

Clostridioides Difficile Infection (CDI)

How To Use This Guide

This AEBP provides evidence-based actions and resources for executives, leaders, clinicians, and performance improvement specialists. This document is intended to be used as a guide for healthcare organizations to examine their own workflows, identify practice gaps, and implement improvements. In it, you'll find:

Best Practice Summary: A high level summary of evidence-based, clinical best practices.

Executive Summary: Executives should understand the breadth of the problem and its clinical and financial implications.

Leadership Checklist: This section is for senior leaders to understand common patient safety problems and their implications related to CDI. Most preventable medical harm occurs due to system defects rather than individual mistakes. Leaders can use this checklist to assess whether best practices are being followed and whether action is needed in their organization around CDI.

Clinical Workflow: This section includes more specific information about CDI across the continuum of care. Leaders should include the people doing the work in improving the work. This section outlines what should be happening on the frontline. Clinicians can use this section to inform leaders whether there are gaps and variations in current processes. This is presented as an infographic that can be used for display in a clinical area.

Education for Patients and Family Members: This section outlines what frontline healthcare professionals should be teaching patients and family members about CDI. Clinicians can inform leaders whether there are gaps and variations in the current educational processes.

Performance Improvement Plan: If it has been determined that there are gaps in current practice, this section can be used by organizational teams to guide them through an improvement project.

What We Know About Clostridioides difficile Infection (CDI): This section provides additional detailed information about CDI.

Resources: This section includes helpful links to free resources from other groups working to improve patient safety.

Endnotes: This section includes the conflict of interest statement, workgroup member list, and references.

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Best Practice Summary

Prevention

- Reinforce the importance of hand hygiene for everyone in the organization, including visitors, patients, and family members.
- Prescribe antibiotics only as needed.
- Manage patient's expectations of receiving an antibiotic during their medical visit and educate patients around when antibiotics are used, when antibiotics are not used, and why.
- Employ appropriate environmental cleaning protocols.
- Identify patients at risk for CDI and explain to patients why they are at risk and what they can do to stay safe.

Identification and Diagnosis

- Use validated tools to recognize symptoms of CDI.
- Follow the organization's standard protocol for laboratory testing of specimens.
- Communicate with leadership about challenges in the CDI identification and diagnosis process.
- Identify patients with CDI clearly for other staff members using tools like isolation signs and EHR alerts.
- Ensure patients and family members are aware of their diagnosis and what they can do to stay safe.
- Follow the organizational protocol for implementing and removing isolation precautions for patients with CDI.

Treatment

- Discuss treatment plans during multidisciplinary rounds.
- Ensure treatment follows evidence-based guidelines and that the treatment is targeted to the infection and the patient's needs.
- Perform hand hygiene before and after every patient interaction.



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Discharge

- Educate patients and family members about the steps for care post-discharge.
- Ensure the patient's primary care provider is aware of a CDI infection and any antibiotics prescribed.
- Disinfect patient's rooms thoroughly.

Executive Summary

The Problem

Annually, Clostridioides difficile infection (CDI) impacts an estimated 500,000 Americans with approximately 29,000 associated deaths (Mada et al., 2019). Globally, its incidence rate hovers around 2.24 per 1000 admissions annually (Balsells, et al., 2018). Incidents of CDI could be minimized significantly with protocols already available and affordable in healthcare settings, including aligned incentives for antibiotic prescribing, isolation precautions, and hand hygiene.

The Cost

The average total cost for a single inpatient CDI infection is an estimated \$35,000 and the estimated annual cost burden of CDI on the healthcare system exceeds \$6 billion (APIC, 2013). Investment in low-cost preventive measures, such as implementation of a CDI bundle, could save lives and entirely eliminate the significant financial burden.

The Solution

Many healthcare organizations have successfully implemented and sustained improvements and reduced death from CDI. This document provides a blueprint that outlines the actionable steps organizations should take to successfully reduce and improve CDI prevention compliance and summarizes the available evidence-based practice protocols. This document is revised annually and is always available free of charge on our website.



