

Educational Module for Nursing Assistants in Long-term Care Facilities: Preventing and Managing *Clostridium difficile* Infections

Clostridium difficile (*C. difficile*) causes a wide range of illness - from uncomplicated diarrhea to life-threatening inflammation of the colon.

This module:

- Describes the link between antibiotic use and the development of *C. difficile* infection (CDI)
- Describes how *C. difficile* bacteria spreads between people and the environment
- Provides ways to limit the spread of *C. difficile* within long-term care facilities



Minnesota Department of Health
Infectious Disease Epidemiology, Prevention, and Control Division
PO Box 64975, Saint Paul, MN 55164-0975
651-201-5414 or 1-877-676-5414 www.health.state.mn.us

Pre-test

1. List at least two characteristics of the *Clostridium difficile* bacterium.
2. Identify at least one important risk factor for the development of CDI in long-term care residents.
3. State the difference between colonization and infection with *C. difficile* bacteria.
4. Describe at least three ways to prevent the spread of *C. difficile* bacteria in long-term care facilities.

Objectives



Introduction

- There are many disease-causing germs (also known as pathogens) responsible for causing diarrhea in humans. The most important to healthcare facilities are:
 - Norovirus
 - *E. coli* 0157:H7 and other types of *E. coli* that make toxins (substances that are harmful to the cells around them)
 - Rotavirus
 - *Clostridium difficile* (also known as *C. diff* or *C. difficile*)
- *C. difficile* bacteria can cause *C. difficile* infection (CDI), a major cause of antibiotic-associated and healthcare-associated diarrhea
- Certain factors make infection and spread of *C. difficile* more likely
 - Elderly (>65 years) are at highest risk for death and serious disease from CDI
 - *C. difficile* bacteria can cause a wide range of symptoms
 - CDI is occurring more frequently than in the past and its seriousness has increased

***Clostridium difficile* bacteria**

C. difficile are a type of bacteria that can't survive very well in oxygen. They like to live in the human gut with other kinds of bacteria. All of these types of bacteria living together in the gut are called "normal bowel flora." *C. difficile*, while in the gut, are living in ideal conditions and can successfully survive in their vegetative form. The vegetative form of *C. difficile* is able to reproduce, "eat," and possibly cause illness. Once *C. difficile* bacteria leave the gut, they can turn themselves into a different form called a spore. As spores, they can survive outside of a human body for very long periods of time.

C. difficile spores are difficult to remove from the environment and surfaces (commode, door knob, bed rail, etc.).

The *C. difficile* spores can return to the vegetative form when they are in their preferred living conditions of the human gut, where they can cause disease.

C. difficile bacteria cause disease by producing two toxins. Toxins are substances that bacteria release which destroy other cells nearby. When cells in the gut are destroyed, the gut isn't able to function as it normally does, resulting in disease.

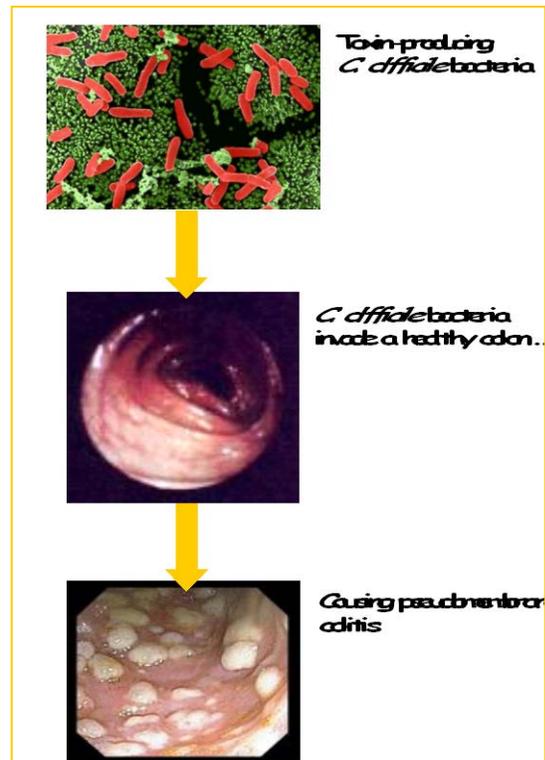
While not all strains of *C. difficile* bacteria produce toxins, a toxin-producing strain of *C. difficile* bacteria must be present to cause disease.

C. difficile infection (CDI): How *C. diff* infects the body

The colon is home to hundreds of types of bacteria that help the human body perform important digestive functions. Bacteria that ordinarily live in the digestive tract (the gut) are called normal bowel flora. Normal bowel flora may include *C. difficile* bacteria. When a person takes antibiotics the normal bowel flora are disrupted and *C. difficile* bacteria overgrow.

In order for *C. difficile* bacteria to cause symptoms, all of the following must occur:

1. Decrease in the healthy bacteria in the gut which is most commonly due to the resident taking antibiotics
 - *C. difficile* can be found on any surface that hands touch, particularly in the bathroom and living areas
 - Healthcare worker hands that have come into contact with the germ can spread it to other surfaces or to people
3. Individual resident factors (for example: advanced age, chronic illness) or strain virulence factors (ability of the bacteria to cause serious infection) are present.



CDI Symptoms

Symptoms of CDI usually begin during or shortly after starting a course of antibiotics, but can be delayed for as long as 8 to 12 weeks following antibiotic use. After disruption of the normal bowel flora by antibiotics, *C. difficile* and other disease-causing bacteria may multiply. All antibiotics increase the risk of infection with *C. difficile* bacteria although certain antibiotics like ciprofloxacin and clindamycin are most often linked with *C. difficile* infection.

C. difficile can cause different effects for different people, ranging from asymptomatic colonization (being a carrier) to severe infection resulting in death.

