

Clostridium Difficile

PREVENTION GUIDE



Table of Contents

Introduction

- About Healthcare-Associated Infections
- About *Clostridium difficile*

Step 1. Getting Started

- 1.1 An Illustrative *C. difficile* Cost Calculator
- 1.2 The Importance of Institutional Collaboration
- 1.3 Addressing Concerns Associated with Bleach Usage

Step 2. Frontline Activities for Infection Prevention

- 2.1 The Frontline Bundle

Step 3. Key Success Factors for Disinfection of *C. difficile* Spores

- 3.1 Education and Training of Environmental Services Staff
- 3.2 Competency and Verification of Environmental Services Staff
- 3.3 Proper Disinfecting Design
- 3.4 Antimicrobial Testing Plan to Measure Surface Disinfection

Appendix: Additional Published Studies Involving Bleach

Environmental Services Implementation Tools Include:

- Discharge and Occupied Room Cleaning Protocols
 - Discharge and Occupied Room Cleaning Checklists
 - *C. difficile* Cleaning Protocol Compliance Review
-

Introduction: About Healthcare-Associated Infections

Healthcare-Associated Infections, or HAIs, affect up to 2.4 million patients in U.S. hospitals every year. They are estimated to account for 100,000 deaths annually.¹ In addition, HAIs can be costly to a hospital and its reputation.

According to economist R. Douglas Scott II of the Centers for Disease Control and Prevention (CDC), the annual direct medical costs of HAIs to U.S. hospitals range from \$35.7 billion to \$45 billion for inpatient hospital services.² In 2008, legislation eliminated the Centers for Medicare and Medicaid Services (CMS) reimbursement for many HAIs over and above the typical Inpatient Prospective Payment System (IPPS) rate.³

Broader awareness of the problem — and increased pressure on healthcare facilities to prevent HAIs — is growing as public reporting of HAI data has become mandated. Currently, public reporting has broad support among many state governments, healthcare regulatory agencies and trade groups:⁴

- As of February 2011, 28 states have implemented public reporting laws
- Centers for Disease Control and Prevention (CDC)
- Association of Professionals in Infection Control and Epidemiology (APIC)
- Society of Healthcare Epidemiology of America (SHEA)
- Infectious Diseases Society of America (IDSA)
- Council of State and Territorial Epidemiologists (CSTE)



1. "Infection Prevention Products and Services: Industry Study 2526," The Freedonia Group Inc., August 2009.

2. "The Direct Medical Costs of Healthcare-Associated Infections in U.S. Hospitals and the Benefits of Prevention" (http://www.cdc.gov/ncidod/dhqp/pdf/Scott_CostPaper.pdf)

3. "Inpatient Prospective Payment System (IPPS) Fiscal Year (FY) 2009 Final Rule" 7/31/2008.

(https://www.cms.gov/HospitalAcqCond/O6_Hospital-Acquired_Conditions.asp#TopOfPage)

4. Public Reporting of Hospital Acquired Infections (<http://www.healthwatchusa.org/downloads/PR-HAI-2010-Support-Documents.pdf>)

About *Clostridium difficile*

***Clostridium difficile* (or *C. difficile*) is a spore-forming bacterium found in the intestines that causes a variety of symptoms, from diarrhea to more serious, life-threatening intestinal disease.**

A survey by the Association for Professionals in Infection Control (APIC) found that the *C. difficile* incidence rate of 13 out of every 1,000 inpatients either infected or colonized with *C. difficile* is 6.5 to 20 times greater than previous incidence estimates.⁵

Dr. Becky Miller of Duke University Medical Center has found that, in a recent study of 28 Southeast hospitals, *C. difficile* has surpassed methicillin-resistant *Staphylococcus aureus* (MRSA) as the most prevalent cause of HAIs. *C. difficile* was found to be 25% more common than MRSA.⁶ The CDC estimates that 28,000 deaths annually are caused by *C. difficile* bacteria. In addition, *C. difficile* enacts a financial toll on healthcare facilities. Economist R. Douglas Scott II of the CDC conservatively estimates the cost per case of *Clostridium difficile* infection (CDI) — not including operating room costs — to range from \$5,042 to \$7,179.