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Leadership Checklist

On a monthly basis, or more frequently if a problem exists, the executive team should review the outcomes of patients at risk for CDI and those diagnosed with CDI. Use this checklist as a guide to determine whether current evidence-based guidelines are being followed in your organization:

Understand and optimize antibiotic prescribing habits.

- Change patient's expectations about prescriptions and antibiotic use through general public awareness campaigns.
- Share in-hospital data about CDI in the hospital with outpatient providers to inform next steps and to influence long term prescribing habits. See Care Coordination AEBP.
- Establish an antimicrobial stewardship program based on local guidelines. See "[Establishing an Antimicrobial Stewardship Program with David Ha](#)" video.
- Monitor prescribing behaviors and tools used to prescribe antibiotics and debrief routinely with providers to understand barriers to sustained compliance.
- Empower providers with communication strategies to counter the patient's expectation of receiving a prescription, even when it's not clinically indicated. See Healthcare Literacy AEBP.
- Carefully examine patient satisfaction surveys, as patients may indicate decreased satisfaction if they expected an antibiotic prescription and did not receive a prescription.

Prepare staff to provide the standard of care, hold them accountable, and reward success.

- Plan for enough staff to effectively manage necessary preventive care.
- Routinely assess CDI prevention competencies and skills.
- Ensure that CDI prevention protocols are embedded into clinical workflows, whether electronic or paper.
- Ensure CDI alerts are accessible and readily known by all staff (e.g., environmental cleaning staff may not see alerts in the EHR).

Set up systems for coordination and communication and anticipate challenges based on human factors.

- Prioritize funds, resources, time, and staffing for the CDI initiative.
- Include multidisciplinary, system-wide collaboration across teams (e.g., rounding, meetings,



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committees, education, communication, etc) to standardize the expectation for coordination. See Care Coordination AEBP.

- Set up the environment to prevent CDI after thorough consideration of human factors and workflows. Make it as easy as possible for those on the frontline to perform behaviors as intended by leadership (e.g., ensure sinks are in close proximity to encourage hand hygiene). See Performance Improvement plan for further details and examples.

Plan for sustainability.

- Ensure that leaders have a simple process to oversee CDI prevention improvement work while also considering how it aligns with other initiatives across the organization.
- Eliminate barriers to making rapid changes to documentation templates and order sets.
- Implement a CDI surveillance program, with involvement from system-wide providers. Appeal to all clinicians' desire to 'do good' for their patients by reinforcing examples of questions they should ask routinely in their own workflows for CDI prevention. See Clinical Workflow.
- Measure and report CDI prevention compliance monthly (Number of healthcare associated CDI based on [CDC NHSN definitions](#)/total number of patient days based on [CDC NHSN definitions](#)). Note trends in areas with low compliance and high CDI incidence. Routinely reassess outcomes.
- Audit processes (e.g., hand hygiene, environmental cleaning, etc) for all staff (e.g., non-clinical and clinical staff). See Performance Improvement plan for more examples of processes to consider assessing on an ongoing basis.



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Clinical Workflow

1. PREVENTION

- Ensure all visitors, patients, and healthcare workers practice frequent and thorough hand hygiene (See Hand Hygiene APSS).
- Practice judicious use of antibiotics to minimize the duration of antibiotic therapy. Prescribe antibiotics only as necessary and appropriate ([CDC, 2019](#)).
 - Are antibiotics warranted?
 - Can antibiotics be de-escalated or discontinued?
 - Is patient on any anti-diarrheal medications?
 - Are appropriate infection control measures in place?
 - Has patient/family been educated on CDI?
- Explain to patients:
 - Why they may not receive an antibiotic during a primary care or outpatient visit, even though they may expect a prescription
 - Why not receiving an antibiotic is in their best interest for their health.
- Disinfect surfaces routinely. Involve patients and family members in this process to both educate them about the importance of disinfection to prevent CDI and to encourage their own disinfecting behaviors (e.g., remotes, call lights, etc).
- Explain to patients their risk for CDI (e.g., immunosuppressed, taking multiple antibiotics, etc).