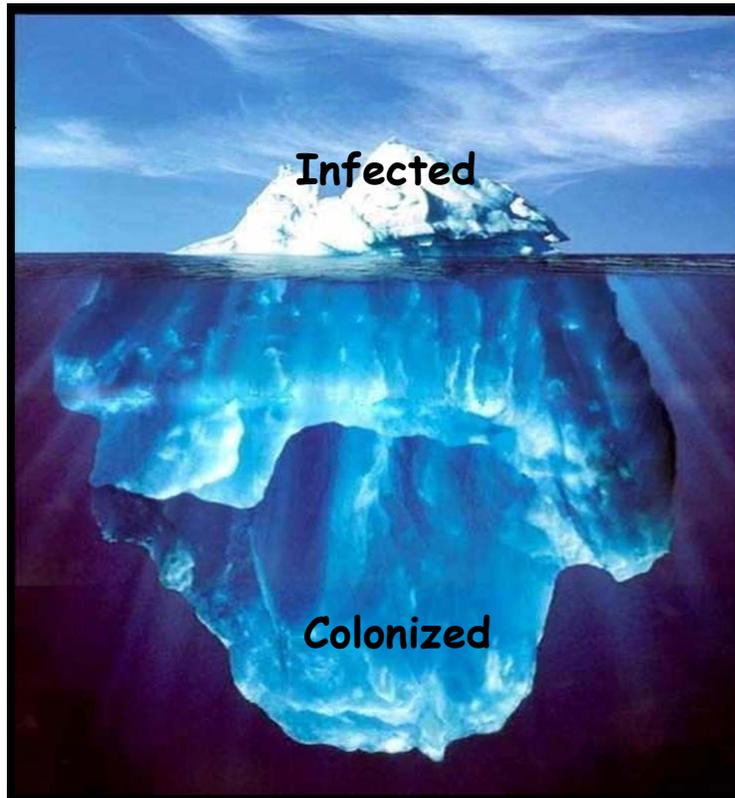
Clinical symptoms

- Watery diarrhea
 - Most common symptom
- Fever
- Abdominal cramps

Severe disease

- Pseudomembranous colitis (severe swelling and pus production in the intestine)
- Toxic megacolon (if the intestine swells too much, it may cause the intestine to stop getting rid of gas and waste, leading to a lot of built up pressure)
- Perforations of the colon (the extra pressure in the intestine can cause a hole to form in the intestine, which allows bowel waste contents to leak into the abdominal space where it can cause widespread infection)
- Sepsis (a serious blood infection)
- Elevated white blood cell count
 - May be an early warning sign for a sudden severe and intense infection even in the absence of other symptoms
- Death

C. difficile colonization vs. *C. difficile* infection



This iceberg shows colonization versus infection as a picture. The “tip of the iceberg” represents only those residents known to be infected. Residents who are colonized carry the bacteria but do not have signs of infection.

- Infected and colonized residents can shed the bacteria from their stool to objects in the environment such as commodes, rectal thermometers, etc.
- *C. difficile* spores remain on surfaces and objects in the environment for long periods of time (door knobs, TV remotes, chairs, etc.).
 - If other staff or residents touch these surfaces or objects and then touch their mouth or anything that goes into their mouth, they become exposed to the bacteria
- *C. difficile* is easily spread within a facility when healthcare workers do not follow infection prevention and control practices or perform good hand hygiene.
 - Bacteria can be spread to other residents, even those who have not been on antibiotics

Risk factors for CDI

Antibiotic use is the major risk factor for developing CDI

- More than 90% of all cases of CDI occur during or after antibiotic treatment
- Antibiotics change the normal bowel flora, allowing *C. difficile* bacteria to multiply. A person can be at risk for developing CDI up to 12 weeks after the antibiotic is stopped because it can take this long for normal bowel flora to return
- Any antibiotic can increase the risk of CDI, but broad-spectrum antibiotics (those that do not target specific germs, but instead kill helpful *and* harmful bacteria) are more likely to be associated with CDI.

In addition to antibiotic use, LTCF residents may be at increased risk for CDI because of the characteristics listed here:

- Advanced age (>65 years)
- Use of nasogastric (NG) or gastrostomy (GT or G-tube) feeding tubes
- Use of antacids or other medications that decrease stomach acid
- Severe underlying medical conditions that make it harder for people's bodies to fight infection (people receiving steroids, cancer chemotherapy, anti-rejection drugs after transplant; or who have existing infections such as HIV or AIDS)

While most of these characteristics cannot be changed, nursing assistants play a critical role in observing residents and communicating status changes to nurses in a timely manner. This can contribute to the early recognition of CDI and action to prevent spread of CDI to other residents. Additionally, watching for physical or non-physical changes in a resident, and notifying the resident's nurse if any changes are noticed - no matter how big or small - can help keep residents safe and healthy, and may even save a life.

Rates of *Clostridium difficile* infection

Rates of CDI are increasing in both hospitals and long-term care facilities. This increase may be due to:

- Strains of *C. difficile* bacteria that cause more severe disease
- Inadequate infection prevention and control practices in healthcare facilities
- Overuse and misuse of antibiotics

Figures 1 and 2 (below) show the increasing rates of *C. difficile* infection in hospitalized patients from 1998 to 2011 and the rates of *C. difficile* by sex and age for 2011.

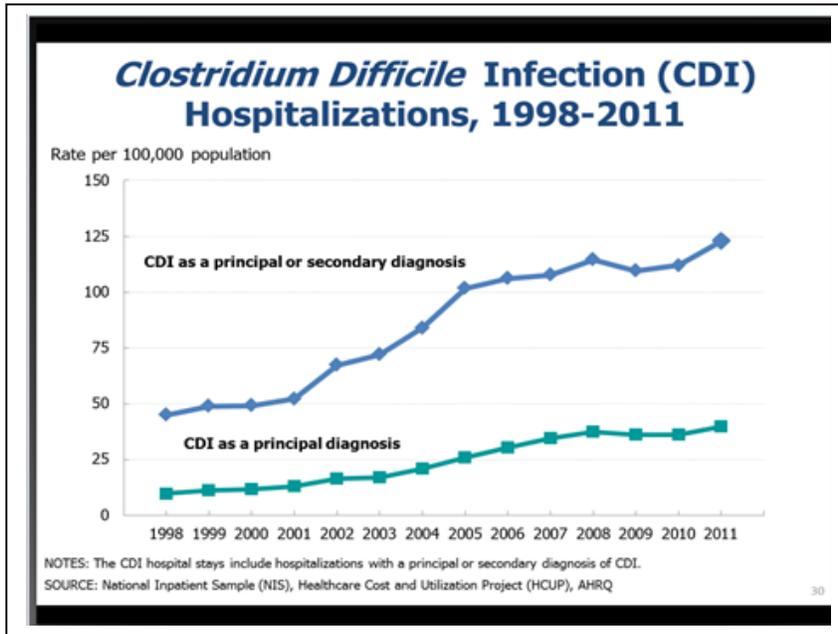


Figure 1. *C. difficile* as a Discharge Diagnosis, 1998-2011.

