



# **Guidelines for the Management of *Clostridium difficile* Infection (CDI) in all Healthcare Settings**

## Acknowledgements

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## Introduction

This document outlines infection prevention and control practices to:

- assist healthcare providers in the management of patients and residents with *Clostridium difficile* infection (CDI) and outbreaks related to CDI; and,
- prevent the transmission of *Clostridium difficile* infection to other patients and residents.

It applies to all patients and residents in acute care, long-term care, and other residential care facilities.

These guidelines should be integrated with existing health region infection prevention and control programs, and used as part of a comprehensive effort to maintain accepted standards of infection prevention and control.

## Epidemiology

*Clostridium difficile* (*C. difficile*) is a gram positive, spore-forming anaerobic bacillus. It is the leading cause of healthcare-associated diarrhea in industrialized countries and has been responsible for a large number of outbreaks in Canadian hospitals.<sup>1</sup>

According to a recent report prepared by the Canadian Nosocomial Infection Surveillance Program (CNISP) working group, the incidence of healthcare-associated *Clostridium difficile* infection (CDI) in Canada in 2009 was 4.70 per 1,000 admissions and 5.75 per 10,000 patient days. For the Saskatchewan/Manitoba region, the rate of CDI in 2009 was 2.27 per 1,000 admissions and 3.24 per 10,000 patient days.<sup>2</sup>

The clinical presentation of CDI ranges in severity from mild or moderate diarrhea to life-threatening pseudomembranous colitis. Patients/residents with healthcare-associated CDI may experience one or more of the following complications: clinical dehydration, hypokalemia, mild gastrointestinal bleeding and ileus. Complications of severe infection include bowel perforation, hypotension, renal failure, sepsis and death.<sup>3</sup> CDI has been associated with additional diagnostic and interventional procedures, additional length of stay in hospital, and total hospital costs that are significantly higher than for patients who are not infected.<sup>4</sup>

In recent years there has been an increase in the incidence and severity of *C. difficile* infection across North America and Europe. This increase has been due in large part to the emergence of a new, hypervirulent strain of *C. difficile*, typed NAP1/BI/027, believed to be more easily transmitted than other strains. This was the strain identified in the serious outbreak in Quebec between 2002 and 2006 and other significant outbreaks.<sup>5</sup> Three bacterial factors have been implicated in outbreaks of CDI caused by the NAP1/027 strain: increased production of toxins A and B, production of a third binary toxin, and fluoroquinolone resistance.<sup>6</sup>

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<sup>1</sup> Provincial Infectious Diseases Advisory Committee (PIDAC), "Annex C: Testing, Surveillance and Management of *Clostridium difficile*", 4.

<sup>2</sup> Canadian Nosocomial Infection Surveillance Program (CNISP) Working Group, "*Clostridium difficile* infection (CDI) epidemiology, 2007-2009", slides 7, 10, 31 and 34.

<sup>3</sup> Cohen, Gerding, Johnson et al., 433-434.

<sup>4</sup> Dubberke, Gerding, Classen et al., S81-S82.

<sup>5</sup> Cohen, Gerding, Johnson et al., 436.

<sup>6</sup> Kelly and LaMont, 1933.

The primary reservoirs of *C. difficile* include colonized or infected patients/residents, and contaminated environments and surfaces within hospitals and long-term care facilities. Studies have revealed that the prevalence of asymptomatic colonization with *C. difficile* is 7%-26% among inpatients in acute care facilities and 5%-7% among elderly residents in long-term care facilities.<sup>7</sup>

Transmission of *C. difficile* occurs primarily through the fecal-oral route following transient contamination of the hands of healthcare workers and patients/residents. Contamination of the care environment also plays a major role in the spread of *C. difficile*.

*C. difficile* cells die within minutes of exposure to air; however, the organism produces spores that are the transmissible form of *C. difficile*. These spores are resistant to most disinfectants and can survive up to 70 days in a hospital room after it has been occupied by a patient with CDI.<sup>8</sup>

Transmission of CDI can be prevented by strict adherence to routine practices and additional precautions. Practices that are critical to preventing transmission of CDI include appropriate use of personal protective equipment (PPE), meticulous hand hygiene, and thorough and appropriate cleaning and disinfection of environmental surfaces and equipment.

Antimicrobial stewardship has been shown to be the single most successful strategy for preventing CDI. Antibiotic prescribing (selection, frequency and duration) should be reviewed with an emphasis on avoiding the use of high-risk agents (e.g. cephalosporins, fluoroquinolones, clindamycin) for at-risk patients. Gastric acid suppression with proton pump inhibitors (PPIs) has also been recognized as a risk factor for CDI and should be used selectively.<sup>9</sup> A surveillance system that identifies trends is critical to limiting the spread of CDI within a facility.

### **Risk Factors for CDI<sup>10</sup>**

Risk factors include:

- history of antibiotic use, particularly fluoroquinolones;
- bowel disease and bowel surgery;
- chemotherapy;
- prolonged hospitalization;
- treatment with proton pump inhibitors; and,
- immunosuppressive therapy.

Additional risk factors that predispose some people to developing severe disease include:

- history of CDI, particularly with the NAP1 strain of *C. difficile*;
- recent surgery; and,
- increased age.

The rate of community-acquired *C. difficile* infection (CA-CDI) is rising among persons previously thought to be at low risk. Recent studies indicate that only two thirds of CDI cases identified in the

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<sup>7</sup> Cohen, Gerding, Johnson et al., 436.

<sup>8</sup> Dubberke and Wertheimer, 58.

<sup>9</sup> Cohen, Gerding, Johnson et al., 437.

<sup>10</sup> PIDAC, "Annex C: Testing, Surveillance and Management of *Clostridium difficile*", 5.

community are actually linked to recent antibiotic therapy and prior hospitalization.<sup>11</sup> Since these classic risk factors are sometimes lacking in identified CA-CDI cases, it may be prudent to test symptomatic patients for *C. difficile* (refer to the section “Identifying *Clostridium difficile* Infection”), even if they have no known risk factors.<sup>12</sup>

## Infection Prevention and Control Measures

Your health region’s Infection Prevention and Control (IPAC) department should be consulted when:

- there is a confirmed case of CDI;
- an outbreak of CDI is suspected;
- challenges are encountered with accommodation or cohorting;
- additional precautions are discontinued or the patient is discharged; and,
- assistance is required for patient or facility management.

### 1. Initiation of Contact Precautions

In addition to routine practices, contact precautions shall be initiated by a healthcare provider **at the onset of diarrhea** (refer to the definition of diarrhea in the Glossary). **Do not delay** placement of the patient or resident on contact precautions while awaiting results of *C. difficile* testing.