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2. IDENTIFICATION AND DIAGNOSIS

- Recognize symptoms of CDI using tools like [Bristol Stool Chart](#). Watch for watery, constant diarrhea.
- Send for laboratory testing after three stool samples that conform to the shape of the container (e.g., diarrhea).
 - Reject formed stool samples and limit the retesting of patients or testing of asymptomatic patients in the lab.
 - Communicate lab results back to the nursing unit and to infection control immediately upon acquisition.
- Alert care team members immediately if a patient has CDI. If the patient is returning to the hospital from an outpatient care setting, ensure risk of CDI or diagnosis of CDI is communicated clearly.
- Make the care team aware of CDI diagnosis (e.g., posters on the door, EHR alerts, etc).
- Educate family members or close contacts about their susceptibility to infection based on the patient's infection and what they can do to prevent it.
- Implement appropriate isolation precautions until diagnosis is ruled out or confirmed by laboratory results. If ruled out, isolation precautions may be able to be removed. If confirmed, maintain isolation precautions. See Isolation Precautions and Environmental Safety AEBP.



3. TREATMENT

Consult with team of clinicians, including infectious disease personnel, before deciding on best treatment options for that patient.

- Use caution around repeat testing.
- Target treatment according to the infection and the individual (e.g., adults versus pediatric). See [Infectious Disease Society guidelines](#) for further specifications.



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- Consider stool transplant for recurrent infection. Ensure thorough [education for patients and family members](#) before making this decision.

Maintain the utmost personal and environmental cleanliness via:

- Contact precautions
 - Initiate contact precautions for all symptomatic patients. Remove only with a negative laboratory test.
 - Place positive patients in a single room with its own bathroom.
 - Communicate isolation precautions in EMR, verbally upon transfer, in the patient's chart, and by using signage on the door.
- Hand hygiene
- Use soap and water frequently and thoroughly, as CDI spores are not killed with alcohol-based rub.
 - Disinfection
 - Use single use equipment whenever possible.
 - If single use equipment is not available, thoroughly disinfect equipment using health-care-certified bleach germicidal wipes before using the equipment on the next patient.



4. DISCHARGE

Anticipate patient and family learning needs leading up to discharge and establish thorough communication with the care team to coordinate discharge effectively.

- Educate patients and family members.
- Alert receiving clinician about the patient's CDI and antibiotic history and anticipate any areas of ambiguity in the report. See Care Coordination AEBP.
- Disinfect patient rooms thoroughly and completely immediately upon their discharge. See Isolation Precautions and Environmental Safety AEBP.

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Education For Patients And Family Members

The outline below illustrates all of the information that should be conveyed to the patient and family members by someone on the care team in a consistent and understandable manner.

Explain what members of the general public can do to prevent CDI in the first place. Convey what an antibiotic is, when it is needed, and what the risks of antibiotics are. Explain that members of the general public should:

- Not immediately hold the notion that not receiving antibiotics at a doctor's appointment is bad. Ask the provider to explain why a prescription was or was not written for an antibiotic.
- Take antibiotics exactly as prescribed and describe the importance and implications of taking or not taking exactly as prescribed.
- Know the risk factors for CDI (e.g., recent antibiotic use, recent hospitalization, older age, weakened immune systems, and inflammatory bowel disease).
- Practice thorough hand hygiene.

Explain what patients and family members can do to prevent CDI. Encourage patients and family members to:

- Not immediately hold the notion that not receiving antibiotics at a doctor's appointment is bad. Ask the provider to explain why a prescription was or was not written for an antibiotic.
- Share their full medical history, especially antibiotic history, and emphasize that providers will not be able to treat properly without this complete and accurate information.
- Ask questions about why antibiotics were changed.
- Ensure providers always perform hand hygiene and practice hand hygiene themselves.
- Keep surfaces as sanitized as possible. Point out examples to patients of surfaces that should be regularly cleaned (e.g., remotes, bedrails, etc).
- Report any symptoms that may indicate CDI.
- Keep a record of all medications and antibiotics the patient is taking and ask questions when a new therapy is recommended. Ensure providers are aware of antibiotic history at each clinical interaction across the system.
- Ensure the room is being properly sanitized.

Explore next steps. Planning for life after the hospital, whether in assisted living, returning home, or another option, should begin as early as possible between the healthcare providers and the patient and family.

