

Case-control outbreak investigation of *Clostridium difficile* infections in a bone marrow transplant unit

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Abstract

Background: The rise of *Clostridium difficile* as a leading cause of antimicrobial-associated diarrhea and pseudo membranous colitis is of growing concern and importance in public health. *C. difficile* has been identified as an emerging pathogen with changing epidemiology and characteristics that pose difficult challenges to infection prevention and control. This spore-forming bacterium can be difficult to control in the environment and can cause serious health problems as well as extended length of hospital stay and increased costs. A cluster of cases was identified in a bone marrow transplant unit and the need for an investigation was recognized. The purpose of this study was to identify risk factors associated with the acquisition of *C. difficile* colitis for the cluster of cases.

Methods: The investigation was conducted using a case-control study design in which cases were identified using the case definition and controls were randomly selected after satisfying inclusion and exclusion criteria. I reviewed medical charts and laboratory results to identify risk factors pertaining to medical conditions, medications, and patient demographics. Additionally, I assessed the possibility of an environmental contribution to the cluster by determining the risk associated with being placed in a room in which a prior infection had occurred. Also, I observed unit staff members and visitors for behavioral compliance with the isolation precaution procedures.

Results: In total, there were nine cases in the cluster, corresponding to a significant increase for this unit (p -value=0.06). There were no differences between cases and controls regarding age, race, and gender. The cases had a longer length of stay (52 days on average vs. 25 days on average, p -value=0.05) and higher mortality rates (33% vs. 0.05%). Having documented renal disease upon admission was the most important risk factor associated with this cluster (adjusted OR=21.7, 95% CI=4.0, 178.6). Several classes of medications were significantly associated including anti-virals, glucocorticoids, calcium channel blockers and anticoagulants while the only antibiotic associated with CDI was intra-venous vancomycin. Being placed in a room where a previous case was assigned was a significant risk factor (OR=6.634, 95% CI=1.124, 50.57) and there was a shorter amount of time between patients as well (p -value=0.03).

Discussion: Based on the results of this investigation, the cluster of CDI's that occurred in the bone marrow transplant unit was multi-factorial and complex with both biological and environmental risk factors. This patient population is immune-suppressed and vulnerable to infections and this cluster of cases resulted in poor health outcomes, including an increased mortality rate. Therefore, as more people enter acute care settings and patients admitted with infections continue to increase, the results from investigations such as this one may be a key in upholding patient safety and preventing healthcare-associated infections.