Environmental transmission

C. difficile bacteria is found in feces and can be transmitted by hand to frequently touched surfaces such as bedding, toilets, bedpans, light switches and grab bars. People can become infected if they touch contaminated surfaces or items and then touch their mouths or mucous membranes.

Who is at risk?

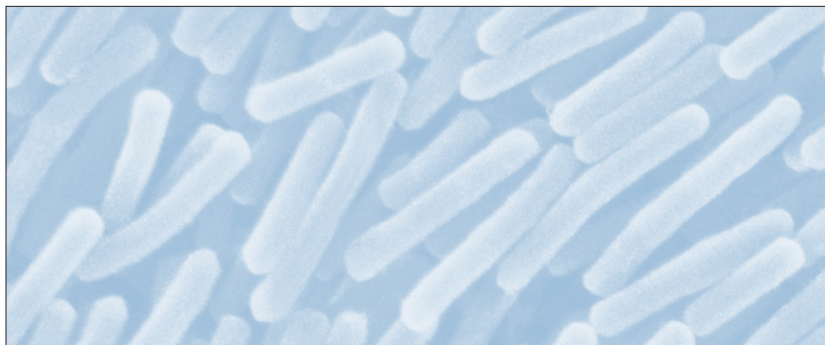
The risk of contracting *C. difficile* increases in the elderly and in patients with previous antibiotic use, gastrointestinal surgery, serious underlying illness, immunocompromising conditions and long stays in healthcare settings such as hospitals, nursing homes and other healthcare institutions.

Decontamination of environmental surfaces

C. difficile spores are resistant to many commonly used disinfectants, sanitizers and cleaning agents, including alcohol-based hand sanitizers. Because *C. difficile*-infected patients can contaminate their environment and the spores can persist on surfaces for months, adherence to the CDC “Guidelines for Environmental Infection Control in Healthcare Facilities” is critical to help reduce the spread of *C. difficile* spores. Multiple studies have shown sodium hypochlorite bleach to be an effective disinfectant against *C. difficile* on surfaces.

The role of proper hand hygiene

Washing hands with non-antimicrobial or antimicrobial soap and water may help to physically remove spores from the surface of contaminated hands. Healthcare workers should be encouraged to wear gloves when caring for patients with *C. difficile*-associated diarrhea.⁷



5. Association for Professionals in Infection Control, “Intestinal Infection Afflicts 13 of 1,000 Hospital Patients; Infection Rates 6.5–20 Times Greater Than Previous Estimates, New Study Says,” November 11, 2008. APIC Elimination Guide, “Guide to the Elimination of *Clostridium difficile* in Healthcare Settings” 2008.

6. “Lesser-known *C. diff* a bigger hospital threat than MRSA?,” *USA Today*, March 22, 2010.

7. “Guideline for Hand Hygiene in Healthcare Settings.” (<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5116a1.htm>).

Step 1: Getting Started

1.1 Making the Financial Case with a *C. difficile* Cost Calculator

Implementing a comprehensive program can help prevent *C. difficile* in your facility. Doing so often requires gaining senior leadership approval for additional resources (labor and/or disinfecting products).

To place additional upfront expenses in perspective, the calculator below can help you assess how costly *C. difficile* infections can be to your facility — and discover the positive savings impact a bundled program can have.

Additional resource expenditure up front may help your facility save significant funds down the road.

Research suggests that implementing a multi-tiered approach, including, but not limited to, staff education, antibiotic stewardship and surface disinfection using a 1:10 dilution of sodium hypochlorite bleach (consistent with CDC guidelines) can help reduce CDI rates.

	Example	Your Organization
Cases of <i>C. difficile</i> per 10,000 patient days ⁸	12.1	= \$
	X	X
Estimated per case cost to facility, excluding surgical costs ⁹	\$5,042 - \$7,719	\$5,042 - \$7,719
Estimated cost to facility per 10,000 patient days	\$61,008 - \$93,400	= \$
	X	X
Potential decrease in CDI cases ¹⁰	Up to 83%	Up to 83%
Potential savings per 10,000 patient days	\$50,636 - \$77,522	= \$

8. Sohn S, Climo M, Diekema D, et al. "Varying rates of *Clostridium difficile*-associated diarrhea at prevention epicenter hospitals." *Infect Control Hosp Epidemiol* 2005; 26:676-679.

