A case-control study to examine risk factors for Clostridium difficile infection at CPMC medical center

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Abstract

Clostridium difficile (C. diff) is a well-known toxin-producing bacterium that causes gastrointestinal infection among hospitalized patients. C.diff associated diarrhea occurs when patients have a reduction in their normal intestinal flora that allows for the growth of C.diff. Clinical manifestations range from diarrhea to full blown colitis and sepsis and as such it is associated with significant morbidity, mortality and longer length of hospital stay. A well-known risk factor for its development is the use of antibiotics among such patients. Studies in the United States and Canada have demonstrated an increase in the number of C. diff cases in the last five years among hospitalized cases as well as in the community. One group estimated an increase in cases from 3.9-4.5 per 1000 to 7.9-8.4 per 1000 among approximately 100 hospitals in the United States. Studies have been shown to be more virulent, causing more severe disease, associated with more broad-spectrum antibiotics and may also be associated with increased use of acid blocking gastrointestinal agents. Anectdotal evidence has suggested a similar excess of C. diff cases at Columbia Presybterian Medical Center (CPMC). The purpose of this study is to exam what risk factors such as type of antibiotic use, acid blocker use and host factors such severe underlying illness, may be associated with its re-emergence. Data will be compared from two different time periods to determine if there is in fact an increase in cases at CPMC and if risk factors are changing. These findings could be used to strengthen infection control practices, inform antibiotic prescribing guidelines and potentially impact the wide spread use of acid blocking agents to prevent and control C. difficile infection.

This study will utilize CPMC WEBCIS data on hospitalized adult patients with ICD-9 codes for C.diff infection as well as CPMC laboratory data of stool cultures. There are no procedures or visits required for any patients and no ethical issues related to the performance of this study.

A. Study Purpose and Rationale

The purpose of this study is to examine risk factors for C. diff infection among hospitalized adult patients at CPMC during the years 1995-2005. Time periods will be compared to determine if there is an increase in cases and emergence of new risk factors in recent years. Although C.diff has been traditionally associated with antibiotic use (particularly Clindamycin), both the literature and anectodal evidence suggest new risk factors that have lead to an increase in infections over the last 5-10 years. Characterization of new risk factors for C.diff infection could lead to new policies for infection control and antibiotic prescribing to prevent infection at CPMC

B. Study Design and Statistical Analysis

The study will be a case-control design utilizing CPMC WEBCIS electronic medical records database, pharmacy records for antibiotic use, and laboratory records for stool cultures. Using laboratory records, all patients that had at least 3 stool studies sent for C.diff infection will be entered into the study as possible subjects. Using the WEBCIS database cases will be identified using ICD-9 codes for Clostridium difficile infection. Further subjects will be identified by laboratory stool cultures that tested positive for C.diff toxin A or C. diff toxin B. To avoid missing cases, ICD-9 codes for Pseudomembranous colitis, which is pathognomonic for C. diff infection will also be used. These records will be cross-checked. Those patients that developed one positive C.diff toxin within 72 hours of hospitalization will be designated cases and those patients with three negative stool cultures will be

designated controls. Data will be search from the years 1995-2005. Controls will be matched to cases on age, sex, admission date, and length of hospital stay. Once the subjects are identified, medical record data will be collected on demographics, admission diagnoses, immune status, antibiotic use and length of use, acid blocker use, underlying illness, and necessity of ICU stay.

Power analysis was performed using a chi-square test of proportions and estimating a 90% prevalence of antibiotic use in the cases versus a 60% prevalence of antibiotic use in the controls. These prevalences were based on estimates in the literature. In order to see a difference of 30% between cases and controls, 38 subjects will be needed in each group. The alpha level will be set at .05 with a power of 80%.

Analysis will be performed using a multiple logistic regression model comparing differences in use of antibiotic agents (IV, oral) length of use, underlying illness, use of acid blocker and other characteristics above.

C. Study Procedures

None

D. Study Drugs

None

E. Medical Devices

None

F. Study Questionnaires

none

G. Study Subjects

Not applicable

H. Recruitment of Subjects

Not needed

I. Confidentiality

All patient identifying data will be removed.

J. Potential Conflict of Interest

None

K. Location

CPMC

L. Potential Risks

None as this is a retrospective cohort study on existing data

M. Potential Benefits

These findings could be used to strengthen infection control practices, inform antibiotic prescribing guidelines and potentially impact the wide spread use of acid blocking agents to prevent and control C. difficile infection.

N. Alternative Therapies

Not applicable

O. Compensation to Subjects

None

P. Costs to Subjects

None

Q. Minors

None

R. Radioactive substances

None

S. Consent Form

None required