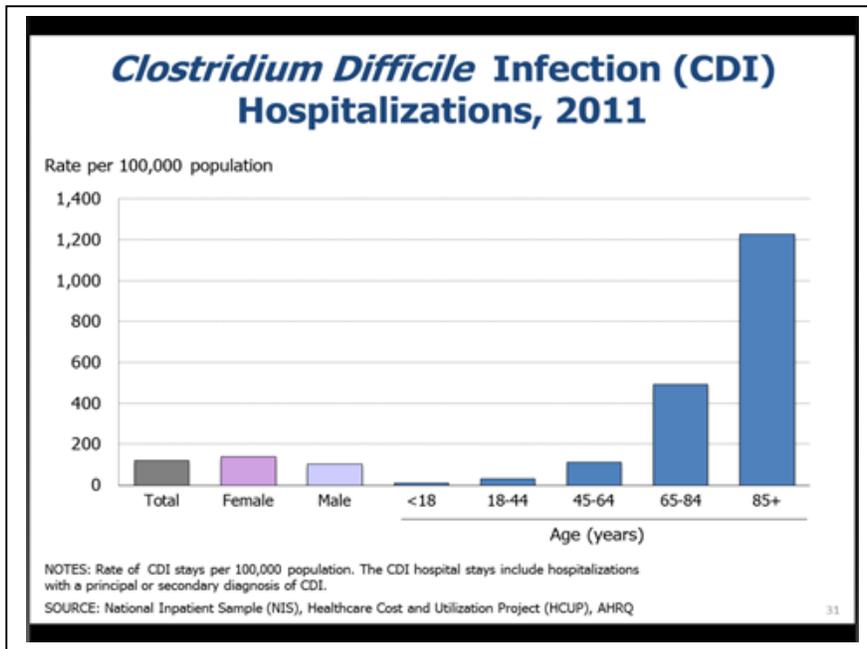


Figure 2: National Rates of *C. difficile* Hospitalizations as Principal or Secondary Diagnosis by Sex and Age, 2011.

Diagnosis of CDI

To determine if a resident has CDI, the provider must consider both symptoms and lab test results. The stool sample to be tested must be loose and watery, taking the shape of the stool collection container. See the Bristol Stool Chart below - stool to be tested should be type 5-7.

Bristol Stool Chart	
Type 1  Separate hard lumps, like nuts (hard to pass)	Type 2  Sausage-shaped but lumpy
Type 3  Like a sausage but with cracks on its surface	Type 4  Like a sausage or snake, smooth and soft
Type 5  Soft blobs with clear-cut edges (passed easily)	Type 6  Fluffy pieces with ragged edges, a mushy stool
Type 7  Watery, no solid pieces. Entirely Liquid	Reproduced by kind permission of Dr KW Heaton, Reader in Medicine at the University of Bristol

How to obtain stool specimens

- Fresh stool is required from residents with suspected CDI
 - Only unformed stools should be collected
- Collect specimen in clean, watertight container
- Stool specimen must be refrigerated immediately after collection
 - Provide fresh stool to the resident's nurse as soon as possible
 - *C. difficile* toxin is very unstable and breaks down at room temperature in as short as two hours
 - Testing errors can happen if specimens are not kept refrigerated until testing can be done
 - Do not place stool specimens in refrigerator where food is stored

Treatment of CDI

Treatment of CDI involves a number of strategies.

Stop the antibiotic!

As soon as CDI is diagnosed, any noncritical antibiotic therapy should be stopped. After stopping the antibiotic, the normal bowel flora can begin to return (this can take as long as 12 weeks). Symptoms resolve in 15-20% of people after stopping the antibiotic.

Medication

As unusual as it seems, CDI is usually treated with an antibiotic such as metronidazole (oral or intravenous) or oral vancomycin.

Rehydration

Watery diarrhea caused by CDI can lead to dehydration. Ask the resident's nurse about any conditions that may require fluid restrictions. If the nurse approves, provide as many clear liquids as possible such as water, non-caffeinated tea, broth, or electrolyte-rich liquids.

Other treatment considerations

- Avoid anti-diarrheals
 - Diarrhea is nature's way of getting rid of toxins and "bad" bacteria from the intestine. Anti-diarrheals will slow this process.
- Probiotics
 - Probiotics can be found in dietary supplements. These may replace bacteria normally found in the large bowel but it is not known that they are effective.

Monitor resident for status changes

CDI can result in serious intestinal conditions such as ileus (bowel obstruction) that need immediate evaluation by a physician. Symptoms of bowel obstruction can include:

- Cramping abdominal pain that comes and goes
- Abdominal bloating
- Dramatic decrease in bowel movements (from 10 per day to 0 per day)

Notify the resident's nurse immediately if these signs or symptoms develop.

Recurrent CDI

After CDI has been treated, it can come back due to relapse (the same infection returns) or reinfection (the first infection was cured but a new infection begins). Recurrence of CDI symptoms occurs in 6-35% of patients.

How *C. difficile* bacteria can spread

C. difficile bacteria are spread through the fecal-oral route. When disease spreads through the fecal-oral route, it means that stool from an infected person is somehow swallowed by another person. How can that happen with *C. diff*? A resident can contaminate the environment and/or hands with stool if he/she is infected or colonized with *C. diff* bacteria and has diarrhea, is incontinent of stool, or is unable (or forgets) to perform good hygiene. If the hands of healthcare workers touch fecally-contaminated objects (items that have come into contact with stool) or surfaces in the environment such as commodes, bedrails, sinks, doorknobs, telephones, bathing tubs, and thermometers and then touch other residents or surfaces prior to washing hands with soap and water or using an alcohol-based hand sanitizer, they can spread *C. diff*. Then, if other staff or residents touch contaminated surfaces and then touch their mouth or anything that goes into their mouth, they become exposed to the bacteria and the fecal-oral route is complete. Hand hygiene and environmental cleaning are required to prevent the spread of and infection by bacteria.