#### Upon initiation of Contact Precautions:

- (a) Signage shall be prominently displayed on the patient’s/resident’s door outlining the necessary precautions (contact precautions) to be used when entering the room.
- (b) Signage shall be prominently displayed on the patient’s/resident’s door stating that hand washing with soap and water is required (refer to sub-section 2, “Hand Hygiene”).
- (c) Personal protective equipment (PPE) must be easily accessible either directly outside the patient’s/resident’s room, in the anteroom, or (if using spatial separation) on a supply cart directly outside the curtained bed space.

Contact precautions should be lifted only upon the advice of an infection prevention and control professional.

### 2. Hand Hygiene

Effective hand hygiene is essential in limiting the spread of *C. difficile*.

- (a) All staff entering the patient’s room shall **wash hands with soap and water** before and after contact with the patient/resident or their environment (a sample hand washing poster is provided in Appendix A).

**Note:** Soap and water is more effective than alcohol based hand rub (ABHR) as it is the mechanical action (friction) of washing and rinsing that physically removes spores from the hands. ABHR is not effective at removing *C. difficile*.

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<sup>11</sup> Wilcox, Mooney, Bendall et al., 388.

<sup>12</sup> Kuijper and Van Dissel, 747.

- (b) If a hand washing sink is not readily available, use ABHR before leaving the room and wash hands at the nearest staff hand wash sink. Do not use hand wash sinks in medication or food preparation areas, clean service rooms, or nursing desk areas.
- (c) Patients and residents should be educated regarding the need and the proper procedure for hand hygiene. Patients may wash their hands in the patient sink in their own room. Those who are unable to perform hand hygiene independently must be assisted by a healthcare provider after toileting, before meals, and before mobilization outside of the room.

### **3. Personal Protective Equipment (PPE)**

Contact precautions require the use of PPE, specifically gloves and a long-sleeved gown. Refer to your region's policy for contact precautions. For more information, refer to PIDAC's "Routine Practices and Additional Precautions in All Health Care Settings".<sup>13</sup>

Studies involving healthcare workers caring for patients with CDI have shown that wearing gloves can prevent hand contamination. This is important because hand washing may not remove all potential pathogens when hands are heavily contaminated. Studies have also provided evidence that wearing gloves can help reduce transmission of pathogens in healthcare settings.<sup>14</sup> For example, in a prospective controlled trial that required personnel to routinely wear vinyl gloves when handling any bodily substances, the incidence of *C. difficile* diarrhea among patients decreased from 7.7 cases per 1,000 patient discharges during the six months before the intervention to 1.5 cases per 1,000 discharges during the six months of the intervention.<sup>15</sup>

After gloves are removed, hands must be washed with soap and water because microorganisms can contaminate hands via small defects in the gloves or during glove removal.

### **4. Accommodation**

Decisions regarding accommodation for patients/residents with CDI should be based on the mode of transmission of *C. difficile* (i.e. the spread of feces containing *C. difficile* spores) and the patient's/resident's condition. Individuals who are incontinent of feces are more likely to contaminate the environment with *C. difficile*.<sup>16</sup>

- (a) All patients/residents with CDI should remain in their room or bed space while symptomatic with CDI.
- (b) A single room with dedicated toileting facilities (private bathroom or dedicated commode chair) is strongly recommended.
- (c) A patient or resident who is incontinent of stool shall have priority for a private room.
- (d) If a single room is not available, the IPAC department or an infectious disease physician should be consulted to assess the risks and determine the best placement options. Laboratory-confirmed CDI cases may be cohorted with other laboratory-confirmed CDI cases but not with patients or residents infected with multidrug-resistant organisms (MDROs) such as Vancomycin-resistant *Enterococcus* (VRE) or Methicillin-resistant *Staphylococcus aureus* (MRSA).

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<sup>13</sup> PIDAC, "Routine Practices and Additional Precautions in All Health Care Settings", 28-34 and 48-51.

<sup>14</sup> Caspari.

<sup>15</sup> Johnson, Gerding, Olson et al., 137.

<sup>16</sup> PIDAC, "Annex C: Testing, Surveillance and Management of *Clostridium difficile*", 6.

- (e) If two or more patients are cohorted, when the diarrhea stops for one person (i.e. the patient is symptom-free for 48 hours), that patient should be transferred to a clean room if possible.<sup>17</sup>
- (f) Immediately after transfer to a clean room, the vacated bed space, furniture, patient care equipment and bathroom shall receive a terminal cleaning and disinfection.

In healthcare settings where private rooms are not available, other measures should be taken:

- (i) Display signage indicating the precautions to be used (at minimum, contact precautions).
- (ii) Maintain physical separation (draw a privacy curtain, or maintain space of at least two metres) to reduce the opportunity for inadvertent sharing of items between patients. Some facilities use a visual cue, such as coloured tape on the floor, in order to identify areas where restricted access and use of additional precautions are needed.<sup>18</sup>
- (iii) Provide an easily accessible supply cart with PPE outside the bed space.
- (iv) Place a laundry hamper and hands-free waste container within the patient's/resident's bed space.
- (v) Dedicate a commode chair and other personal care items for the patient's or resident's use. **The toilet or commode must not be shared.**
- (vi) Bedpans must not be shared unless disinfected between patients/residents. "Sterilization of reusable bedpans between patients must be considered if the aim is to have bedpans free of bacterial spores in order to better control sources of *C. difficile* infection."<sup>19</sup>

## 5. Disposal of Waste<sup>20</sup>

The safe disposal of excrement is of critical importance in preventing contamination of the worker's hands, clothing and environment. Healthcare workers must be alert to the risks of transporting waste in bedpans and urinals outside the patient/resident room as there are many opportunities to contaminate the corridor and the utility room environment. At all times, the healthcare worker must wear gloves and wash hands with soap and water after glove removal.

- (a) Do not empty bedpans into sinks or toilets.
- (b) The bedpan or commode must be covered and transported to the soiled service room for cleaning and disinfection.
- (c) Bedpans of patients with CDI should not be cleaned manually as this poses a very high risk of infection. Spray wands must not be used.
- (d) If available, use a washer/disinfector (WD). The manufacturer should be contacted to determine if adjustments can be made to the WD to achieve conditions that will effectively eliminate spores. Without this process, the WD may remain contaminated, and contaminate items subsequently washed in the unit.
- (e) Washer/disinfectors must be installed and maintained according to the manufacturer's directions. To ensure that the equipment is operating properly, preventive maintenance and verification of the machine's operational parameters must be performed regularly.