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- Explain what can be anticipated in the patient after discharge regarding both physical and cognitive functioning after CDI.
- Ensure thorough explanation of necessary post-discharge appointments, therapies, medications, and potential complications.
- Assess for patient preference in time and location of follow-up appointments, if possible.
- Provide patients and family members resources, including direct contact phone numbers, to the hospital for post-discharge questions.
- If any care or maintenance is required post-discharge, set aside time with the patient and family members more than once to ensure their understanding and confidence.

Performance Improvement Plan

Follow this checklist if the leadership team has determined that a performance improvement project is necessary:

- Gather the right project team.** Be sure to involve the right people on the team. You'll want two teams: an oversight team that is broad in scope, has 10-15 members, and includes the executive sponsor to validate outcomes, remove barriers, and facilitate spread. The actual project team consists of 5-7 representatives who are most impacted by the process. Whether a discipline should be on the advisory team or the project team depends upon the needs of the organization. Patients and family members should be involved in all improvement projects, as there are many ways they can contribute to safer care.

Complete this Lean Improvement Activity:



Conduct a [SIPOC](#) analysis to understand the current state and scope of the problem. A SIPOC is a lean improvement tool that helps leaders to carefully consider everyone who may be touched by a process, and therefore, should have input on future process design.

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RECOMMENDED CDI IMPROVEMENT TEAM

- Environmental service staff members
- Infection preventionists
- Laboratorians
- Nurses
- Physicians and all others with authority to prescribe
- Pharmacists
- Antimicrobial stewardship
- Pharmacists
- Admitting and registration staff
- Public health promotional personnel
- Data analysts
- EHR specialists
- Patient and family members

Table 1: Understanding the necessary disciplines for a CDI prevention improvement team. Ensure representation from professionals in all facilities across the system.

- Understand what is currently happening and why.** Reviewing objective data and trends is a good place to start to understand the current state, and teams should spend a good amount of time analyzing data (and validating the sources), but the most important action here is to go to the point of care and observe. Even if team members work in the area daily, examining existing processes from every angle is generally an eye-opening experience. The team should ask questions of the frontline during the observations that allow them to understand each step in the process and identify the people, supplies, or other resources needed to improve patient outcomes.



Create a [process map](#) once the workflows are well understood that illustrates each step and the best practice gaps the team has identified ([IHI, 2015](#)). Brainstorm with the advisory team to understand why the gaps exist, using whichever [root cause analysis tool](#) your organization is accustomed to ([IHI, 2019](#)). Review the map with the advisory team and invite the frontline to validate accuracy.

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CDI PROCESSES TO CONSIDER ASSESSING

- Antibiotic prescribing and justification
- Time between suspicion and ordered laboratory testing
- Communication between lab and the appropriate teams (infection control, unit nurse, etc.)
- Isolation precaution initiation
- Number of places in which the isolation initiation and discontinuation is communicated/documentated
- Number of laboratory retests for the same patient
- Auditing of antimicrobial therapy appropriateness and duration
- Use of single-use equipment for CDI positive patients
- Disinfection of equipment if not single use
- Conversations with patients about why antibiotics are not warranted
- Patient practice of taking antibiotics
- Patient understanding of the reason behind changing antibiotics after receiving the culture
- Frequency of entering and leaving a patient's room
- Equipment accessibility in close proximity to a patient's room (e.g., sinks, syringes, etc)
- Discharge processes and coordination with the outpatient setting for patients who had CDI in the hospital

Table 2: Consider assessing these processes to understand where the barriers to CDI prevention may be in your organization

- Prioritize the gaps to be addressed and develop an action plan.** Consider the cost effectiveness, time, potential outcomes, and realistic possibilities of each gap identified. Determine which are a priority for the organization to focus on. Be sure that the advisory team supports moving forward with the project plan so they can continue to remove barriers. Design an experiment to be trialed in one small area for a short period of time and create an action plan for implementation.

