PROJECT TITLE: Developing a Risk Prediction Model for Hospital Acquired Clostridium Difficile Infection

PROPOSAL NUMBER: Care2	PI: Midge Ray, Ferhat Zengul	
RESEARCH THEME: Care Coordination		
BUDGET: $42,000	MULTI-UNIVERSITY PROJECT: NO	PROJECT YEAR: 2

DESCRIPTION:

Hospital Acquired Infections (HAI), infections acquired after admission to the hospital, consume about $25 to $31 billion. In 2002, the Centers for Disease Control and Prevention estimated the rate for HAIs to be about 1.7 million, with 99,000 related to deaths during hospitalization. Hence, HAI affect quality and cost of healthcare. In 2008, Medicare initiated a plan to reduce payments to hospitals for complications that occur during the hospital stay, including HAI. One such infection is the Clostridium difficile infection (CDI), which is the most common cause of infectious diarrhea occurring in the hospital. Treatments costs per patient is approximately $8,911 to $30,049 in the U.S. In Phase I, we identified predictors of hospital acquired CDI. In Phase II, we will conduct a retrospective study using UAB i2b2 dataset to develop a risk prediction model for CDI. The main goal of this study is to develop a CDI risk prediction model that allows categorizing patients into high, medium, and low risk categories, which will allow for more targeted strategies.

HOW THIS IS DIFFERENT THAN RELATED RESEARCH:

Even though there have been studies exploring the predictors of CDI, there has not been a study that develops a CDI risk prediction model that allows categorizing patients into high, medium, and low risk categories. These risk categories would allow the development of more targeted testing strategies for CDI infection. Given that CDI testings tend to be expensive and they are not reimbursed by the payers, it is crucial for hospitals to be able to develop more targeted CDI testing strategies.

EXPERIMENTAL PLAN:

Phase I: Literature Review - Completed
Phase II: Initial UAB i2b2 exploration generated 20,325 patients who were tested for CDI. Currently, we don't know how many of these patients had positive test results. We will be able to know this information after acquiring the IRB approval. If a patient was tested for CDI, there should be some clinical reason. Having both positive and negative tested patients would allow us to develop models that would better differentiate these two categories of patients.
Phase III: Testing the findings by using industry partner's data set and writing a grant proposal for the development of a clinical decision support system, integrated into electronic health records, that would use findings from machine learning algorithms to provide probability of risk for each patient for present-on-admission CDI or development of CDI during hospital stay.

EXPECTED MILESTONES:

Month 1-2: Acquiring IRB approval
Month 3-6: Preprocessing the data and running descriptive statistics
Month 7-8: Predictive Analyses
Month 9-12: Write report on the results of risk prediction model of CDI

BENEFITS TO INDUSTRY:

A risk prediction model of CDI will be useful in screening patients at risk for the infection at the time of admission, leading to more targeted strategies in testing CDI, reducing costs. Identifying predictors of CDI would also allow development of potential interventions to reduce the rate of CDI by (1) administering proactive treatment to patients at risk (2) diagnosing patients who have pre-existing or HAI CDI resulting in quicker treatment, and (3) potentially reducing the length of stay, also reducing costs.

EXPECTED DELIVERABLES:

Year 1: Final report on risk prediction model of CDI
Year 2: (1) Publish a manuscript based upon the findings and (2) Poster presentation by PhD student at professional meeting.