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<sup>17</sup> Association for Professionals in Infection Control & Epidemiology (APIC), 24.

<sup>18</sup> APIC, 24.

<sup>19</sup> Lobè, x.

<sup>20</sup> Lobè.

- (f) If a macerator system is used in the facility, the bedpan support frames must be washed and disinfected after each use.
- (g) Use of hygienic bags is recommended during a CDI outbreak. Waste is contained in the bag and disposed of in general waste. In order to avoid accidental spillage, it is advisable to discard the soiled pads and bag in a sturdy leak-proof garbage bag. The plastic holder can be discarded after precautions are discontinued.
- (h) Upon discontinuation of contact precautions, the bedpan and bedpan supports must be disinfected. If possible, bedpans should be sterilized because disinfection (although eliminating a large proportion of the microorganisms on bedpans) does not destroy bacterial spores.

## 6. Environmental Cleaning

**Note:** In keeping with the recommended practice of moving from clean to dirty for all cleaning, the rooms of patients **without** *C. difficile* should be cleaned first. The following guidelines apply when cleaning the rooms of patients symptomatic for CDI.

It is the manual effort of scrubbing that is most effective at spore removal. After cleaning with your facility's usual detergent solution, disinfect all surfaces using a hospital grade sporicide.

The following disinfectants have been shown to be effective against *C. difficile* spores:

- Chlorine bleach (sodium hypochlorite 5.25%), which diluted at 1 part bleach with 9 parts tap water yields a 5,000 parts per million (ppm) sporicidal disinfect solution requiring 10 minutes of contact time.  
**Note:** Chlorine bleach is not a cleaner – it is inactivated in the presence of organic material such as feces, blood and mucous. For bleach to be an effective sporicide, surfaces must be cleaned first.
- Accelerated hydrogen peroxide (AHP) or other disinfectants with both a sporicidal claim and Drug Identification Number (DIN). AHP sporicidal products may also have detergent properties and can be used as a one step cleaner and disinfectant.  
**Note:** All detergents and disinfectants used **must** have both a Drug Identification Number (DIN) issued by Health Canada, and a claim to be sporicidal against *C. difficile* at the recommended contact time.

Always follow the manufacturer's directions for use to ensure that disinfectants are properly prepared and applied, and that there is sufficient contact time on items/surfaces. It is also important to note that some cleaning agents, if allowed to come into contact with *C. difficile* in low concentrations, could promote sporulation and, therefore, the persistence of the bacterium in the environment.<sup>21</sup>

Twice daily, clean and disinfect all high-touch surfaces and all items and surfaces within reach of patients/residents with suspected or confirmed CDI. "The heaviest contamination is found on floors and bedrails; other sites frequently found to be contaminated include windowsills, commodes, toilets, bedsheets, call buttons, scales, blood pressure cuffs, electronic thermometers, flow-control devices for intravenous catheters, and feeding tube equipment."<sup>22</sup>

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<sup>21</sup> Cohen, Gerding, Johnson et al., 443.

<sup>22</sup> Gerding, Muto and Owens, S44.

Decontamination, cleaning and disinfection of environmental surfaces must be thorough and incorporate the following:

- (a) Prepare a checklist of surfaces and equipment that need to be cleaned and disinfected during an outbreak. Using a checklist promotes consistency in cleaning among staff, and helps identify opportunities for improvement.
- (b) Declutter the patient/resident room to facilitate cleaning and disinfection.
- (c) Always work from clean items/surfaces to dirty ones.
- (d) Successful cleaning and disinfection requires manual scrubbing followed by application of the disinfectant to the surface for the appropriate contact time.
- (e) All cleaning and disinfectant solutions must be applied directly to the cloth. Saturating several clean cloths in a pail of solution and using one at a time is the safest way to clean and disinfect. The used cloth must go directly into the laundry. **Do not use spray bottles to apply disinfectants.**
- (f) Cloths and mop heads must not be double dipped and must be changed after use in the patient's/resident's room. This practice reduces contamination of clean cloths, mops and the disinfectant solution, and prevents transferring bacteria to other rooms and equipment.
- (g) Disposable toilet brushes shall be used in the rooms of all patients/residents with CDI.
- (h) Housekeeping staff shall wear appropriate PPE at all times.

A discharge/terminal cleaning must be done upon discontinuation of precautions, transfer of the patient to another room, or discharge from the healthcare facility. In cases where precautions are being discontinued (refer to sub-section 15, "Discontinuing Additional Precautions"), patients/residents must be temporarily removed from the room while terminal cleaning is done. The person should be bathed and dressed in clean bed-clothes or personal clothing before re-admission to the room. Please refer to your region's housekeeping policy and procedure manual for specific information regarding environmental cleaning upon discharge/transfer.

The following additional procedures must be incorporated into your organization's discharge/terminal cleaning and disinfection procedure for CDI:

- (i) Contact precautions shall remain in effect until discharge cleaning has taken place.
- (ii) All privacy, shower, and window curtains shall be taken down and sent for laundering.
- (iii) All disposable items including paper towels, toilet paper, glove boxes and toilet brush must be discarded.
- (iv) Clean and disinfect all dedicated equipment in the patient's room upon discharge or transfer.

## **7. Patient Care Equipment**

- (a) Dedicate noncritical nursing and personal-care equipment (e.g. thermometer, stethoscope, blood pressure cuff, tourniquet, vacutainer, laundry hamper stand, commode/bedpan) to a single patient/resident.
- (b) If sharing of equipment is unavoidable, clean and disinfect it between patients/residents (refer to sub-section 6, "Environmental Cleaning").
- (c) Equipment that cannot be disinfected must be discarded rather than being used for another patient/resident.

- (d) Limit the supplies taken into the room to avoid unnecessary waste when the patient/resident is discharged or precautions are discontinued.

### **8. Dietary**

No special handling or precautions are required in addition to contact precautions.

**Feeding tubes:** One study found that tube feeding was an independent risk factor for CDI. The investigators suggest four causes: *C. difficile* on the hands of healthcare workers handling tube feeding equipment; contaminated formulas and delivery systems; formulas lacking dietary fibre, resulting in an intestinal environment favourable to the growth of *C. difficile*; and, delivery of formulas below the gastric acid barrier. **Healthcare workers should wear gloves when handling feeding tube systems.**<sup>23</sup>

### **9. Linen and Laundry**

No special handling or precautions are required in addition to contact precautions.

### **10. Patient/Resident Transport**

- (a) Transportation of the patient to other departments should be limited to medically necessary procedures only.
- (b) If the patient/resident is transferred to another unit or facility, the receiving unit/facility must be notified and must be able to comply with requirements for accommodation. For example, a sticker that notes “Contact Precautions Required” may be placed on the nurse to nurse referral form.
- (c) Refer to “Appendix B: Procedure – Transporting a Patient/Resident on Contact Precautions” for further instructions on patient/resident transportation.