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TYPICAL GAPS IDENTIFIED IN CDI

- Non-clinically indicated antibiotic prescribing (Example fishbone diagram)
- Frequent retesting
- Inadequate sterilization of rooms and equipment
- Poor hand hygiene
- Lack of adequate antimicrobial therapy auditing and reporting systems
- Poor communication with visitors of the importance of hand hygiene
- Poor discharge planning and patient education
- Patient expectation of receiving antibiotics when they visit a clinician
- General public perception that all bacteria are 'bad'
- Communication from the laboratory to the charge nurse to the bedside nurse about a critical positive

Table 3: By identifying the gaps in CDI prevention compliance, organizations can tailor their project improvement efforts more effectively

The action plan should include the following:

- Assess the ability of the culture to change and adopt appropriate strategies
- Revise policies and procedures
- Redesign forms and electronic record pages
- Clarify patient and family education sources and content
- Create a plan for changing documentation forms and systems
- Develop the communication plan
- Design the education plan
- Clarify how and when people will be held accountable

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- Evaluate outcomes, celebrate wins, and adjust the plan when necessary.** Measure both process and outcome metrics. Outcome metrics include the rates outlined in the leadership checklist. Process metrics will depend upon the workflow you are trying to improve and are generally expressed in terms of compliance with workflow changes. Compare your outcomes against other related metrics your organization is tracking.

Routinely review all metrics and trends with both the advisory and project teams and discuss what is going well and what is not. Identify barriers to completion of action plans, and adjust the plan if necessary. Once you have the desired outcomes in the trial area, consider spreading to other areas ([IHI, 2006](#)).

It is important to be nimble and move quickly to keep team momentum going, and so that people can see the results of their labor. At the same time, don't move so quickly that you don't consider the larger, organizational ramifications of a change in your plan. Be sure to have a good understanding of the other, similar improvement projects that are taking place so that your efforts are not duplicated or inefficient.

CDI COMPARATIVE OUTCOMES

- | | |
|---------------------|------------------------------------|
| • Hand hygiene | • Readmission |
| • Length of stay | • Number of isolation rooms in use |
| • Antimicrobial use | |

Table 4: Consider evaluating related metrics to better understand CDI presence and contributing factors

[Read this paper](#) from the Institute for Healthcare Improvement to understand how small local steps



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What We Know About Clostridioides Difficile Infection (CDI)

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Clostridioides difficile (CDI) is a bacterium that can cause symptoms ranging from diarrhea to life-threatening swelling of the colon ([CDC, 2012](#)). CDI is a spore-forming, Gram- positive anaerobic bacillus bacteria that produces two exotoxins: toxin A and toxin B ([CDC, 2012](#)).

Patients can become infected with a CDI if they touch items or surfaces that are contaminated with feces and then touch their mouth or other mucous membranes. In healthcare settings, spores are primarily spread to patients by the hands of healthcare staff who have touched a contaminated surface or item. These spores are not killed by alcohol- based hand rubs, therefore, soap and water must be used ([Oughton et al., 2009](#); [Jabbar et al., 2010](#)).

Symptoms of CDI include ([CDC, n.d.](#)):

- Watery diarrhea
- Fever
- Dehydration
- Loss of appetite
- Serious intestinal conditions, such as toxic megacolon
- Nausea
- Abdominal pain and tenderness

Diagnosis

Doctors use laboratory tests to diagnose CDIs, including:

- Stool cultures
- Molecular tests
- Antigen detection for C. diff
- Toxin testing:
 - Tissue culture cytotoxicity assay
 - Enzyme immunoassay

Clinical Implications

Annually, CDI impacts an estimated 500,000 Americans with approximately 29,000 associated deaths ([Mada et al., 2019](#)). In the EU, there are approximately 125,000 CDI cases and, with a

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3% mortality rate, approximately 3,700 deaths per year ([European Centre for Disease Prevention and Control](#)). It has been suggested that approximately 40,000 cases are underdiagnosed in Europe each year ([Balsells et al., 2020](#)). Once a patient has been infected, the recurrence of CDIs is estimated to occur in 20-30% of cases ([Banawas, 2018](#)). Due to its significant prevalence and unique challenges, CDI is projected to become the most common healthcare-associated gastrointestinal infection in the US and Europe ([Banawas, 2018](#)).

