Prevention of HealthCare-Associated Pneumonia, 2010[216] (http://publications.gc.ca/site/archivee-archived.html?url=http://publications.gc.ca/collections/collection_2012/aspc-phac/HP40-54-2010-eng.pdf).

Appendix VII: Terminal cleaning

1. Terminal cleaning refers to the process for cleaning and disinfecting patient accommodation, which is undertaken upon discharge of any patient or on discontinuation of contact precautions. The patient room, cubicle, or bedspace, bed, bedside equipment, environmental surfaces, sinks and bathroom should be thoroughly cleaned before another patient is allowed to occupy the space. The bed linens should be removed before cleaning begins.
2. In general, no extra cleaning techniques are warranted for rooms that have housed patients for whom other additional precautions were in place. Specific recommendations related to additional precautions are outlined in items 4 and 9, below.
3. Terminal cleaning should primarily be directed toward items that have been in direct contact with the patient or in contact with the patient's excretions, secretions, blood or body fluids.
4. Housekeeping personnel should use the same precautions to protect themselves during terminal cleaning that they would use for routine cleaning. Respirators are not needed unless the room was occupied by a patient for whom there were airborne precautions and insufficient time has elapsed to allow clearing of the air of potential airborne microorganisms (Refer to Appendix VIII).
5. All disposable items in the patient's room should be discarded.
6. Reusable items in the room should be reprocessed as appropriate to the item. Refer to the most current publication for environmental infection control[239].
7. Bedside tables, bedrails, commodes, mattress covers and all horizontal surfaces in the room should be cleaned with a detergent/disinfectant[239].
8. Carpets that are visibly soiled with patient's excretions, blood or body fluids should be cleaned promptly[239].
    a. Routine washing of walls, blinds and window curtains is not indicated. These should be cleaned if visibly soiled.
    b. Privacy and shower curtains should be changed[117].
    c. Disinfectant fogging is not a satisfactory method of decontaminating air and surfaces and should not be used.
9. Additional cleaning measures or frequency may be warranted in situations where continued transmission of specific infectious agents is noted (e.g., *C. difficile,* norovirus and rotavirus). The efficacy of disinfectants being used should be assessed; if indicated, a more effective disinfectant should be selected[239;264;265]. Attention should be paid to frequently touched surfaces, such as doorknobs, call bell pulls, faucet handles and wall surfaces that have been frequently touched by the patient. [BII]
    a. In outbreak situations or when there is continued transmission, rooms of *C. difficile* infection patients should be decontaminated and cleaned with chlorine-containing cleaning agents (at least 1,000 ppm) or other sporicidal agents[43;266-271]. [BII]

Appendix VIII: Air changes per hour and time in minutes required for removal efficiencies of 90%, 99% and 99.9% of airborne contaminants[21]

Air changes per hour and time in minutes required for removal efficiencies of 90%, 99% and 99.9% of airborne contaminants[i]

	Minutes required for each removal efficiency		
Air changes per hour	90%	99%	99.9%
1	138	276	414
2	69	138	207
3	46	92	138
4	35	69	104
5	28	55	83
6	23	46	69
7	20	39	59
8	17	35	52
9	15	31	46
10	14	28	41
11	13	25	38
12	12	23	35
13	11	21	32
14	10	20	30
15	9	18	28
16	9	17	26
17	8	16	24
18	8	15	23
19	7	15	22
20	7	14	21

[i]This table is prepared according to the formula t = (in C2/C1)/(Q/V) = 60, which is an adaptation of the formula for the rate of purging airborne contaminants (100-Mutchler 1973) with t1 = 0 and C2/C1 = 1 – (removal efficiency/100). Adapted from CDC Guidelines for preventing the transmission of *Mycobacterium tuberculosis* in health-care facilities,1994[585].

Appendix IX: Advantages and disadvantages of barrier equipment

Reproduced with permission from Provincial Infectious Diseases Advisory Committee (PIDAC) *Routine Practices and Additional Precautions in All Health Care Settings*. Ministry of Health and Long-Term Care, August 2009.

