An Introduction to Clinical Informatics: Data Acquisition, Analyses, and Applications

Wednesday, February 17, 2016
Tuesday, March 1, 2016
Thursday, March 17, 2016
Wednesday, March 30, 2016

Hanes Classroom G28
Ground floor, Hanes building
The healthcare industry is in the early stages of a massive explosion of digital information. Spurred by incentives in the Affordable Care Act, the use of electronic health records (EHRs) has increased from 10 percent of U.S. medical practices in 2008 to 70 percent in 2014. Between the EHR and other ancillary systems, large hospitals like Wake Forest Baptist Medical Center generate 10 million digital transactions per day, which is twice the rate of the NASDAQ stock exchange. In addition to EHRs, data is becoming increasingly available for healthcare from a wide variety of sources: social media, genetic data, claims data, census data, medical devices, surveys, and patient reported outcomes. Clinicians and medical researchers are expected to synthesize and act upon this data while continuously improving clinical outcomes. Healthcare has truly entered an era of “Big Data,” defined by Gartner Consulting as “high-volume, high-velocity, and/or high-variety information assets that require new forms of processing to enable enhanced decision-making, insight discovery, and process optimization.” Clinicians are increasingly aided by computerized machines that help to process these data, suggest courses of action, and alert healthcare workers to potential problems. However, the design of the human-computer interface is paramount and workflows must be developed to accommodate these smart machines.

Clinical Informatics is a field that has arisen out of a demand for expertise in mechanisms to collect, process, and analyze these copious health-related data. Informaticians study medical decision-making, create risk prediction models, build clinical decision support tools, and aid in the implementation of these tools into the clinical workflow. Ultimately, the goal of an informatician is to help physicians and patients make better medical decisions that lead to improved human health.

**Course Overview**

This course will introduce participants to the core content of clinical informatics and encourage ongoing learning in this rapidly evolving field. Content will include the flow of data and information within the health system, ethical issues in EHR research, clinical data standards, decision science, statistical methodology used for analyzing EHR data, and risk prediction models. The course will be led by Brian Wells, a board certified clinical informatician, and will include lectures and discussions from other professionals actively involved in clinical informatics-related work at Wake Forest.

Participants will receive a free copy of Robert Wachter’s book *The Digital Doctor: Hope, Hype, and Harm at the Dawn of Medicine’s Computer Age* and are encouraged to the read the book to generate class discussions around important clinical informatics-related issues.

**Target Audience**

This course is designed for both clinical and non-clinical researchers who are interested in an introductory overview of clinical informatics. It is anticipated that most participants will be in the early stages of their careers, but researchers of all skill levels are welcome to enroll. Participants do not need to have a strong background in computer science or information technology.

**Attendance Limits**

Course is limited to 15 participants. Priority will be given to those who can commit to attend all four sessions.

**Registration**

Registration is required by January 24, 2016. To register, please complete the online registration form.
Wednesday, February 17

1:00 - 2:00pm    The Discipline of Informatics
Brian Wells, MD, PhD, Associate Program Leader, CTSI Biomedical Informatics Program

- Delineate the four key components that define biomedical informatics-related research: data, decisions, health, and implementation.
- Identify at least two organizations and/or journals that promote or fund clinical informatics research.
- Discuss the drivers that are shaping and advancing the growth of big data analytics.
- Recognize the implications, challenges, and opportunities for clinical informatics.

2:00 - 3:00pm    Decision Science
Brian Wells, MD, PhD, Associate Program Leader, CTSI Biomedical Informatics Program

- Recognize the two distinct types of research in Healthcare Decision Science.
- Explain the key concepts in cost effectiveness analysis.
- Differentiate the perspectives of policymakers, patients/consumers, payers, and providers as they influence medical decision-making.