Figure 3 (below) shows how easily *C. difficile* bacteria can be spread by healthcare worker hands.

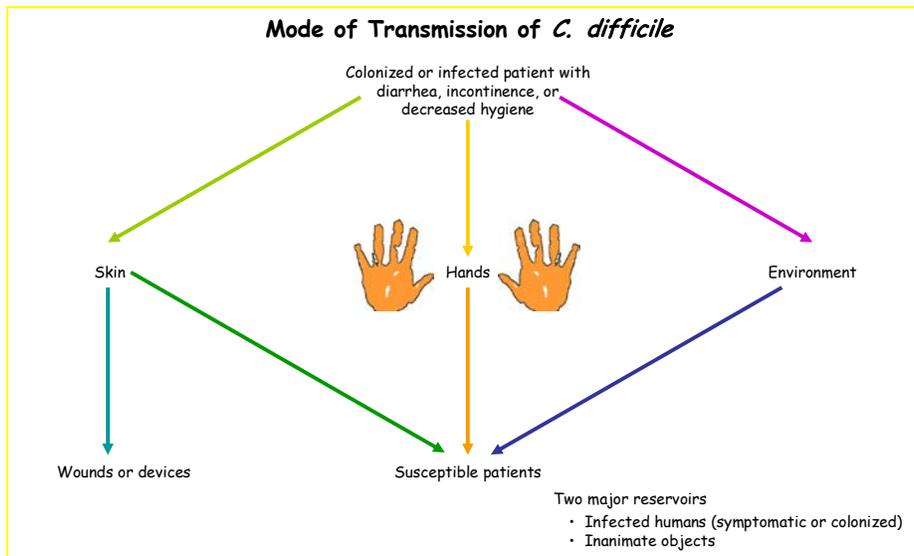


Figure 3: Mode of Transmission of *C. difficile*.

Infection Prevention and Control

Keys to Successfully Preventing CDI:

- Prevent residents from coming into contact with *C. difficile* bacteria
 - Always use good infection prevention and control practices, including good hand hygiene (see below)
- Prevent development of CDI
 - Antibiotic stewardship (only giving residents antibiotics when they are really needed) (see page 16)

Infection Prevention and Control (See also Appendices 1-5)

Good infection prevention and control practices are essential to preventing the spread of *C. difficile* bacteria.

Infection prevention and control practices include:

CDI surveillance

- Surveillance programs are an important measure used to detect and prevent outbreaks of *C. difficile* within healthcare facilities. A surveillance program should incorporate:
 - Early and accurate recognition of CDI residents
 - Nursing assistants play an important role in notifying the nurse of any physical or non-physical resident changes

Hand hygiene

- Perform excellent hand hygiene when caring for all residents
 - Before touching a resident
 - Before a clean procedure involving contact with resident's mucous membranes (eyes, nose, mouth, genital area, etc.), non-intact or open skin, or invasive medical device (such as a Foley catheter)
 - After actual or possible blood or body fluid contact
 - After touching a resident
 - After touching a resident's surroundings
- Clean hands with antibacterial soap and water for 15 - 20 seconds before and after entering rooms of, and caring for residents with CDI. Rubbing and friction will remove the *C. difficile* spores from the hands.
- Alcohol-based hand rubs can be used when soap and water are not available, however are not recommended during *C. difficile* outbreaks.

- Always perform hand hygiene before putting on gloves and/or gowns and after taking them off.



Standard Precautions for the care of **all residents, all of the time**

- Wear gloves, gown, mask or eye protection if you think you may have any contact with blood or body fluids (direct contact, spraying or splashing) while performing resident care

Contact Precautions for the care of residents with CDI symptoms

- Always wear gloves and a gown to provide care to the resident
- Dedicate equipment to individual residents who have CDI whenever possible (keep equipment in resident's room). Commodes, blood pressure cuffs, stethoscopes and any other items from the resident's room should not be shared between residents.
 - Clean and disinfect all shared equipment immediately after use and before use with any other resident with proper cleaning products that kill *C. difficile* and have contact with the equipment for the time designated on the bottle or container. Make sure you have been trained on how to do this.

Isolation Precautions

- Private room, if possible
 - Room two CDI-positive residents together if a private room is not available.

- For residents that are continent or have diarrhea that can be contained with incontinence products, and who can follow instructions and perform (or who can be assisted with) appropriate hand hygiene, consider letting residents enter common areas and participate in social activities. Continue Standard Precautions.
- Residents may be removed from Contact and Isolation Precautions when their watery diarrhea has been gone for 48-72 hours. Continue Standard Precautions. See page 20 for additional guidance.

Environmental cleaning and disinfecting

- *C. difficile* spores can survive for months on environmental surfaces. Follow your facility's cleaning and disinfection policies and procedures.
- Cleaning must be done before disinfection.
 - Cleaning removes all food, dirt, and organic matter and allows the disinfection product to be effective against microorganisms.
 - Be sure you know what areas/items are your responsibility to clean and disinfect.
- Routine daily cleaning and disinfection of resident rooms should include at least the following items:
 - Bedrails, furniture (bedside and over-the-bed tables, bedside commodes)
 - Bathrooms (sink, floor, tub/shower, toilet)
 - Frequently touched surfaces (light switches, door knobs, call bell, monitor cables, computer keyboards, TV remotes)
- Terminally clean and disinfect the room of a resident with CDI after discharge - regardless of how long ago they had diarrhea. Make sure to include bed frame, mattress, pillows, and curtains.

Cleaning and disinfection products for CDI

- Use the facility- approved disinfection solution for routine use in CDI rooms.
 - A bleach-containing or other spore-killing disinfectant is recommended.
 - Be familiar with the manufacturer recommendations and follow these instructions for diluting and applying the product; leave the product on the surface/item for the recommended amount of time. Make sure you have been trained on how to do this correctly.

Antibiotic Stewardship

Stewardship definition: "the careful and responsible management of something entrusted to one's care" - Merriam-Webster Dictionary. In other words, 'stewardship' is about taking care of something valuable.