9. Dubberke ER, Reske KA, Olsen MA, McDonald, LC, Fraser VJ. "Short- and-long-term attributable costs of *Clostridium difficile*-associated disease in non-surgical patients." *Clinical Infectious Diseases* 2008; 46: 497-504.

10. McMullen KM, Zack J, Coopersmith CM, Kolfel M, Dubberke E, and Warren DK. "Use of hypochlorite solution to decrease rates of *Clostridium difficile*-associated diarrhea." *Infect Control Hosp Epidemiol* 2007; 28:205-7.

Mayfield JL, Leet, T, Miller J and Murdy LM. "Environmental Control to Reduce Transmission of *Clostridium difficile*." *Clin Dis* 2000; 31:995-1000.
Note: success may vary per facility based on a number of factors.

1.2 Reinforcing Institutional Collaboration

A successful CDI initiative begins with teamwork between Infection Prevention and Environmental Services (EVS) staff at kickoff. Key steps to successful collaboration include, but are not limited to:

1. Alignment across functions on the common problem faced in your facility
2. Gaining administrative approval on priority setting and resource expenditure (labor, product expense)
3. Assigning a project manager to draft a project plan across functions — key decision point is IP/EVS alignment on disinfectant active/product and where it will be used
4. Measuring baseline data (which subsequent data will be measured against)
5. Setting common goals to keep collective “eye on prize” and “focus on being successful”
6. Working as a team to drive results



1.3 Addressing Concerns Associated with Bleach Usage

To drive overall program compliance and success, it can help to proactively address two concerns associated with bleach usage — the salt residue that bleach can leave on surfaces and bleach’s odor (which is augmented when it comes into contact with soils).

Addressing your team’s potential concerns with constructive solutions can help avoid mission creep and reinforce your credibility.

1. Addressing residue

The “residue” sometimes seen on shiny surfaces disinfected with bleach is salt. The residue can be simply wiped away with a clean damp cloth. A simple way to address the residue is to instruct EVS staff to keep a water bucket and clean cotton wipes on their carts to wipe away residue if needed.

2. Addressing bleach’s odor

It is important to proactively address any potential concerns your EVS team might have about bleach’s odor in several ways:

- Offer mitigation steps — masks, fan usage — to team members if requested.
- Arrange for colleagues in Infection Prevention to speak with the team to assure them that there are no long-term respiratory effects associated with using bleach, when it is used as directed.

Clinical studies on bleach odor

With regard to bleach odor, multiple leading hospital studies have noted that when patients and Environmental Services’ personnel were exposed to bleach, little or no concern about the odor of bleach was expressed.

- At Barnes-Jewish Hospital (St. Louis), an 18-month study was conducted demonstrating 1:10 bleach’s efficacy against *C. difficile* spores as part of a bundled program. The authors noted that “during the study, patients, family and staff did not complain about the odor of bleach.”¹¹
- At Cleveland Veterans Affairs Medical Center, during a five-and-a-half month study involving routine use of 1:10 bleach as part of a tiered program with documented decreases in *C. difficile* incidence, authors found that “EVS reported no surface damage or complaints due to use of bleach.”¹²
- A Mayo Clinic study on patient and staff tolerance of bleach wipes reported: “Most (67.6 %) patients were in their rooms while ESE cleaned with bleach wipes, and of those only a few (8.8 %) noticed odor with the germicidal bleach used for cleaning. None of these patients found the odor bothersome.”¹³

11. J. L. Mayfield et al., *Clinical Infectious Diseases* 2000; 31:995-1000.

12. B.D. Eckstein et al. *BMC Infectious Diseases* 2007, 7:61.

13. Aronhalt, K. “Patient and Environmental Service employee satisfaction and tolerance of using germicidal bleach wipes for patient room cleaning to reduce transmission of *Clostridium difficile* infection” 2010. Study presented at the Association for Professionals in Infection Control (APIC) Annual Meeting, New Orleans, Louisiana.