### **11. Chart Alerts**

- (a) Temporarily flagging the patient/resident chart with “Contact Precautions” is suggested to increase awareness during transfers within and outside the unit or facility. The chart label may be removed once contact precautions have been discontinued.
- (b) A chart alert need **not** be permanently affixed to the patient/resident file.

### **12. Visitors**

The following apply to anyone visiting a patient/resident with CDI:

- (a) Instruct visitors to wash their hands before entering and after leaving the patient’s/resident’s room, and before and after personal contact (refer to sub-section 2, “Hand Hygiene”).
- (b) Visitors who provide direct care to the patient/resident, or who have significant contact with the patient/resident or their environment, should follow the same precautions as healthcare providers (refer to sub-section 3, “Personal Protective Equipment”).
- (c) Visitors must not use the patient’s/resident’s bathroom or sit on the bed.
- (d) Visitors must not visit other patients/residents or attend social functions within the facility.

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<sup>23</sup> Gerding, Muto and Owens, S47.

### **13. Patient/Resident and Family Teaching**

Provide teaching material to patients, residents and families regarding *C. difficile*. Refer to “Appendix C: Information Sheet – Patient, Resident and Family Information about *Clostridium difficile*”.

### **14. Staff Exclusion from Work**

Food handlers, environmental services workers and healthcare workers with symptoms of enteric illness including CDI are to be excluded from work for at least 48 hours after diarrhea has resolved, or as directed by the Medical Health Officer and/or Occupational Health Services.

### **15. Discontinuing Additional Precautions**

Contact precautions should be discontinued only upon the advice of Infection Prevention and Control. Typically, this is when the patient/resident has had no symptoms of diarrhea (i.e. is producing formed stool, or stool normal for the individual) for at least 48 hours.<sup>24</sup>

**Colostomy and ileostomy patients:** Contact precautions may be discontinued when 72 hours of stools of a type consistent with pre-illness are present. Retesting of patients/residents with an ileostomy may be required in cases where no change in stool consistency is observed.

## **Identifying *Clostridium difficile* Infection**

### **Case Definition for CDI<sup>25</sup>**

A patient is identified as a CDI case if:

- s/he has diarrhea, or fever, abdominal pain and/or ileus, **AND** a laboratory confirmation of a positive toxin assay for *C. difficile*;
- OR**
- s/he has a diagnosis of pseudomembranes on sigmoidoscopy or colonoscopy or histological/pathological diagnosis of CDI;
- OR**
- s/he has a diagnosis of toxic megacolon.

Diarrhea (watery or unformed stool that takes the shape of the specimen collection container) is defined as one of the following:

- 3 or more unformed stools in a 24-hour period for at least 1 day and new or unusual for the patient;
- 6 or more watery stools in a 36-hour period; or
- 8 or more unformed stools over 48 hours.

**Note:** If the information about the frequency and consistency of diarrhea is not available, a toxin-positive stool will be considered as a case.

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<sup>24</sup> PIDAC, “Annex C: Testing, Surveillance and Management of *Clostridium difficile*”, 8.

<sup>25</sup> CNISP, “2010 Surveillance for *Clostridium difficile*-associated infection (CDI) within healthcare institutions”, 8-9.

### Testing for *C. difficile* Toxin

Prompt CDI identification is required for proper and rapid treatment to prevent disease progression, and for timely infection control interventions to reduce the incidence of additional nosocomial cases.<sup>26</sup>

1. Any stool sent to a laboratory for *C. difficile* testing should be from a patient/resident who meets the case definition. Do not submit specimens from children less than one year of age as *C. difficile* and its toxins are found in a high proportion of healthy infants as part of the normal gut flora.<sup>27</sup>
2. Early identification of CDI may be improved by permitting nursing staff to order *C. difficile* toxin testing at the onset of diarrhea. Health regions may wish to adopt this practice.
3. Stool specimens should be collected in a plain sterile container without transport medium. If there is a delay in specimen transport, refrigerate the specimen. Specimens requiring toxin testing need to be refrigerated and not frozen.  
**Note:** Specimens that are delayed in transport may be too degraded to detect the toxin. A negative cytotoxin result from such a specimen may indicate a false negative.
4. To ensure timely testing and diagnosis, stool samples should be tested in the health region's laboratory. A diagnosis is typically made by identifying *C. difficile* toxins in a diarrheal stool sample. If the test result is indeterminate, the sample should be forwarded to the Saskatchewan Disease Control Laboratory (SDCL) for cytotoxin testing. The *C. difficile* testing protocol is described in Figures 1a and 1b.
5. Whether sending to your region laboratory or SDCL, ensure that the laboratory requisition accompanying the sample is completed in its entirety. This information will guide testing. As an example of what is required, a blank requisition from SDCL is provided in Appendix D.
6. In the event of an outbreak, it is important to determine the *C. difficile* strain(s) responsible. To do this, SDCL must culture an isolate of the bacterium (a process that takes three to five days) and send it to the National Microbiology Laboratory (NML) in Winnipeg for strain typing (an additional week or more). When your region declares an outbreak suspected to be CDI:
  - (a) If possible, take a fresh stool sample from each affected patient (a sample in addition to the one used for toxin confirmation). Specimens previously sent to SDCL for toxin testing are likely too degraded to culture.
  - (b) Place the stool specimen in either: a container without transport medium and **freeze the sample**, or in a container with Cary Blair transport medium.
  - (c) Use a requisition form for Bacteriology rather than Virology. Include the outbreak number on the accompanying laboratory requisition.
  - (d) Send the sample and requisition to SDCL as soon as possible.
7. Retesting after treatment is not indicated. Toxin may remain at low levels in stool for several days or weeks and is therefore not helpful in determining further treatment options or discontinuation of contact precautions.

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<sup>26</sup> Kufelnicka and Kirn, 1452.

