Evidence-Based Practice in the Treatment for Antibiotic-Associated Diarrhea in the Intensive Care Unit

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KEYWORDS

• Diarrhea • Antibiotic • *Clostridium difficile* • Probiotics • Spores • Vancomycin

KEY POINTS

- The use of antibiotics leads to diarrhea.
- *Clostridium difficile* infection (CDI) is a serious hospital-acquired infection.
- Contact precautions need to begin when diarrhea is identified.
- Vancomycin is used to treat CDI.

Antibiotic-associated diarrhea (AAD) is a common occurrence in intensive care units (ICU) across the United States. Antibiotics can disrupt the normal gut microbiota and cause AAD.[1] Some patients who have AAD develop *Clostridium difficile* colonization or infection. More than 500,000 people were known to contract *C difficile* infections (CDI) while hospitalized in 2011, and the trend for CDIs is increasing.[2] The Centers for Disease Control and Prevention are tracking CDI through the Emerging Infections Program, in which many states and academic health centers are participating. Of the one-half million persons who contracted *C difficile* in 2011, 29,000 died.[2] CDI costs the United States more than 4.8. billion dollars per year, just for acute care facilities.[3] The additional acute care costs were from longer hospitalizations, contact isolation, laboratory fees, and antibiotics. These costs are expected to double over the next 4 decades because the population over age 65 is increasing.[4] Elderly patients in surgical units and ICU are the most susceptible to CDI.[5] Many medications, including antibiotics, list diarrhea among the side effects. CDI is the number one cause of nosocomial infections.[6] The purpose of this article is to inform nurses about AAD, describe the antibiotics

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that are more likely to lead to both AAD and CDI, and to explore the role of probiotics in prevention of AAD. Last, what ICU nurses can do to decrease the incidence of AAD and CDI is discussed.

WHO IS PRONE TO ANTIBIOTIC-ASSOCIATED DIARRHEA AND WHY?

AAD affects 25% to 30% of the people taking antibiotics.[6] AAD is usually defined as 3 loose stools in a 24-hour period while on antibiotics or after completing the course of antibiotics.[1,7,8] If the patient has 3 episodes of unformed stool in 24 hours, testing for CDI and consideration to stop or change antibiotics is recommended.[2] One reason for AAD is that broad-spectrum antibiotics disrupt the normal interaction of the microbiota and host, leading to diarrhea.[8] Some patients are more likely to develop AAD and require special consideration when beginning a new antibiotic.

Patients over the age of 65, those on proton pump inhibitors (PPI), or those having a prior hospitalization, especially within the previous 3 months, are prone to AAD.[2,9,10] Also, patients on chemotherapy, with immunocompromised conditions, or having diabetes are more likely to develop AAD.[11] Lin and colleagues[11] looked at 486 patients, where 86 (17.8%) developed colonization with *C difficile*, and found that diabetes mellitus, piperacillin–tazobactam, or those on a protein pump inhibitors had a higher rate of *C difficile*–associated diarrhea (CDAD). There were no statistical differences between body mass index or gender for those who acquire AAD and those who do not develop AAD.[11] Besides underlying conditions, antibiotics, and age, PPIs may contribute to CDAD.

Nurses are well aware that antibiotics may lead to diarrhea, but Gordon and colleagues[12] questioned if receiving high-risk antibiotics and being on a PPI caused greater risk of AAD. With 3513 patients on high-risk antibiotics and a PPI, and 6149 who were on high-risk antibiotics, but not a PPI, 111 total patients were positive for CDI. The conclusion was that using high-risk antibiotics and a PPI had a significantly higher rate of CDI. Therefore, avoidance of PPIs for patients in the ICU when possible could decrease the morbidity of CDI. Abdelfatah and colleagues[13] performed a retrospective study of 3020 patients who were positive for CDI. This study found that glucocorticoids, use of PPIs, and end-stage renal disease place patients at risk for recurrent CDI.[13] Faleck and colleagues[14] studied 18,134 ICU patient records to determine predictive factors for CDI. The question was whether patients in the ICU were different from other patients, with respect to causes of CDI.[14] The results showed that, like other studies, antibiotics were the strongest predictive factor for CDI. However, unlike other studies, there was not an increased risk of CDI for those on a PPI. Finally, a large international study was done with more than 3 million patients, and 54,957 patients selected for review.[15] The results showed an association between PPIs and CDI in this group. Like with antibiotics, the PPI must be considered a risk factor for hospitalized, high-risk patients.

Also, infectious diarrhea may be caused by the norovirus, *Clostridium perfringens*, *Klebsiella oxytoca*, and *Bacteroides fragilis*. *B fragilis* is a community-acquired diarrhea-causing organism, but is rarely a cause of nosocomial diarrhea. Testing for these organisms and other causes of diarrhea is limited.[8] *K oxytoca* creates a toxin that impedes DNA syntheses, and causes bloody diarrhea.[8] *C perfringens* also causes bloody diarrhea, which usually resolves in 24 hours without treatment.[1] *Staphylococcus aureus* is a rare cause of AAD.[1] CDI causes diarrhea, cramping, and severe abdominal pain, and begins 48 to 72 hours after introduction of the organism.[1] The patient may have 10 to 15 loose stools per