Medical Grade Gloves			
Type	**Use**	**Advantages**	**Disadvantages**
Vinyl	▪ Protection for: ➢ Minimal exposure to blood/body fluids and/or infectious agents ➢ Contact with strong acids and bases, salts, alcohols ➢ Short duration tasks ▪ Protection for staff with documented skin breakdown	▪ Good level of protection but based on the quality of manufacturer ▪ Punctures easily when stressed ▪ Rigid – non elastic ▪ Medium chemical resistance	▪ Not recommended for contact with solvents, aldehydes, ketones ▪ Quality varies with manufacturers
Latex	▪ Activities that require sterility ▪ Protection for: ➢ Heavy exposure to blood/body fluids and/or infectious agents ➢ Contact with weak acids and bases, alcohols	▪ Good barrier qualities ▪ Strong and durable ▪ Has re-seal qualities ▪ Good comfort and fit ▪ Good protection from most caustics and detergents	▪ Not recommended for contact with oils, greases and organics ▪ Not recommended for individuals who have allergic reactions or sensitivity to latex
Nitrile	▪ Protection for: ➢ Heavy exposure to blood/body fluids/infectious agents ➢ Tasks of longer duration ➢ Tasks with high stress on glove ➢ Tasks requiring additional dexterity ➢ Chemicals and chemotherapeutic agents ➢ Recommended for contact with oils, greases, acids, bases ➢ Sensitivity to vinyl ▪ Preferred replacement for vinyl gloves when a documented allergy or sensitivity occurs	▪ Offers good dexterity ▪ Strong and durable ▪ Puncture-resistant ▪ Good comfort and fit ▪ Excellent resistance to chemicals	▪ Not recommended for contact with solvents, ketones, esters
Neoprene	▪ Replacement sterile glove for latex when a documented allergy or sensitivity occurs ▪ Recommended for contact with acids, bases, alcohols, fats, oils, phenol, glycol ethers	▪ Good barrier qualities ▪ Strong and durable ▪ Good comfort and fit ▪ Good protection from caustics	▪ Not recommended for contact with solvents

Adapted from Sunnybrook Health Sciences Centre, Patient Care Policy Manual Section II: Infection Prevention and Control [Policy No: II-D-1200], 'Gloves'. Revised July, 2007 and London Health Sciences Centre, Occupational Health and Safety Services, '*Glove Selection and Use'*. Revised April 26, 2005.

Masks and N95 Respirators			
Type of Mask	**Use**	**Advantages**	**Disadvantages**
Standard Face Mask ('procedure mask or 'isolation' mask)	▪ Protection for: ➢ Minimal exposure to infectious droplets ➢ Short duration tasks ➢ Tasks that do not involve exposure to blood/body fluids ▪ Protection from client and/or patient and/or resident during transportation outside of room	▪ Inexpensive	▪ Not fluid or water resistant
Fluid Resistant Mask	▪ Protection for: ➢ Heavy exposure to infectious droplets or blood/body fluids	▪ Good comfort and fit ▪ Fluid resistant	▪ Expensive
Surgical Mask	▪ Protection for: ➢ Exposure to infectious droplets or blood/body fluids ➢ Long duration tasks	▪ Good comfort and fit ▪ Fluid resistant ▪ Inexpensive	
NIOSH certified N95 respirator	▪ Protection for airborne pathogens	▪ Provides protection from small particle aerosols ▪ Better face seal prevents leakage around mask	▪ Required fit-testing, training and seal-checking ▪ Uncomfortable for long periods of use

Adapted from Sunnybrook Health Sciences Centre, Patient Care Policy Manual Section II: Infection Prevention and Control [Policy No: II-D-1200], 'Gloves'. Revised July, 2007 and London Health Sciences Centre, Occupational Health and Safety Services, 'Glove Selection and Use'. Revised April 26, 2005

Eye Protection			
Type of Eyewear	**Use**	**Advantages**	**Disadvantages**
Safety Glasses	▪ Protection for: ➢ Exposure to infectious droplets or blood/body fluids	▪ May be cleaned and re-used until visibility is compromised ▪ May be worn over prescription eyeglasses ▪ Good visibility	▪ With continued use, visibility may be compromised
Goggles	▪ Protection for: ➢ Exposure to infectious droplets or blood/body fluids	▪ May be cleaned and re-used until visibility is compromised ▪ May be worn over prescription eyeglasses	▪ Poor visibility
Face Shield	▪ Protection for: ➢ Exposure to infectious droplets or blood/body fluids	▪ May be worn over prescription eyeglasses ▪ Good visibility	
Visor attached to Mask	▪ Protection for: ➢ Minimal exposure to infectious droplets or blood and/or body fluids	▪ May be worn with prescription eyeglasses ▪ Quick to put on	

Adapted from Sunnybrook Health Sciences Centre, Patient Care Policy Manual Section II: Infection Prevention and Control [Policy No: II-D-1200], 'Gloves'. Revised July, 2007 and London Health Sciences Centre, Occupational Health and Safety Services, 'Glove Selection and Use'. Revised April 26, 2005

Appendix X: Technique for putting on and taking off personal protective equipment