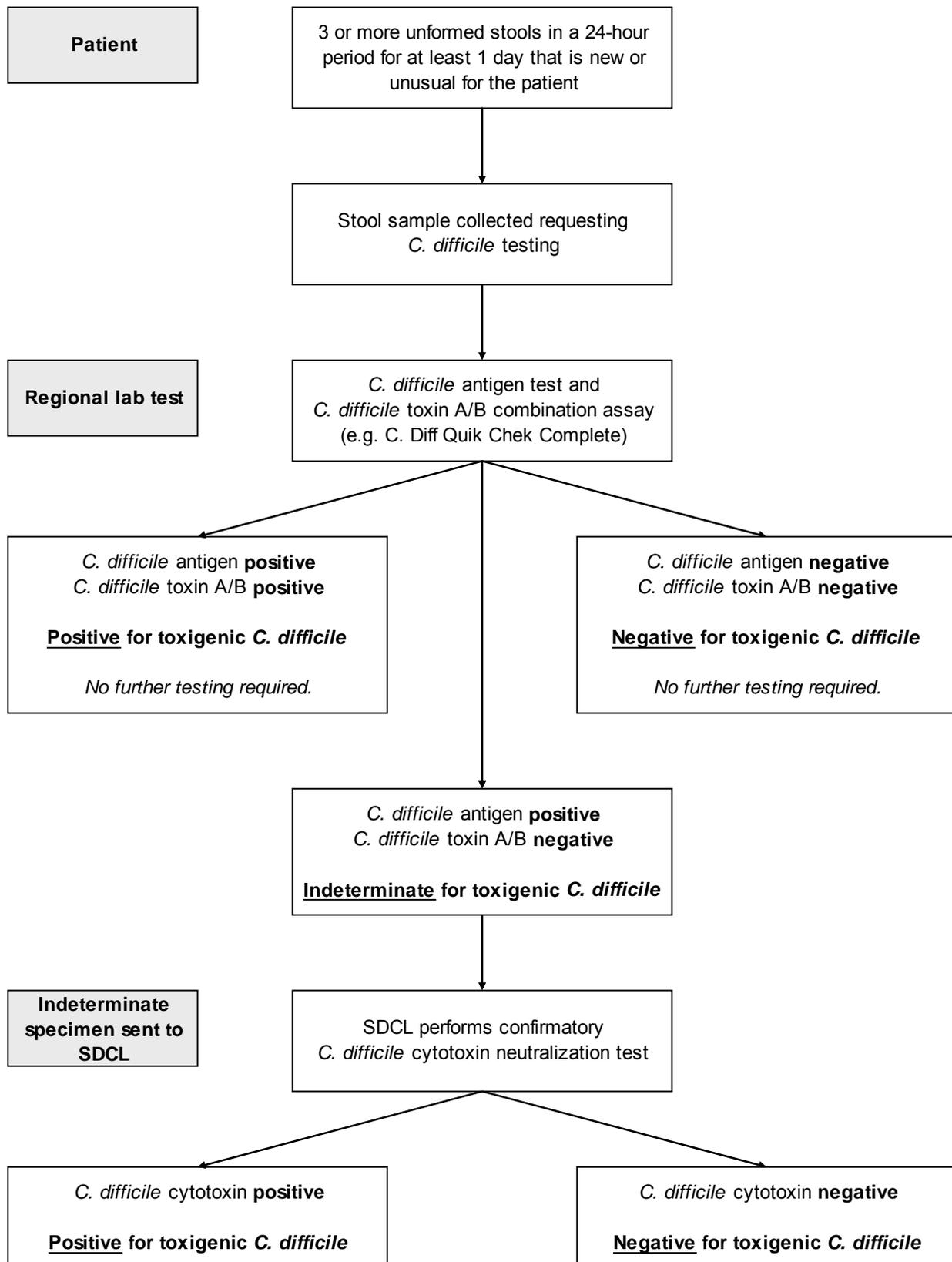
<sup>27</sup> Saskatchewan Disease Control Laboratory (SDCL), 1.

8. If symptoms return following a period of absence, retesting may be indicated to determine if a relapse has occurred. Consultation with a regional infection prevention and control professional may be required in this situation.

**Figure 1a: Explanation of *C. difficile* Toxin Test Algorithm**

Specimens are tested using a two-step assay that first detects the presence of *C. difficile* by looking for glutamate dehydrogenase (GDH) antigen. If this is present, a second test for *C. difficile* toxins A and B is performed to determine if this is a toxigenic strain of *C. difficile*. A confirmed case is antigen+ / toxin+, while a negative test is antigen- / toxin-. Specimens that are antigen+ / toxin- are considered indeterminate. An indeterminate test result may be a false positive (the patient may be a carrier of a non-toxigenic strain of *C. difficile*), so further testing is required. Indeterminate samples (antigen+ / toxin-) are forwarded to the Saskatchewan Disease Control Laboratory (SDCL) for confirmatory cytotoxin testing. SDCL performs the tissue culture neutralization test, a biological assay in which the cytotoxin (toxin B) is neutralized by a specific antitoxin. A patient with a positive result in the fecal cytotoxin assay is regarded as a confirmed case.

Figure 1b: *C. difficile* Toxin Test Algorithm



## Surveillance

At a minimum, every healthcare facility should have the ability to identify clusters of infections, know how to conduct a systematic epidemiologic investigation to determine commonalities in person, place and time, and develop, implement and evaluate prevention measures.<sup>28</sup>

Refer to the Saskatchewan *Clostridium difficile* Infection (CDI) Surveillance Protocol [available in 2012] for more information.

## Outbreak Management

Ontario's Provincial Infectious Diseases Advisory Committee (PIDAC) defines a CDI outbreak as: "CDI occurring at a rate exceeding the normally expected baseline rate for the health care setting (or unit, floor, ward) during a specified period of time."<sup>29</sup>

For long-term care, the Saskatchewan Ministry of Health "Communicable Disease Manual" defines an enteric outbreak as: "Two (2) or more residents/clients and/or staff members are exhibiting signs and symptoms of gastrointestinal illness over a twenty-four (24) hour period."<sup>30</sup> Sections 9-50 to 9-55 of this manual provide detailed information for the management of an outbreak of enteric illness including CDI. Key points include:

- (a) Facilities must report **suspected** enteric outbreaks to local or regional Infection Prevention and Control (IPAC) personnel and the Medical Health Officer (MHO) as soon as possible.
- (b) The outbreak is declared by the Medical Health Officer, Infectious Disease Physician or a designate.
- (c) Outbreak management should focus on key infection prevention and control measures such as hand washing, environmental cleaning, and the use of routine practices and additional precautions.
- (d) A multidisciplinary team with expertise in outbreak management should be assembled to assist in determining the course of action for admissions, discharges, cancellations of service and internal and external communication.
- (e) Only the Medical Health Officer, the Infectious Disease Physician, or designate may declare the outbreak over.
- (f) An outbreak report shall be submitted to the Saskatchewan Ministry of Health according to defined specifications and timelines.

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<sup>28</sup> APIC, 18

<sup>29</sup> PIDAC, "Annex C: Testing, Surveillance and Management of *Clostridium difficile*", 11.