Step 2: Focus on the Frontline Activities as Part of a Tiered Approach to *C. difficile*

A bundled Infection Prevention program has been shown to be effective in fighting HAIs, especially *C. difficile*, versus a single approach. Examples of comprehensive program bundles for *C. difficile* include: APIC “Guide to the Elimination of *C. difficile* in Healthcare Settings” and Minnesota Department of Health’s “Safe from CDI” initiative. Within a bundled program, five frontline activities are important steps to addressing *C. difficile* on an immediate and day-to-day basis. The next sections of this toolkit will discuss how to best implement the environmental cleaning and disinfection component.

Frontline Activities

Step	Activity	Detail
2.1	Rapid Identification of Potential CDI Patients	<ul style="list-style-type: none"> Prompt confirmatory testing should be executed as soon as possible Implement easy-to-follow procedures — such as a color-coded door card system — to clearly delineate Isolation rooms from general patient rooms
2.2	Isolation Precautions	<ul style="list-style-type: none"> Patients with diarrhea and coming from long-term care facilities should be isolated prior to confirmatory testing
2.3	Hand Hygiene Procedures	<ul style="list-style-type: none"> Proper hand hygiene by all personnel prior to, during and following patient interaction and environmental disinfection is critical <p><i>Note: Remember that alcohol-based hand sanitizers are not effective against C. difficile spores.</i></p>
2.4	Barriers	<ul style="list-style-type: none"> Environmental Services should don appropriate Personal Protective Equipment (PPE) prior to entering patient room
2.5	Environmental Cleaning and Disinfection	<ul style="list-style-type: none"> See next section “The 4 Key Success Drivers” for implementation of best practices.

Best Practice: Choose the right product

An important element of a successful *C. difficile* prevention bundle is to use a proven EPA-registered disinfectant for environmental cleaning and disinfection. Multiple studies have proven that 1:10 sodium hypochlorite bleach is effective in killing *Clostridium difficile* spores. Among these are:

- Brigham & Women’s Hospital (Boston): Implementation of the SHEA-IDSA bundle — including use of Clorox Healthcare™ bleach products for patient room cleaning/disinfection — reduced healthcare-associated CDI incidence by 40%. Results were sustained for 21 months after implementation of bundle.¹⁴
- The Cleveland Veterans Affairs Medical Center: A bundled infection prevention program that included a 1:10 bleach (Clorox Healthcare™) solution for routine disinfection of high-touch surfaces reduced positive CDI rates by 67%.¹⁵

14. S.K. Abbott et al., *Infect. Control Hosp. Epidemiology*, 2009; 30:1062-1069

15. B.D. Eckstein et al. *BMC Infectious Diseases* 2007; 7:61

Step 3: 4 Key Success Drivers for Disinfection of *C. difficile* Spores

As part of an integrated *C. difficile* initiative, four key drivers for successful, day-to-day environmental infection prevention have been identified.

	Key Driver	Elements
3.1	Education and Training of EVS Staff	<ol style="list-style-type: none"> 1. Communicate and prioritize Environmental Services key role in preventing infection 2. Set clear objectives — achieving high-quality outcomes in appearance and infection prevention 3. Provide specific training tools — checklists, protocols and just-in-time (JIT) job aids
3.2	Competency & Verification <i>(for New Hires and Annually)</i>	<ol style="list-style-type: none"> 1. Disinfecting technique demonstration and return demonstration 2. Written competency testing for: <ul style="list-style-type: none"> ▪ Disinfecting process and techniques ▪ Policy and procedures 3. Verification (60 days — new hires and annual) Practice vs. Procedure observation in occupied patient room and at discharge
3.3	Proper Disinfecting Process <i>(applying disinfectant actives to the surface at the intended dilution)</i>	<ol style="list-style-type: none"> 1. Best Practice: Clorox Healthcare™ Bleach Germicidal Wipes as an optimal closed-bucket system with minimal variability achieving maximum process capability. <ul style="list-style-type: none"> ▪ Keep lid closed on wipes when not in use ▪ Change wipe when unable to achieve appropriate wet contact time and when visibly soiled <p>Benefit: Improved staff safety — reduced splash hazard</p> <p>Benefit: Yields zero probability of the reintroduction of microorganisms back into the environment after the laundry process</p> 2. An open-bucket system adds variation to process and is not preferred because: <ul style="list-style-type: none"> ▪ Diluted disinfectant must be changed often to maintain stability ▪ Measuring and mixing disinfectant solution opens risk of human error ▪ Risks potential double-dipping or re-dipping of wipes ▪ Disinfectant may not be compatible with wipes ▪ Wipes may not be changed as frequently if/when unable to achieve appropriate wet time or visibly soiled
3.4	ATP science-based Evidence on Surface Cleanliness	<ol style="list-style-type: none"> 1. Develop an Antimicrobial Testing Plan to regularly perform surveillance of surface cleanliness and disinfection. <ul style="list-style-type: none"> ▪ Objective assessments of surface cleanliness ▪ Science-based evidence on surface cleanliness 2. This is one of several key areas of collaboration between Infection Preventionists, Environmental Services and Infectious Disease.