3:00 - 4:00pm    Ethical Issues in EHR Research
Brian Moore, Associate Director, Institutional Review Board

- Summarize the importance of protecting privacy and confidentiality of study participants and ways to maximize protections.
- Describe approaches for re-identification of participants in a study.
- Develop a plan for using the EHR for participant recruitment.
- Recognize the possibility of data manipulations and possible Type I errors in studies using EHR data.

4:00 - 5:00pm    Open Discussion

Tuesday, March 1

1:00 - 2:00pm    Standardization and Ontologies
Michael Horvath, Programmer/Analyst, Clinical and Translational Science Institute

- Discuss how the use of standards enhances communication among researchers.
- Describe the most common standards in clinical data: medications, clinical and laboratory procedures, and diagnoses.
- Discuss common tools and methods for mapping among standards, including their limitations.

2:00 - 3:00pm    Clinical Data Standards
Brian Wells, MD, PhD, Associate Program Leader, CTSI Biomedical Informatics Program

- Recognize the importance of and appreciate the barriers to universal standards in health care.
- Distinguish between the “legal medical record” and the federal designation of “certified EHRs.”
- Discuss clinical data standards within the context of clinical documentation.

3:00 - 4:00pm    The Flow of Data, Information and Knowledge within the Health System
Ajay Dharod, MD, Coordinator of Medical Informatics, Department of Internal Medicine

- Sketch a workflow diagram of a physician clinical workflow.
- Understand the key components of the flow of data, information and knowledge within the health system.
- Recognize current challenges and workflow limitations within the health system.

4:00 - 5:00pm    Open Discussion

Lunch will be provided at 12:30pm before the start of each session.
Thursday, March 17

1:00 - 2:00pm **The Nature and Cognitive Aspects of Human Decision-Making**
*Matthew Corriere, MD, MS, Director of Clinical Research, Department of Vascular Surgery*
- Describe the process that individuals use to evaluate alternative options and choose between them.
- Characterize barriers to shared decision-making in health care.
- Review methods that can be used to elicit stakeholder preferences and understand their value systems.
- Discuss applications of preference elicitation to shared decision-making and product design.

2:00 - 3:00pm **Application of Clinical Decision Support**
*Martin Sizemore, Associate Vice President, Chief Data Officer, Enterprise Information Management*
- Examine the shift from a traditional business intelligence approach to a “data conversation” for clinical decision support.
- Identify the methods for integrating structured, unstructured or semi-structured data into clinical decision processes.
- Discuss the impact of cloud and hybrid cloud technologies on the process for clinical informatics, including the potential for “Internet of Things” applications.

3:00 - 4:00pm **Mobile Health**
*David Miller, MD, MS, Director of Research, Internal Medicine Residency Program*
- Describe the demographics of mobile technology use in America.
- Define mobile health.
- Critically evaluate the impact of mobile health interventions on health outcomes.
- Explain how mobile health interventions could positively or negatively impact health disparities.

4:00 - 5:00pm **Open Discussion**

Wednesday, March 30

1:00 - 2:00pm **Statistical Methodology Used for Analyzing EHR Data**
*Brian Wells, MD, PhD, Associate Program Leader, CTSI Biomedical Informatics Program*
- Determine reasons and frequency of missing data and how imputation can be used to address it.
- Differentiate the strengths and weaknesses of Case Control Studies and Cohort Studies in regards to the secondary analysis of EHR data.
- Describe the relevant outside data sources that can be integrated with EHR data.

2:00 - 3:00pm **Risk Prediction Models**
*Brian Wells, MD, PhD, Associate Program Leader, CTSI Biomedical Informatics Program*
- Differentiate among calibration, discrimination, and reclassification when determining the prediction accuracy of a risk equation.
- Compare and contrast internal and external validation.
- Describe how to apply resampling techniques for internal validation.
- Explain the difference between a prediction and causal inference.
- Explain how the evaluation of a predictor variable in isolation can lead to misleading conclusions about the variable’s importance in patient risk stratification.

3:00 - 4:00pm **Demonstration of Data Extraction, Cleaning and Analyses**

4:00 - 5:00pm **Open Discussion**