<sup>30</sup> Saskatchewan Ministry of Health, Section 9-52, 1.

## Medical Management of *Clostridium difficile* Infection

Management of CDI focuses on supportive therapy, discontinuation of antibiotic therapy, and conservative medical treatment based on the clinical symptoms of the patient. The process is illustrated in Figure 2.

### Clinical Guidelines

The following guidelines are summarized from Cohen et al.<sup>31</sup> and Gilbert et al.<sup>32</sup>

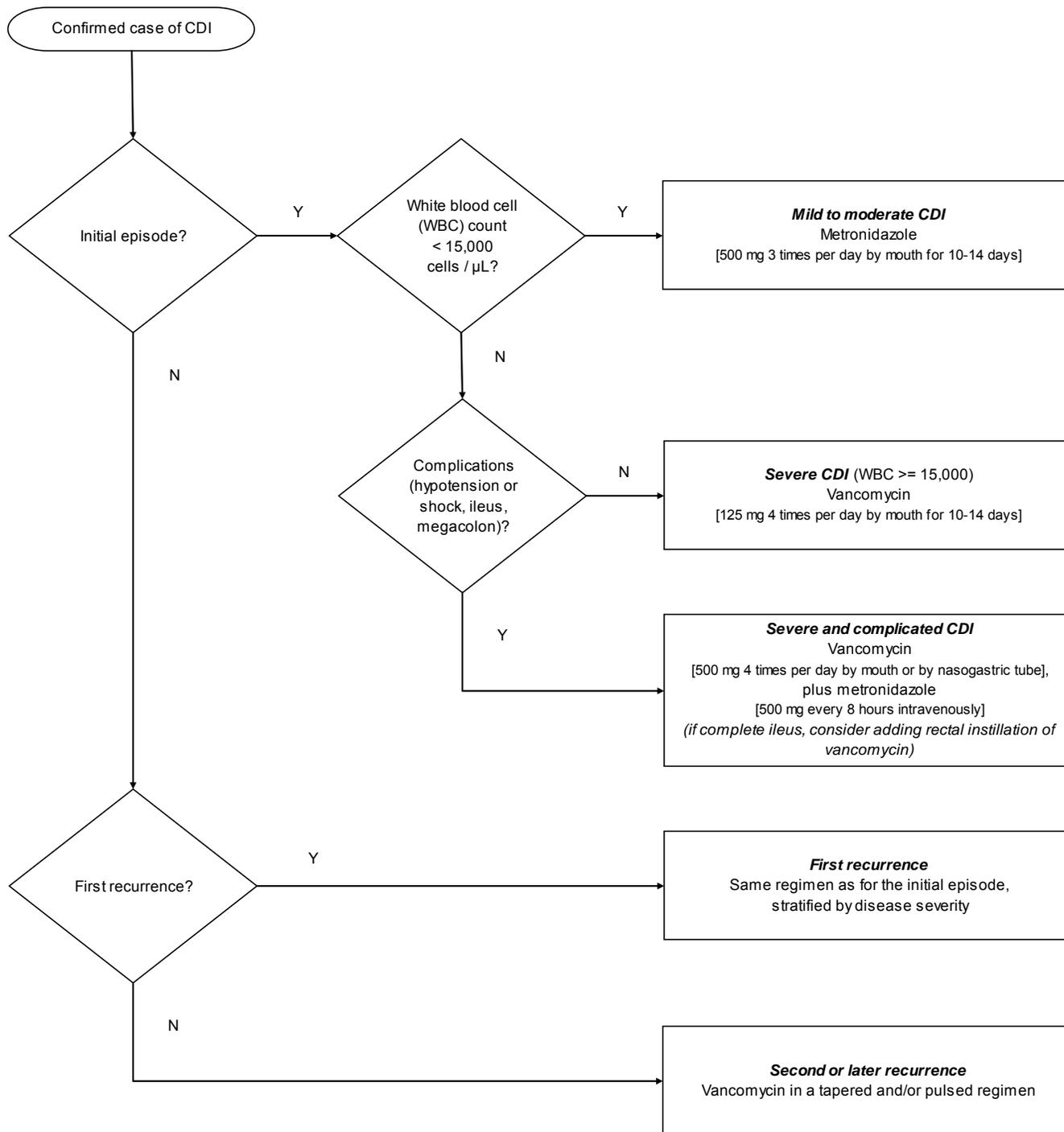
- (a) Do not treat symptom-free carriers of *C. difficile*.
- (b) Discontinue antibiotics if possible, or consider changing to a lower CDI risk group of antibiotics such as aminoglycosides, TMP/SMX, tetracyclines, and/or metronidazole.
- (c) Do not use antidiarrheals (e.g. loperamide [Immodium], diphenoxylate [Lomotil]).
- (d) Supportive therapy with intravenous fluids and electrolytes may be sufficient to relieve symptoms.
- (e) Dosages must be given orally in order to be fully effective in the gut.
- (f) An oral vancomycin solution can be prepared from an injectable solution. It is advisable to consult a pharmacist.
- (g) Consultation with an infectious disease physician is recommended for the management of complex cases.
- (h) Evidence does not support the use of probiotics for the prevention of CDI.
- (i) Other antimicrobial agents and treatments are being developed for CDI, but are not clinically recommended at this time.

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<sup>31</sup> Cohen, Gerding, Johnson et al., 440-448.

<sup>32</sup> Gilbert, Moellering, Eliopoulos et al.

**Figure 2: Medical Management of CDI<sup>33</sup>**



**Note:** This is provided for general information only. The physician will determine the course of treatment based on her/his clinical judgement and the patient’s condition.

<sup>33</sup> Cohen, Gerding, Johnson et al., 437 (Table 3).

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## Appendix A: Sample Hand Washing Poster

**Wash your hands with soap and water for 20 seconds immediately before entering and upon leaving the patient's bedside or room.**



## **Appendix B: Procedure – Transporting a Patient/Resident on Contact Precautions**

1. The caregiver or porter shall wash hands, don appropriate personal protective equipment (PPE) and obtain a clean sheet prior to entering the patient's room.
2. Place the clean sheet over the stretcher or wheelchair.
3. The patient/resident is to wear a clean gown and housecoat.
4. Assist the patient/resident to the stretcher or wheelchair.
5. Use a sporicidal disinfectant to wipe the handles of the wheelchair or the rails of the stretcher.
6. Assist the patient/resident to wash their hands with soap and water.
7. Remove your gown and gloves. Wash your hands.
8. Remove the patient/resident from the room.
9. Don clean gloves and gown. Place a clean sheet over the patient/resident.
10. Place the appropriate precaution sign on top of the chart.
11. Place the chart on top of the clean sheet, or in a plastic bag or pillow case.
12. Ensure that the receiving area is aware that the patient/resident has arrived and that contact precautions are required.
13. If the patient/resident is also on droplet or airborne precautions, a procedure mask should be provided to the patient. Staff shall wear a procedure mask or N95 respirator as required.
14. Upon completion of transport, clean the wheelchair or stretcher with an approved sporicidal disinfectant, remove gown and gloves, and wash hands with soap and water.