Step 3.1 1st Key Driver: Education and Training

Devoting proper time and detail to EVS education and training is important to a successful infection prevention program. The following steps — and corresponding toolkit resources — are recommended:

Step	Recommendation — What	How	Resources Provided in Kit
1	Communicate and prioritize EVS key role in infection prevention	<ul style="list-style-type: none"> • Schedule 2-3 days of onboard training including detailed review of protocols • Discuss the “big picture” including EVS role in helping to save lives 	<ul style="list-style-type: none"> • HAs and <i>C. difficile</i> overview
2	Set clear objectives	<ul style="list-style-type: none"> • Appearance (cleaning) • Infection Prevention (disinfection) 	<ul style="list-style-type: none"> • Per your facility's objectives
3	Provide specific training tools — checklists, protocols and JIT job aids	<ul style="list-style-type: none"> • Clear disinfecting protocols for occupied, discharge and isolation rooms • Just-in-time job aids for high-touch surfaces 	<ul style="list-style-type: none"> • Checklists and protocols

Best Practice: Tribal leadership

For Environmental Services managers, tribal leadership can play a role in driving optimal buy-in to the team's mission and day-to-day execution. The following elements of tribal leadership may support your leadership style:



- Build trust and enduring bonds with your team from day one. This starts in the initial training session by communicating staff's critical role in preventing infection and by providing them with the information and tools to succeed.
- Manage a flat organization. Treat everyone equally, from your most senior to your newest employee.
- Roll up your sleeves and join them on the frontline.
- Recognition is critical to achieve staff buy-in, ownership and pride: upon success with a CDI initiative, one EVS manager invited his entire team to the boardroom for lunch. Gestures such as these can help a team feel involved.

Step 3.2 2nd Key Driver: Competency and Verification

Training and measurement of competency feed a cycle of continuous improvement in an Environmental Services organization and ensure that the team is aligned to the fundamental elements of the job.

Step	Recommendation	Activity	Resources Provided
1	Disinfecting Technique and Return Demonstration	<ul style="list-style-type: none"> Show cleaning procedure and product demonstration Demonstrate product usage in room during initial training 	<ul style="list-style-type: none"> Protocols to use for demonstration
2	Written Competency Testing in: <ol style="list-style-type: none"> Disinfecting Process and Techniques Policy and Procedures 	<ul style="list-style-type: none"> Provide multiple choice and open-ended quizzes at onboard training and annually Topics include disinfectants/chemicals used in facility, and cleaning process and protocols for occupied and discharge settings 100% required to pass 	<ul style="list-style-type: none"> Compliance quizzes
3	Verification (60 days — New Hires and Annual) Practice vs. Procedure Observation in Occupied Patient Room and at Discharge	<ul style="list-style-type: none"> New employees shadow veteran employees — and are shadowed — for initial 2 weeks on job, prior to being able to work independently Annual testing Spot-check shadowing of all employees is done during first 60 days of employment and annually — “Trust but verify” — by EVS supervisor 	<ul style="list-style-type: none"> Protocols and checklists to use while shadowing

Best Practice: Regular compliance audits

Engaging EVS supervisors to shadow and audit disinfecting practices of all staff is an excellent way to drive compliance.

Step 3.3 3rd Key Driver: Disinfecting Process Design

It is critical to ensure your team is applying the disinfectant active to the surface at the intended dilution for the required contact time.

To do so, select a disinfecting process with less variation. A closed-bucket system, such as using Clorox Healthcare™ Bleach Germicidal Wipes, can offer less variation — and labor for mixing — than an open-bucket system. Below is a table that compares elements of the two systems.