CDI, if left untreated, can lead to other complications, including:

- Pseudomembranous colitis (PMC)
- Toxic megacolon
- Perforations of the colon
- Sepsis (See “Early Recognition and Detection of Sepsis” AEBP)
- Death

Financial Implications

The average total cost for a single inpatient CDI infection is an estimated \$35,000 and the estimated annual cost burden of CDI on the healthcare system exceeds \$6 billion ([APIC, 2013](#)), requiring approximately 2.4 million hospital days ([Zhang et al., 2016](#)).

The cost of healthcare-associated CDI ranges in the general population from \$6,893 to \$90,202. However, in high risk groups, such as congestive heart failure patients and renal impairment patients, the cost hovers around \$7,332 and \$122,318, respectively ([Zhang et al., 2016](#)).

Populations at Risk

Some patients have a higher chance of contracting CDI, including those:

- With antibiotic exposure
- With proton pump inhibitors
- Who are immunocompromised
- Who have had gastrointestinal surgery
- Who have been in the hospital for an extended period of time
- Who may have a serious underlying illness
- Who are elderly





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Resources



Resources for CDI Improvement:

- [CDC: C. diff Guidelines and Prevention Resources](#)
- [CDC: CDI Implementation Guide](#)
- [APIC: Guide to Preventing Clostridium difficile Infections](#)
- [Probiotic Use for the Prevention of Antibiotic-Associated Clostridium difficile Infection](#)
- [Guidelines for Diagnosis, Treatment, and Prevention of Clostridium difficile Infections](#)
- [Antibiotic Resistance Threats in the United States 2019](#)
- [Minnesota Hospital Association: Road Map to a Comprehensive Clostridium difficile Infection \(CDI\) Prevention Program](#)

Resources for Patients and Family Members:

- [CDC: What is C. diff?](#)
- [UWHealth: What you need to know about CDI](#)
- [CDC: The Progression of CDI infographic](#)

For General Improvement:

- [CMS: Hospital Improvement Innovation Networks](#)
- IHI: A Framework for the Spread of Innovation
- The Joint Commission: Leaders Facilitating Change Workshop
- IHI: Quality Improvement Essentials Toolkit
- [SIPOC Example and Template for Download](#)
- [SIPOC Description and Example](#)

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Endnotes

Conflicts of Interest Disclosure

The Patient Safety Movement Foundation partners with as many stakeholders as possible to focus on how to address patient safety challenges. The recommendations in the AEBP are developed by workgroups that may include patient safety experts, healthcare technology professionals, hospital leaders, patient advocates, and medical technology industry volunteers. Workgroup members are required to disclose any potential conflicts of interest.

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References

- APIC. (2013). Guide to Preventing Clostridium difficile Infections. Retrieved from <https://apic.org/wp-content/uploads/2019/07/2013CDiffFinal.pdf>
- Balsells, E., Shi, T., Leese, C., Lyell, I., Burrows, J., Wiuff, C., Campbell, H., Kyaw, M.H., Nair, H. (2020). Global burden of Clostridium difficile infections: a systematic review and meta-analysis. *Journal of Global Health*.
- Banawas, S.S. (2018). Clostridium difficile Infections: A Global Overview of Drug Sensitivity and Resistance Mechanisms. Hindawi BioMed Research International.
- Centers for Disease Control and Prevention. (2016). Clostridium difficile Infection (CDI) Prevention Primer [Powerpoint Slides]. Retrieved from <https://www.cdc.gov/hai/ppt/CDI-Primer-2-2016.pptx>
- Centers for Disease Control and Prevention. (2018, January). Identifying Healthcare-associated Infections (HAI) for NHSN Surveillance. Retrieved from https://www.cdc.gov/nhsn/pdfs/psc-manual/2psc_identifyinghais_nhsncurrent.pdf
- Centers for Disease Control and Prevention. (2012, October). Instructions for Mapping Patient Care Locations in NHSN. Retrieved from <https://www.cdc.gov/nhsn/pdfs/psc/mappingpatientcarelocations.pdf>
- Centers for Disease Control and Prevention. (2018, January). Multidrug-Resistant Organism & Clostridium difficile Infection (MDRO/CDI) Module. Retrieved from https://www.cdc.gov/nhsn/PDFs/pscManual/12pscMDRO_CDADcurrent.pdf
- Centers for Disease Control and Prevention. (2012). Vital Signs: Preventing Clostridium difficile Infections. *MMWR. Morbidity and Mortality Weekly Report*, 61(9), 157. Retrieved from <http://www.cdc.gov/mmwr/pdf/wk/mm6109.pdf>
- European Centre for Disease Prevention and Control. (2020). Clostridium difficile infections - Facts and surveillance. Retrieved from <https://www.ecdc.europa.eu/en/clostridium-difficile-infections/facts>