Promoting the responsible use of antibiotics is referred to as "antibiotic stewardship." This is important in LTCFs because using antibiotics only when prescribed is one of the most important keys to preventing CDI. Additionally, antibiotic use in LTCFs is high; about 40% of all prescription medications in LTCFs are antibiotics. Up to 25 - 75% of LTCF residents receive at least one antibiotic each year, and as many as 75% of these are not necessary.

Some reasons antibiotics are prescribed unnecessarily include inability of LTCF residents to communicate their symptoms to healthcare personnel, not obtaining cultures to determine if antibiotics are needed, treating colonization and not just infection, and pressuring providers (nurse practitioners and doctors) for antibiotics.

Nursing assistants play a very important role in antibiotic stewardship in LTCFs. Nursing assistant observations and communication of physical and non-physical resident changes are essential to assisting nurses' communication with nurse practitioners and doctors about the need for antibiotics.

Thorough, accurate, and timely report of a resident's change in condition leads to correct symptom recognition. Communication of resident changes in condition to appropriate staff leads to correct action being taken. Documentation of resident changes in condition, including signs and symptoms of infection, leads to correct follow-up.

Post-test

1. Describe characteristics of *Clostridium difficile* bacteria.
2. Describe at least one important factor associated with the development of CDI in long-term care residents.
3. State the difference between colonization and infection with *Clostridium difficile* bacteria.
4. Describe at least three ways that you can prevent the spread of *Clostridium difficile* bacteria in long-term care facilities.

Appendices

Algorithms for Prevention and Management of *Clostridium difficile* Infections in Long-term Care Facilities

A1: Early Recognition and Testing

A2: Contact Precautions

A3: Room Placement

A4: Environmental Cleaning and Disinfection

Appendix 5: Social and Activity Precautions

Definitions and commonly used acronyms

ADL: activities of daily living

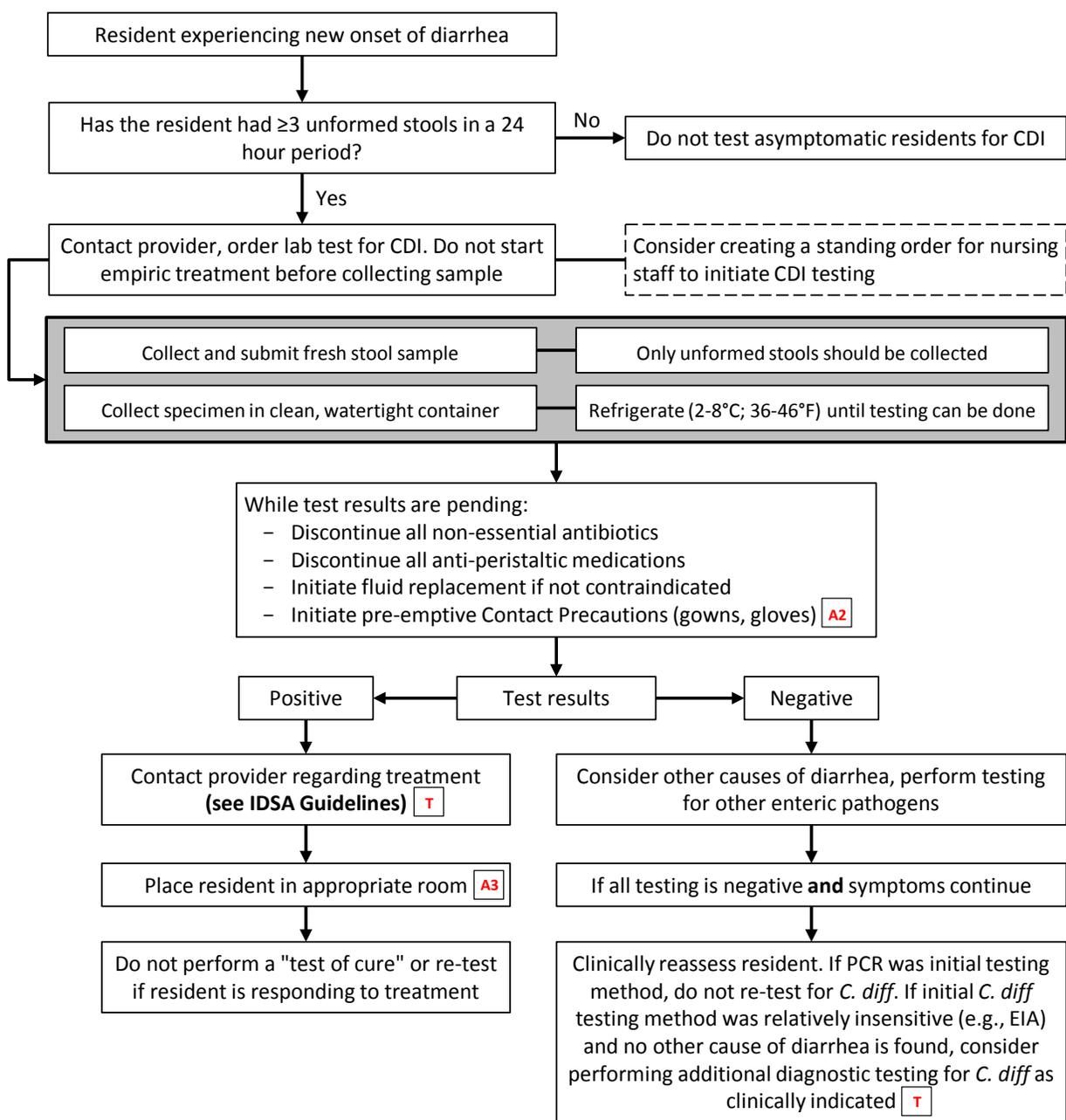
CDI: *Clostridium difficile* infection

HH: hand hygiene

PPE: personal protective equipment

PPIs: proton pump inhibitors

A1. Early Recognition and Testing



Action Items:

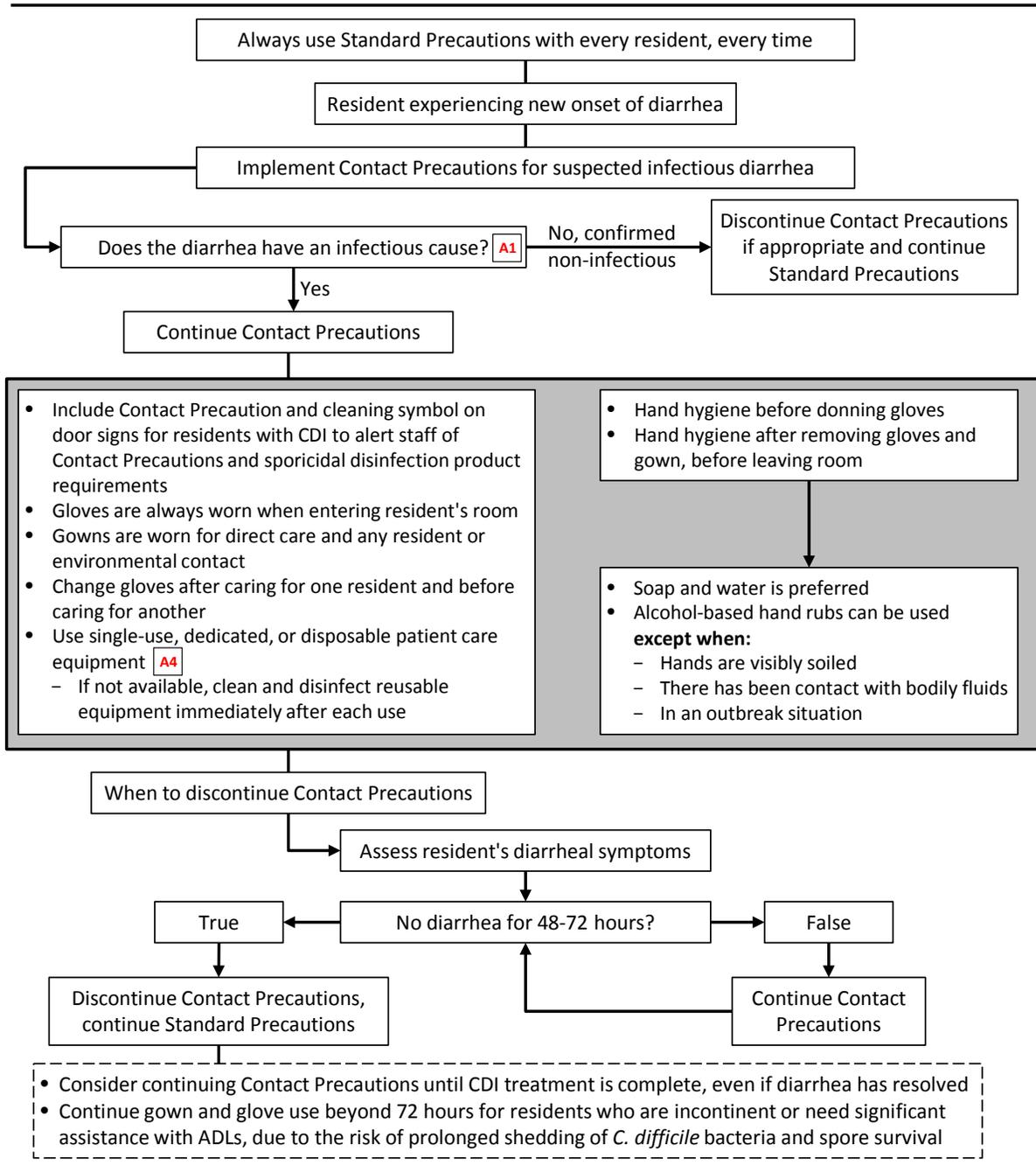
- Train staff to recognize CDI symptoms and to submit only unformed stools for CDI testing
- Establish policy with lab to reject formed and repeat stools for CDI testing
- Know what diagnostic testing method is used by your laboratory

Other considerations:

- Contact Precautions
- Room placement
- Social and activity precautions
- Environmental cleaning and disinfection



A2. Contact Precautions



Action Items:

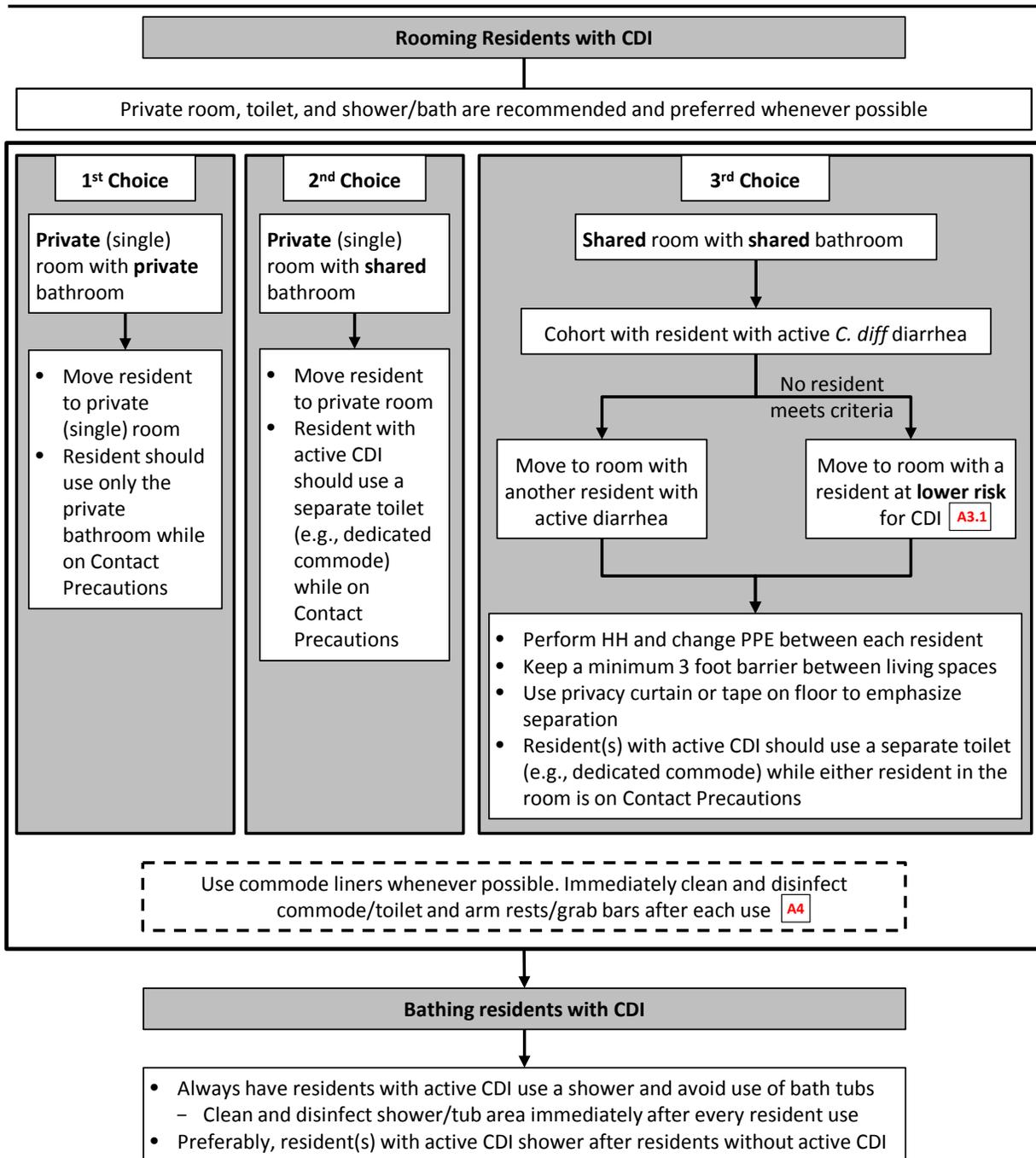
- Provide gowns, gloves, and alcohol-based hand rubs outside resident's room
- Assure laundry bin, trash can, and alcohol-based hand rubs are readily accessible inside resident's room