	Variation Detail	Closed-Bucket, e.g., Clorox Healthcare™ Bleach Germicidal Wipes	Open-Bucket
1	Dilution of Active	None	Possible if active not changed
2	Measuring or Mixing	None	Often Required unless using a pre-mixed 1:10 solution such as Clorox Healthcare™ Bleach Germicidal Cleaner Disinfectant
3	Wiper Compatibility with Active	Non-issue	Possible — requires managing
4	Change Wipe if/when Unable to Achieve Appropriate Wet Contact Time or When Visibly Soiled	Yes	Yes
5	Double-Dipping or Re-Dipping of Wiper	No	Yes
6	Staff Safety Concerns via Splashing	No	Yes
7	Potential to Reintroduce Microorganisms Back into Environment After Equipment Laundry Process	No	Yes

Best Practice: Recommendations for using Clorox Healthcare™ Bleach Germicidal Wipes most effectively

1. Keep lid of container closed when not pulling out wipe.
2. Apply to a surface, achieving a deep wet glare—a potential sign of maximum wet contact time.
3. Change wipe when unable to achieve appropriate wet contact or if visibly soiled.
4. Upon opening refill pouches, transfer wipes to bucket container to avoid wipes' prematurely drying out.

Step 3.4 4th Key Driver: ATP Surface Hygiene Testing for Monitoring

A regular surface disinfection surveillance program objectively measures surface cleanliness and disinfection. For this task, automated adenosine triphosphate (ATP) testing devices output results based on the U.K. Pass/Fail benchmark setting <250 RLU. If such as program is not available to your facility, continue to focus on Key Success Factors 1-3.

ATP testing programs involve close collaboration between Infection Prevention and Environmental Services at kickoff in several areas, including, but not limited to:

- Understanding benchmark data
- Planning a surveillance schedule, including how often hospital areas will be tested
- Executing the plan and recording the data
- Implementation of environmental control and proper surface disinfection to address any cleaning or disinfection needs



Best Practice: Infection Preventionist and Environmental Services collaboration

A close relationship between Infection Prevention and Environmental Services enables each function to rely on the other for expertise and problem solving. To address concerns Environmental Services teams may have about the odor of bleach, it may be helpful to engage Infection Preventionists to reassure the team with facts, especially that there are no long-term respiratory effects associated with bleach when it is used as directed.

Appendix: Additional Studies Involving Bleach

While this guide discusses the use of 1:10 bleach and its role as part of a bundled approach to *C. difficile* spores, bleach has also been shown to be effective against other pathogens in published clinical studies. Two examples are:

- Cleveland Veterans Affairs Medical Center evaluated six high-touch surfaces in rooms with Vancomycin-resistant Enterococcus (VRE) — before cleaning and after typical cleaning and after 1:10 bleach disinfection by the research staff — to determine if a bundled intervention including 1:10 bleach for surface disinfection could reduce contamination of these surfaces. Using 1:10 bleach Clorox Healthcare™ solution for routine disinfection of high-touch surfaces as part a bundled infection prevention program reduced positive VRE detection rates by 100%. The program was sustained for four months with results maintained.¹⁶
- In February 2004, Johns Hopkins Hospital (JHH) identified a norovirus outbreak with 335 individual cases affecting 90 patients and 265 healthcare workers in its coronary care unit. An aggressive infection control program, including healthcare worker education, frequent hand hygiene, furlough of employees, closure of units and thorough disinfection with bleach, was set in place to terminate the outbreak. Extensive environmental decontamination — using 1:50 bleach solution as the primary disinfectant for all surfaces as part of an infection control bundle — terminated the outbreak. In the published study, bleach is cited as the “disinfectant of choice” based on its efficacy against feline caliciviruses (i.e., noroviruses) compared with quaternary compounds or alcohol.¹⁷

16. B.D. Eckstein et al. *MBC Infectious Diseases* 2007, 7 :61.

17. Johnston et al. *Clinical Infectious Diseases* 2007, 45: 534.



For more information, contact your Clorox sales representative or call **800-234-7700**.
email: healthcare@clorox.com
visit us: www.cloroxhealthcare.com

© 2012 Clorox Professional Products Company,
1221 Broadway, Oakland, CA 94612.