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- Gerding, D. N., Muto, C. A. and Owens, R. C. J. (2008). Measures to Control and Prevent Clostridium difficile Infection.. Clin Infect Dis, 46 Suppl 1, S43–9. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/18177221>
- Healthcare Cost and Utilization Project. (2016, October). Clostridium Difficile Hospitalizations. Retrieved from <https://www.hcup-us.ahrq.gov/reports/HCUPCDiffHosp2010-2014Report102616.pdf>
- Jabbar, U., Leischner, J., Kasper, D., Gerber, R., Sambol, S. P., Parada, J. P., ... Gerding, D. N. (2010). Effectiveness of Alcohol-Based Hand Rubs for Removal of Clostridium difficile Spores from Hands. Infection Control & Hospital Epidemiology, 31(06), 565–570. doi:10.1086/652772
- Landelle, C., Verachten, M., Legrand, P., Girou, E. (2014). Contamination of Healthcare Workers' Hands with Clostridium difficile Spores after Caring for Patients with C. difficile Infection. Infection Control & Hospital Epidemiology, 35(1), 10-15. doi.org/10.1086/674396
- Legenza, L., Barnett, S., Rose, W., Safdar, N., Emmerling, T., Peh, K.H., Coetzee, R. (2018). Clostridium difficile infection perceptions and practices: a multicenter qualitative study in South Africa. Antimicrobial Resistance and Infection Control, 7(125). <https://doi.org/10.1186/s13756-018-0425-y>
- Mada, P.K., Alam, M.U. (2019). Clostridium Difficile. StatsPearl Publishing.
- National Scorecard on Rates of Hospital-Acquired Conditions 2010 to 2015: Interim Data From National Efforts To Make Health Care Safer. (2016, December 09). Retrieved from <https://www.ahrq.gov/professionals/quality-patient-safety/pfp/2015-interim.html>
- Oughton, M. T., Loo, V. G., Dendukuri, N., Fenn, S. and Libman, M. D. (2009). Hand Hygiene with Soap and Water Is Superior to Alcohol Rub and Antiseptic Wipes for Removal of Clostridium difficile. Infection Control & Hospital Epidemiology, 30(10), 939–944. doi:10.1086/605322
- United States Environmental Protection Agency. (2018, January 10). LIST K: EPA's Registered Antimicrobial Products Effective Against Clostridium difficile Spores. Retrieved from <https://www.epa.gov/pesticide-registration/list-k-epas-registered-antimicrobial-products-effective-against-clostridium>
- Vogelzang, E.H., Lankelma, J.M., van Mansfeld, R., van Prehn, J., van Houdt., R. (2020). Implementing a Clostridium difficile testing algorithm and its effect on isolation duration and treatment initiation: a pre- and post-implementation study. European Journal of Clinical Microbiology & Infectious Diseases, 39, 1071-1076. <https://doi.org/10.1007/s10096-020-03823-w>
- World Health Organization. (2011, June 08). System Change - Changing Hand Hygiene Behaviour at the Point of Care. Retrieved from http://www.who.int/gpsc/tools/faqs/system_change/en/
- Zhang, S., Palazuelos-Munoz, S., Balsells, E.M., Nair, H., Chit, A., Kyaw, M.H. (2016). Cost of Hospital Management of Clostridium Difficile Infection in United States-a Meta-Analysis and Modelling Study. BMC Infect Dis., 16(1), 447. doi:10.1186/s12879-016-1786-6