Other Considerations:

- Early recognition and testing
- Room placement
- Social and activity precautions
- Environmental cleaning and disinfection



A3. Room Placement



Other Considerations:

- Early recognition and testing
- Contact Precautions
- Social and activity precautions
- Environmental cleaning and disinfection



A3.1 Identifying Lower Risk Roommates

Primary considerations

Not currently taking antibiotics (1st choice)

- or has not taken antibiotics in previous 4 weeks (2nd choice)
- or has not taken antibiotics in previous 12 weeks (3rd choice)

No history of prior CDI (1st choice)

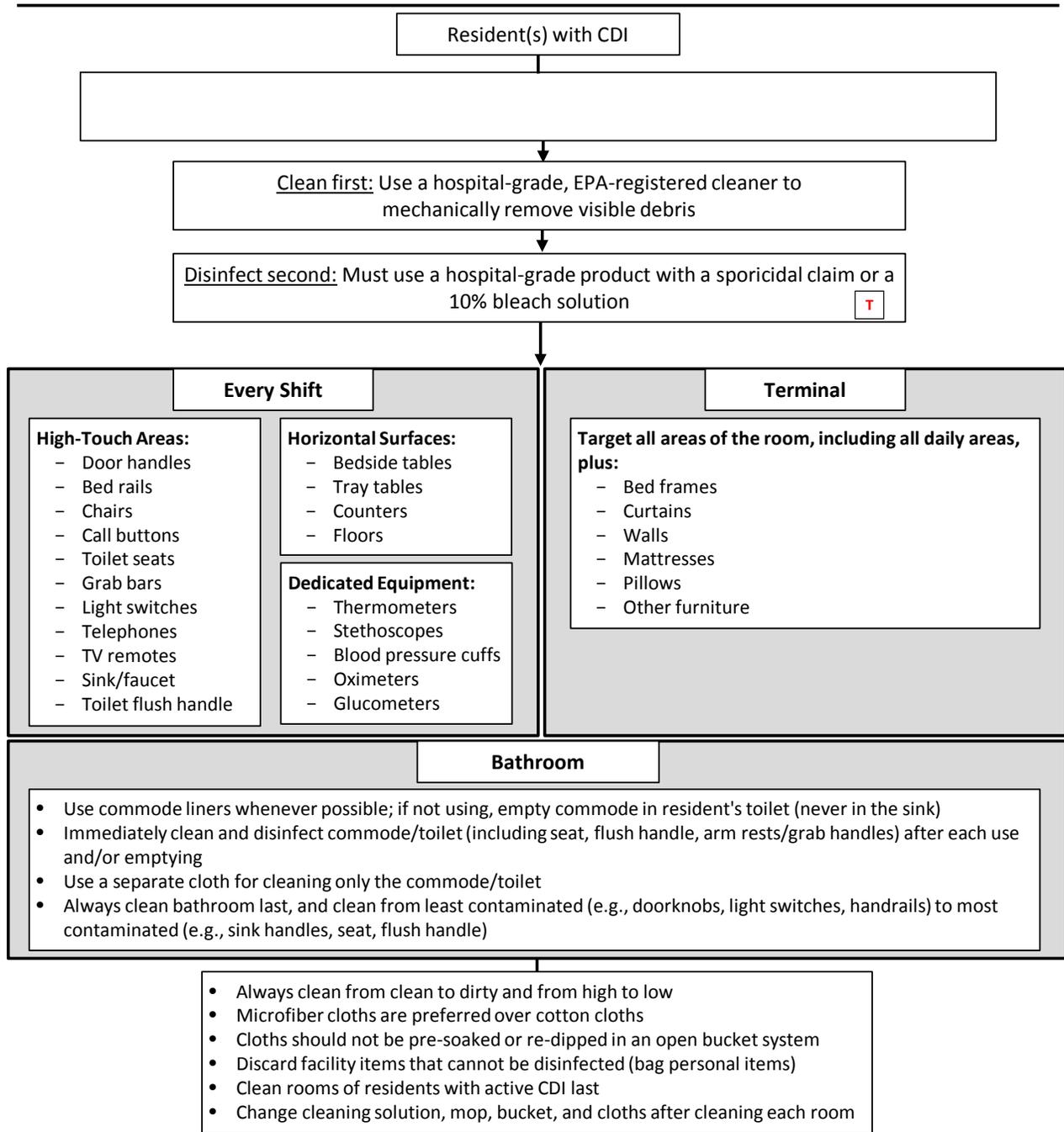
- or has no CDI in previous 4 weeks (2nd choice)
- or has no CDI in previous 12 weeks (3rd choice)

