Distributed Health Outcome Monitoring and Evaluation Using i2b2

William G. Adams, MD1, Nick Anderson, PhD2, Eta S. Berner, EdD3, Daniel P. Schauer, MD4, Ralph J. Zottola, PhD5, Elizabeth S. McClure1, Matthew Wyatt, MSHI3

1Boston University School of Medicine, Boston, MA; 2University of Washington School of Medicine, Seattle, WA; 3University of Alabama School of Health Professions, Birmingham, AB; 4University of Cincinnati College of Medicine, Cincinnati, OH; 5University of Massachusetts Medical School, Worcester, MA

Abstract

 There is a pressing need for better tools to support comparative effectiveness research (CER) on a national scale. In addition, little is known about within-class outcome disparities for commonly used cardiovascular and diabetes medications. In this presentation, we will describe out experience and findings related to the use of a new i2b2 cell, the Health Outcome Monitoring and Evaluation Cell (HOME) cell, to perform distributed CER queries at 5 collaborating CTSAs in the U.S. Our focus is on the assessment of race, gender, and location-based disparities in outcome for patients treated with similar mediations for hypertension, dyslipidemias, and diabetes.

**Introduction and Background**

 The clinical and translational research community has laid the ground work for a data system that can potentially address the need for better CER tools via its broad adoption of “Integrating Informatics from Biology to the Bedside (i2b2)”, however, critical analytic functionality is still needed before i2b2 can easily be used for CER. We have developed a new i2b2 Cell, the Health Outcome Monitoring and Evaluation (HOME) Cell. The HOME Cell allows i2b2 users to model virtually any exposure (including therapeutic interventions such as medications or tests) in i2b2 against any outcome accounting for complex temporal relationships and other factors.   In this presentation, we will describe our national collaboration that seeks to use i2b2 and the HOME Cell for rapid, distributed comparative effectiveness research (CER).

**Methods:**

 CTSA site participants for this project include: Boston University, University of Massachusetts, University of Cincinnati, University of Alabama at Birmingham, and the University of Washington. The HOME Cell uses a highly portable XML-based configuration file to share complex query logic between i2b2 installations.  In this way CER queries can be developed in one location and easily shared with other sites. Health outcome data (in aggregate format) can be generated for large numbers of patients by moving query logic rather than actual patient data between institutions.   The target research foci for the project are primarily focused on the assessment of age-, race-, and location-based differences in blood pressure control, lipid control, and diabetes control for groups of patients on similar classes of medications.

**Results:**

 The HOME Cell has been successfully installed at all participating sites and new functionality has been added to the cell to support the modeling of medication exposure over time using start- and end-dates. In addition, a common initial set of queries have been developed and distributed and a second set are under development. For this presentation, we will: 1) describe our experience within the collaboration; 2) present results of distributed queries performed during the project in all three focus areas; and 3) present a plan for further development and distribution of the HOME Cell.

**Discussion:**

 Our project addresses multiple national priorities related to data sharing, clinical research informatics, and comparative effectiveness. The HOME Cell is a novel, shared resource for use within the CTSA/NCATS community. Our approach provides a new way to perform large-scale collaborative research without the need to actually move patient-level data and has demonstrated that CER, health services research, and quality measurement can share a common framework. We believe our approach has great promise for supporting the re-use of clinical data for rapid, transparent, health outcome assessments on a national scale.