Testing Is Only Part Of The Story: Identifying Risk Factors for \textit{C. difficile} Colonization diagnosed during Inpatient Admission

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**Background**

\text{Clostridium difficile} infection (CDI) is the most common cause of health care-associated infection in US hospitals. In 2008, CDI may have resulted in as much as $4.8$ billion in excess healthcare costs in acute-care facilities alone. According to the Infectious Diseases Society of America (IDSA) clinical practice guidelines, the diagnosis of CDI requires both a positive lab test and clinical symptoms of CDI. A positive Clostridium difficile test in an asymptomatic patient is consistent with \textit{C. difficile} colonization, which does not require treatment or contact isolation. Risk factors for both CDI and \textit{C. difficile} colonization are similar and include recent healthcare facility exposure, antibiotic use, and use of proton-pump inhibitors. Incorrectly diagnosing colonization as true infection can lead to patient harm by preventing correct diagnosis of cause of diarrhea, inappropriate use of antibiotics and delays in discharge. Since \textit{C. difficile} colonization rates increase during hospitalization and inappropriate laxative use is common, the risk for continuing colonization for infection is especially high for hospital onset \textit{C. difficile} cases. Comparing clinical risk factors between colonized and infected patients may guide providers in appropriate testing.

A campaign to promote appropriate \textit{C. difficile} testing involving education and electronic medical record order support began at Mount Sinai Beth Israel October 2015 and was fully implemented by January 2016.

**Study Objective**

The goal of this project was to identify risk factors for inappropriately sending hospital-onset \textit{C. difficile} testing at our facility.

**Methods**

- A retrospective chart review of hospital-onset CDI incident cases from 1/1/2015 to 12/31/2015 was conducted at an urban academic medical center.
- Per the Centers for Disease Control and Prevention, the criteria for hospital-onset \textit{C. difficile} (HO CDI) infection is defined as a \textit{C. difficile} positive specimen collected greater than 3 days after admission to a facility.

**Results**

- Medical records were reviewed for documentation of diarrhea and for symptoms of infection (fever, leukocytosis, abdominal complaint by patient report or on physical exam) within 48 hours prior to submitting stool specimen for testing.
- CDI testing was deemed appropriate if the patient had documented diarrhea along with at least one other sign or symptom of \textit{C. difficile} infection.
- Data on risk factors were collected by reviewing charts for documentation of antibiotic or protein pump inhibitor (PPI) use within 30 days and healthcare facility exposure within 90 days.
- The Chi-square test was utilized to assess the association between risk factor exposure and appropriateness of testing. Statistical significance was set at $P < 0.05$.

**Discussion**

- Our data shows that 37\% of \textit{C. difficile} tests that diagnosed HO CDI were sent inappropriately (fig 2), which ultimately leads to over-diagnosis, unnecessary antibiotic use, and increased healthcare costs. Of inappropriately tested patients, 65\% had no documented diarrhea and almost half of those with diarrhea had received laxatives.
- Recent antibiotic use was over 6 times more common in patients with colonization rather than CDI, although this finding did not reach statistical significance. No differences were found in recent PPI or healthcare facility exposure (fig 3).
- The limitations of this study include the retrospective design which relies heavily on the accuracy and completeness of the charts, the small sample size limiting the power of the study, and the beginning of the implementation of the appropriate testing campaign in October 2015.

**Conclusion**

In our facility, over a third of HO CDI cases were sent inappropriately according to IDSA guidelines. These cases likely represent \textit{C. difficile} colonization instead of true infection, and these misdiagnoses have potential negative impact for both the patient and the healthcare facility.

Our study showed no evidence for using clinical risk factors to help differentiate between colonization and infection, and even shows a trend that recent antibiotic use is more associated with colonization. Our data provides more evidence to support the use of a testing algorithm and highlights the need for hospitals across the country to implement a comprehensive campaign to educate physicians on appropriate \textit{C. difficile} testing, specifically that recent antibiotic use may not help distinguish between colonization and infection.

**References**