Secondary considerations

- Not currently on proton pump inhibitors (PPIs)
- No GI/bowel condition comorbidities (diverticular disease, inflammatory bowel disease, Crohn's, peptic ulcer disease)
- No PEG/PEJ tube (no tube feeds)
- Not severely immunocompromised (cancer, chemotherapy, or solid organ transplant)
- Not bedbound/heavily dependent on healthcare workers for ADLs



A4. Environmental Cleaning and Disinfection

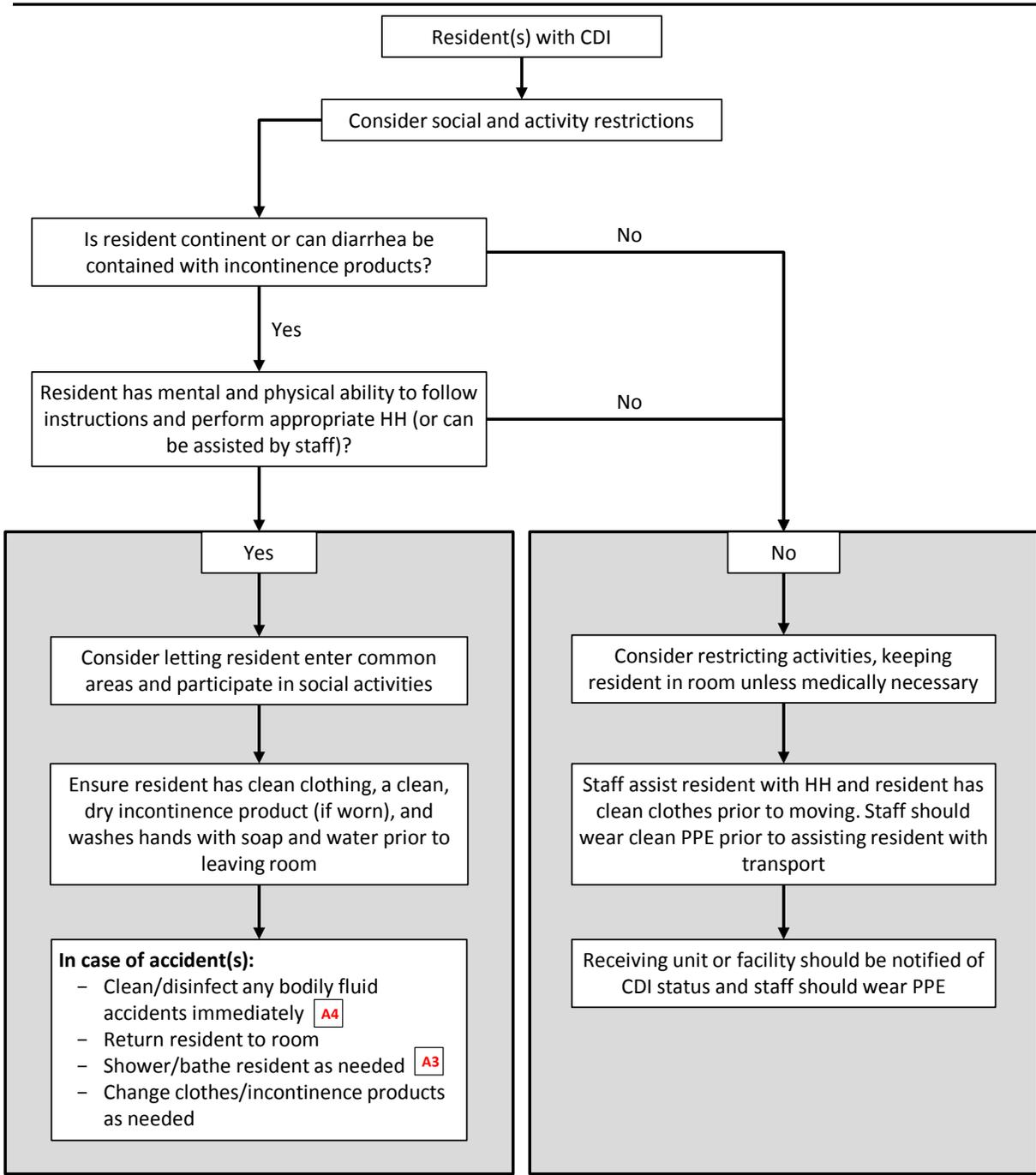


Action Items:

- Train Environmental Service staff on importance of cleaning and disinfection and the transmission of disease
- Establish responsibility for different elements of environmental cleaning and disinfection
- Provide Environmental Service staff with high-touch cards for reference
- Include cleaning symbol on door signs for residents with CDI to alert Environmental Services staff of rooms requiring sporicidal disinfection products



A5. Social and Activity Precautions



Action Items:

Ensure a facility transfer form exists for transferring residents between facilities

Other Considerations:

- Early recognition and testing
- Room placement
- Environmental cleaning and disinfection

- A Please see additional algorithm
- T Please see toolkit for more information



Glossary

Cytotoxicity - The quality of being harmful to cells. Examples of toxic agents are chemical substances or an immune cell.

Diarrhea - At least six watery stools over 36 hours, three unformed stools in 24 hours.

Enterotoxin - A toxin (harmful substance) produced by bacteria that acts on the gut to cause diarrhea.

Fecal incontinence - Inability to prevent the discharge of feces (stool).

Ileus - Bowel blockage; severe pain, abdominal bloating, vomiting, absence of passage of stool, and often fever and dehydration may also be present.

Normal bowel flora - A population of organisms that live in the bowel that normally do not cause infection.

Probiotics - Dietary supplements containing potentially helpful bacteria or yeast that are intended to assist the body's naturally-occurring flora within the digestive tract.

Pseudomembranous colitis (PMC) - Severe swelling and pus production in the intestine caused by the body's response to the *C. difficile* toxins. This condition can be very painful.

Sepsis - The presence of pus-forming and other disease-causing organisms or their toxins in the blood or body tissues.

Spores - The dormant stage of some bacteria, like *Clostridium difficile*.

Toxic megacolon - Severe swelling in the intestine that may cause the intestine to stop eliminating gas and waste, leading to a lot of built up pressure, which may be a result of a *C. difficile* infection.

Toxigenic - Cells that make toxins

Virulence - The power of a germ to cause disease

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