## **Appendix C: Information Sheet – Patient, Resident and Family Information about *Clostridium difficile***

### **WHAT IS *Clostridium difficile* (also known as *C. difficile* or *C. diff*)?**

*C. diff* is one of the many kinds of bacteria that can be found in stool (bowel movement).

### **WHAT IS *C. diff* INFECTION (CDI)?**

*C. diff* is the most common cause of infectious diarrhea in hospitals or long-term care (LTC) facilities. CDI occurs when antibiotics kill the good bacteria in your bowel and allow the *C. diff* bacteria to grow. When *C. diff* grows it produces toxins (poisons). These toxins can damage the bowel and may cause diarrhea. *C. difficile* infection is usually mild, but can be severe. In extreme cases, patients may need surgery. *C. diff* may even cause death.

### **WHAT ARE THE SYMPTOMS OF *C. diff*?**

The usual symptoms are watery diarrhea, fever, and abdominal pain.

### **WHO IS AT RISK FOR *C. diff*?**

- anyone with a recent history of antibiotic use
- persons (especially older or debilitated patients/residents) in hospital or long-term care
- persons with other bowel diseases or who have had bowel surgery
- persons on chemotherapy for cancer

### **HOW DO YOU TREAT *C. diff*?**

Treatment depends on how sick you are with *C. difficile* infection. People with mild symptoms may not need treatment. People with more severe disease may need to be treated with a special antibiotic that kills the *C. diff* bacteria.

### **HOW IS *C. diff* SPREAD?**

1. When a person has *C. diff*, the bacteria in the stool can contaminate surfaces such as toilets, handles, bedpans or commode chairs.
2. When touching these items our hands can become contaminated.
3. If we then touch our mouths without washing our hands, we can become infected.
4. Our soiled hands can also spread the bacteria to other surfaces.

### **WHAT PRECAUTIONS ARE REQUIRED TO PREVENT THE SPREAD OF *C. diff* IN HOSPITALS?**

If you have *C. diff*, special precautions will be taken to prevent it from spreading to other patients in the hospital. These precautions include:

- Single room accommodation if possible (the door can remain open).
- A sign posted outside your door to remind others who enter your room about the need for special precautions.

- Everyone who cares for you must wear a long-sleeved gown and gloves.
- Your activities outside the room will be restricted.
- Everyone **MUST** wash their hands when leaving your room.
- You must wash your hands after using the bathroom and before leaving your room.

### **WHAT SHOULD I DO AT HOME?**

Healthy people are at very low risk. This includes your family and friends who are not taking antibiotics.

#### **Hand Hygiene**

- Everyone who might help you with your personal hygiene or with going to the toilet should wash their hands after assisting you.
- Wash your hands after you go to the bathroom, after handling soiled laundry, and before preparing meals or eating food.

#### **Cleaning the house**

Use a regular household cleaner, then disinfect common hard contact surfaces (e.g. faucets, door handles, countertops, etc.) using a diluted bleach solution (1 part bleach to 50 parts water, or 1 tablespoon of bleach added to 2 litres of water). Follow these four steps:

1. Wet the surface well.
2. Clean it using good friction.
3. Disinfect with the bleach solution.
4. Allow the surface to air dry.

Pay special attention to areas (such as the toilet) that may be heavily soiled with stool.

#### **Cleaning clothes**

For clothes that are heavily soiled with stool:

1. Rinse stool off or dispose of stool in the toilet.
2. Wash separately from other household laundry in a hot water cycle with soap.
3. Dry items in the clothes dryer if possible.

#### **Cleaning dishes**

Dishes and cutlery should be washed with normal household dishwashing products.

#### **Taking medication**

It is very important that you take all of your medication as prescribed by your doctor. You should not take any medications (e.g. Immodium) that will stop your diarrhea.

#### **Sources:**

Saskatoon Health Region Infection: Prevention and Control Fact Sheet (*C. difficile*) 2007.  
PIDAC Sample Patient Information: *Clostridium difficile* 2010.

## Appendix D: Saskatchewan Disease Control Laboratory Requisition

 <b>Saskatchewan Ministry of Health</b> Saskatchewan Disease Control Laboratory		<b>Virology Requisition</b>		Place SDCL number sticker here
Patient's Name & Address (required - print clearly)		Patient PHN		
		Birthdate D / M / Y		
Outbreak # _____		Gender <input type="checkbox"/> Male <input type="checkbox"/> Female		
		Sending Location Phone #		
Hospital ID, Ward or Room#		Patient type <input type="checkbox"/> In <input type="checkbox"/> Out		
Diagnosis		Collection Date D / M / Y		
Medication		Collection Time H / M		
Physician name (include initials)		Physician MCIB#		
Return Address (Doctor/Clinic/Hospital)				
In addition to mail/courier, please copy to: Dr.'s Name _____				
<input type="checkbox"/> Fax (____) _____ <input type="checkbox"/> Phone report (____) _____				
<b>Please ensure that requisition and specimens are properly labeled.</b> This area for Provincial Lab purposes only				
<b>Symptoms</b>				
<input type="checkbox"/> Fever				
<input type="checkbox"/> Headache				
<input type="checkbox"/> Meningitis				
<input type="checkbox"/> Encephalitis				
<input type="checkbox"/> Abdominal pain				
<input type="checkbox"/> Hypoesthesia				
<input type="checkbox"/> Pericarditis				
<input type="checkbox"/> Conjunctivitis				
<input type="checkbox"/> Rhinitis				
<input type="checkbox"/> Cough				
<input type="checkbox"/> Rash				
<input type="checkbox"/> Diarrhea				
<input type="checkbox"/> Flu-like				
<input type="checkbox"/> Lymphadenitis				
<input type="checkbox"/> Stomatitis				
<input type="checkbox"/> Sore throat				
<input type="checkbox"/> Photophobia				
<input type="checkbox"/> Nausea/Vomit				
<input type="checkbox"/> Muscle weakness				
<input type="checkbox"/> Pneumonia				
<input type="checkbox"/> Bronchitis				
<input type="checkbox"/> Other (specify) _____				
<b>Specimen Source</b>				
<input type="checkbox"/> Urine				
<input type="checkbox"/> Penis				
<input type="checkbox"/> Vagina				
<input type="checkbox"/> Auger suction				
<input type="checkbox"/> CSF				
<input type="checkbox"/> Cervix				
<input type="checkbox"/> Throat				
<input type="checkbox"/> Stool for <i>Clostridium difficile</i> Toxin Assay				
<input type="checkbox"/> Stool for Norovirus PCR				
<input type="checkbox"/> Stool for Viral Studies				
<input type="checkbox"/> Other (specify) _____				
<b>Other Information</b>				
Date of illness onset _____				

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### Virology

**Collection and Submission**

Successful performance of virologic studies is in part dependant on the cooperation of informed clinicians who will obtain proper specimens taken at the correct time during the patient's illness and provide sufficient clinical information for the laboratory to select the appropriate test or tests for the specific situation.