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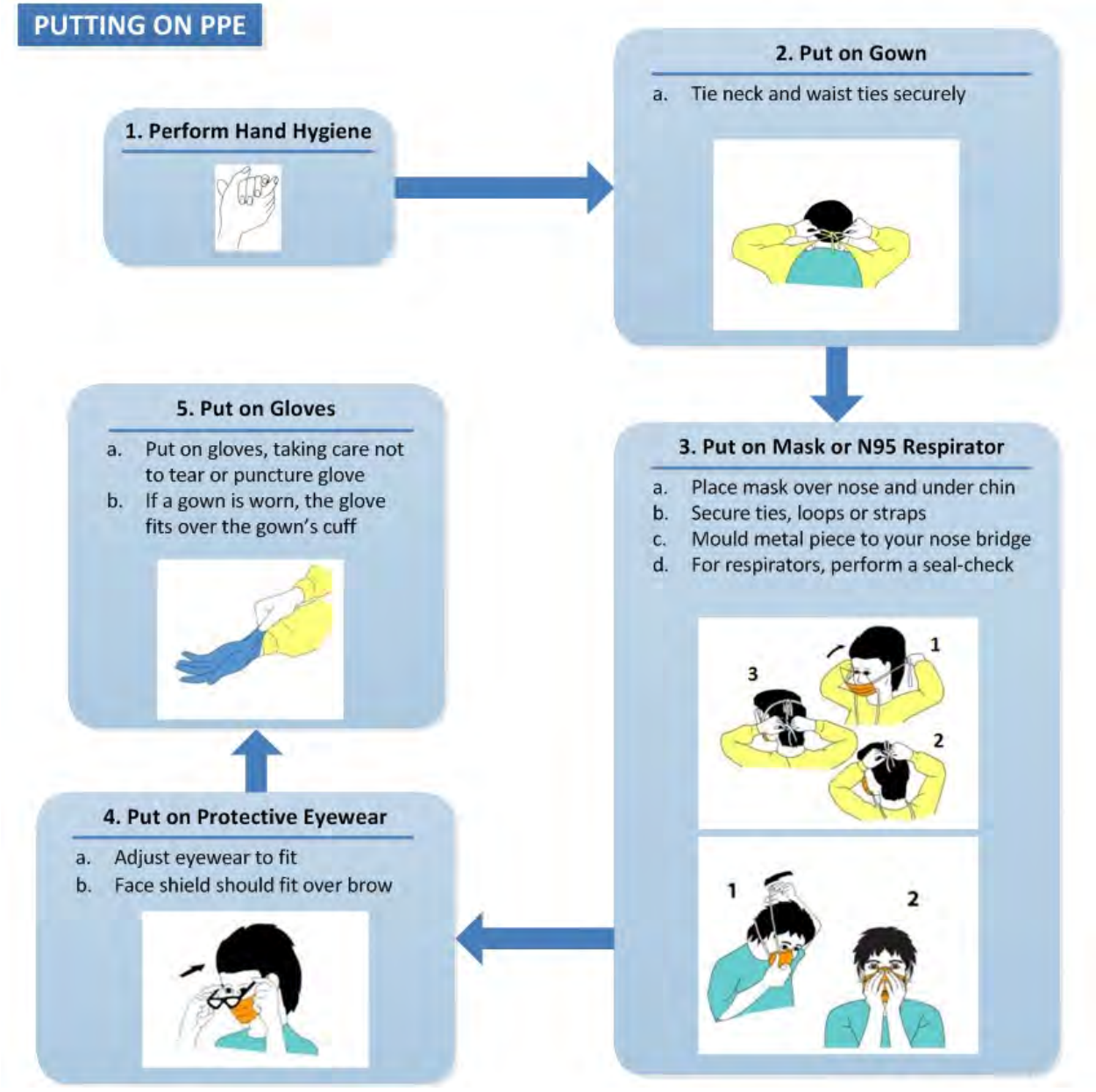
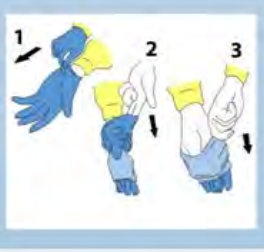
Images developed by Kevin Rostant. Some images adapted from Northwestern Ontario Infection Control Network-NWOICN



TAKING OFF PPE

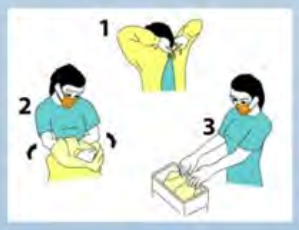
1. Remove Gloves

a. Remove gloves using a glove-to-glove /skin-to-skin technique
b. Grasp outside edge near the wrist and peel away, rolling the glove inside-out
c. Reach under the second glove and peel away
d. Discard immediately into waste receptacle



2. Remove Gown

a. Remove gown in a manner that prevents contamination of clothing or skin
b. Starting at the neck ties, the outer, 'contaminated', side of the gown is pulled forward and turned inward, rolled off the arms into a bundle, then discarded immediately in a manner that minimizes air disturbance



3. Perform Hand Hygiene

4. Remove Eye Protection

a. Arms of goggles and headband of face shields are considered to be 'clean' and may be touched with the hands
b. The front of goggles or face shield is considered to be contaminated
c. Remove eye protection by handling ear loops, sides or back only
d. Discard into waste receptacle or into appropriate container to be sent for reprocessing
e. Personally-owned eyewear may be cleaned by the individual after each use

5. Remove Mask or N95 Respirator

a. Ties or ear loops or straps are considered to be 'clean' and may be touched with the hands
b. The front of the mask or respirator is considered to be contaminated
c. Untie bottom tie then top tie, or grasp straps or ear loops
d. Pull forward off the head, bending forward to allow mask or respirator to fall away from the face
e. Discard immediately into waste receptacle

6. Perform Hand Hygiene

Additional optional opportunities for hand hygiene are between steps 1 and 2, between steps 4 and 5 and before leaving the care area.

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