This is a guide to collect specimens for viral diagnosis. Without proper specimen or clinical information, it may prevent the laboratory from selecting the appropriate test for the disease.

All virology specimens should be placed in leakproof containers, refrigerated, and transported to the laboratory as soon as possible.

**Stool:** A 10-20 gram (walnut size) fresh sample should be collected without preservatives.

Do NOT send formed stool (it will not be processed).

**When testing stool for *Clostridium difficile* toxin:**

- Consider in patients in whom diarrhea develops after 3 days of hospitalization.
- Send liquid or soft stool specimens (soft stool is defined as stool assuming the shape of its container).
- Send in clean dry container (NOT Carey Blair Medium or SAF).
- Do NOT send formed stool (it will not be processed).
- Do NOT send duplicate or repeat specimen within 72 hours if first specimen is positive.
- Do NOT use rectal swabs.

**Nasopharyngeal swab:** Pass a flexible, fine-shafted swab into the nasopharynx. Rotate the swab to collect ample epithelial cells. Carefully remove the swab and place it in the viral transport media.

**Throat specimens:** A vigorous swab taken of the palates, tonsils and pharyngeal wall should be placed in the viral transport media.

**Spinal fluid:** At least 2 mL should be collected aseptically and immediately refrigerated.

**Urine:** 15-20 mL of fresh urine is the specimen of choice for cytomegalovirus, but is not considered useful for the isolation of most other viruses.

**Vesicular lesion - Herpes simplex and Varicella zoster:** Vigorous swabs or scrapings to include epithelial cells of the base of the vesicle should be put into viral transport media. Indicate the site of the specimen.

**Tissue Analysis:** Each biopsy and autopsy specimen must be collected separately and kept in individual containers. Aseptic procedures should be used to prevent cross contamination from other sources. Specimens in formalin are unacceptable.

**For results, please phone:** 787-3138 Virology  
**For interpretations or information, please phone:** 787-8316 Dr. G. Horsman  
 or 787-3135 Dr. P. Levett  
 or 798-4153 Niki Coffin

## Glossary

**Additional Precautions:** Additional precautions are used when routine practices alone may not interrupt transmission of an infectious agent. These precautions are based on the method of transmission (e.g. contact, droplet, airborne). Additional precautions are used in addition to (not in place of) routine practices.

**Alcohol Based Hand Rub (ABHR):** An alcohol-containing (60-90%) preparation (liquid, gel or foam) designed for application to the hands to kill or reduce the number of microorganisms on hands in clinical situations when the hands are not visibly soiled.

**CDAD:** *Clostridium difficile*-associated disease. This term is being replaced by the term *Clostridium difficile* Infection (CDI).

**CDI:** *Clostridium difficile* Infection. CDI is the acute phase of the disease characterized by the symptoms of watery diarrhea, abdominal pain and fever. In contrast, colonized carriers do not have symptoms of the disease and are generally not treated for CDI; however, they are still capable of transmitting *C. difficile* bacteria.

**Cleaning:** The physical removal of foreign material (e.g. dust, soil) and organic material (e.g. blood, secretions, excretions, micro-organisms). Cleaning removes microorganisms but does not kill them. Cleaning is accomplished using water, detergents and mechanical action.

**Cohorting:** Physically separating (e.g. in a separate room) 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 same organism.

**Diarrhea:** Loose/watery stool (i.e. if the stool were to be poured into a container it would conform to the shape of the container); **and** the bowel movements are unusual or different for the patient/resident; **and** there is no other recognized etiology for the diarrhea (e.g. laxative use).

**Disinfection:** The inactivation of disease-producing microorganisms with the exception of bacterial spores. Medical equipment/devices must be cleaned thoroughly before effective disinfection can take place.

**Hand Hygiene:** A general term referring to any action of hand cleaning – the removal of visible soil, and removal or killing of transient microorganisms on the hands. Hand hygiene may be accomplished using soap and water or an alcohol based hand rub.

**Hand Washing:** A process for the removal of visible soil/organic material and transient microorganisms from the hands by washing with soap and water.

**Hospital Grade Disinfectant:** A disinfectant that has a drug identification number (DIN) from Health Canada indicating approval for use in Canadian hospitals.

**High Touch Surfaces:** High touch surfaces are those that have frequent contact with the hands (e.g. doorknobs, call bells, bedrails, light switches).

**Multidrug-resistant organism (MDRO):** Bacteria (excluding *M. tuberculosis*) that are resistant to one or more classes of antimicrobial agents and usually are resistant to all but one or two commercially available antimicrobial agents (e.g. MRSA, VRE, extended spectrum beta-lactamase [ESBL]-producing or intrinsically resistant gram-negative bacilli).<sup>34</sup>

**Pseudomembranous Colitis:** An inflammatory condition of the colon consisting of a characteristic membrane with adherent plaques associated with severe symptoms including profuse watery diarrhea and abdominal pain. The condition is considered distinctly characteristic of *Clostridium difficile* infection.

**Routine Practices:** The system of infection prevention and control practices recommended by the Public Health Agency of Canada to be used with all patients at all times to prevent and control transmission of microorganisms in healthcare settings.

**Spore:** The dormant stage some bacteria will enter when environmental conditions cause stress to the organism or no longer support its continued growth. *C. difficile* spores are highly resistant to cleaning and disinfection measures. The spores also make it possible for the organism to survive passage through the stomach, resisting the killing effect of gastric acid.

**Sporicide:** A substance used to kill spores.

**Terminal Cleaning:** The process for cleaning and disinfecting a patient room or bed space following discharge, transfer or discontinuation of contact precautions, in order to remove contaminating microorganisms that might be acquired by subsequent occupants.

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<sup>34</sup> Siegel, Rhinehart, Jackson et al., 53.