CS 6440 – Intro to Health Informatics Course Syllabus

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Lesson 0: Introduction and Orientation

This lesson briefly introduces and sets the arc of the course. Mark will introduce himself and the impetus for the existence of this course, as well as explain that the lectures provide a fairly detailed overview of the material but the text fills in many details Also supplementary material that will be useful is mentioned throughout along with where to find it. An outline of the story of Marla with Chronic Disease will also be introduced. Marla's story and her electronic record will be used to emphasize the key problems in healthcare and the role health IT can play in solving them.

Lesson 1: US Healthcare System

This lesson will discuss unique and the complex nature of the US healthcare system: its key problems, the specific challenges presented by chronic disease, the major disconnect between the health system's capabilities and the demands of chronic disease management, and the hope that a combination of new incentives, HIT adoption, and new models of care can bridge this disconnect leading to a more efficient, effective, safer and more patient-centered US system of care. We will use Marla's to better explain the problems and potential solutions from a typical patient's perspective.

Lesson 2: Federal Policies and Initiatives

This lesson will build on the healthcare delivery system disconnects and challenges introduced in Lesson 1 and the potential role of health IT in addressing them. Students will be introduced to the role that can be played by financial incentives that reward performance, rather than the quantity of procedures. We will then focus on the important details of the specific programs that the federal government has put into place to spur health IT adoption by eligible providers and hospitals.

Lesson 3: Health Information Exchange (HIE)

In this lesson students will learn the rationale for and the major challenges of health information exchange. We will discuss the various ways of classifying HIE, how to differentiate the various HIE architectures, and the Indiana Health Information Exchange as a premier example including descriptions of its key services. We will discuss new approaches and technologies with a particular emphasis on Direct HIE based on secure email and encrypted attachments. Marla is referred to a specialist and her doctor uses the Direct approach to HIE to send her summary record to her.

Lesson 4: Privacy, Security, and Trust

This lesson focuses on the keys issues of privacy, security, and trust in a world of digital records and health information exchange. Students will understand the key role that patient engagement plays in chronic disease prevention and management and the concerns patients have about sharing their health data. They will also explore the various privacy consent models. Data segmentation will be discussed as a key challenge for obtaining patient consent under what may be the most acceptable model. The concept of public key infrastructure (PKI) including the roles of the public key, private key, registration authority and certificate authority will be covered. Students will be able to differentiate between the use of PKI for securing data and for establishing trust.

Lesson 5A: Data Standards

We divide the discussion of standards into those for health data and those for achieving its sharing by fostering interoperability. This lesson focuses on data standards after reviewing the rationale for standards and the evolutions that have been taking place in their use, technology and structure. Students will be able to recognize the difference between classifications and ontologies. They will be familiar with the key data standards including ICD, CPT, LOINC and SNOMED. They will also gain an overview of the differences between EDI/X12 and XML.

Lesson 5B: Interoperability Standards

This lesson builds on Lesson 5A on data standards to show how they are transmitted within messages using HL7 and packaged into CCDA based clinical documents for sharing via HIE. We'll briefly introduce even more advanced standards with a particular emphasis on the rationale for clinical decision support (an important technology for Meaningful Use 3) and the key elements of and remaining challenges with the Arden Syntax to support CDS. We'll also discuss more facile next generation approaches including FHIR. We'll end by going with Marla to her diabetes doctor and see how he uses data and interoperability standards to send her record to a specialist.

Lesson 6: Clinical Data Collection and Visualization Challenges

Students should understand the key roles that data plays in medical practice and the root causes of common data quality issues in general and the specific root causes of data quality issues with respect to electronic health records. They should understand the high level challenges of efficiently and accurately collecting high quality, comprehensive clinical data from physicians and of visualizing EHR data in a way that supports the provider's mental model. They should understand the key roles that information technology plays in the IOM's future vision of healthcare. We end by introducing the team project: design and implementation of a novel visualization approach for Marla's CCD to support a physician caring for her.

Lesson 7: Empowering the Patient

Students should understand the key role that support for patients can play so they can achieve behavior change, adhere to their prescribed treatments and generate data to help their providers more continuously manage their chronic diseases. They should understand patient interests. They should understand the key information technology tools now available to patients including patient health records, portals, social networking, in home technologies and mobile devices and sensors. They should have a detailed functional understanding of personal health records and their potential as app platforms. They should understand the potential role of social networking in patient education and care management. They should understand the various telemedicine modalities being developed and offered for use by patients at home.

Lesson 8: Population Health Management

Students should understand the difference between individual patient management, population management and public health. They should understand the technologies for aggregating data, the kinds of data that are collected and the kinds of reports that are required for population and public health management.

Lesson 9: Data Query in a Federated Environment

Students should understand the challenges of data query and aggregation in an environment where care providers are using disparate and non-interoperable EHRs. They should be familiar with and understand the differences among the distributed query technologies. They should be familiar with the distributed query standards and the various open source query frameworks reviewed in this lesson.

Lesson 10: Big Data Meets Healthcare

Students should understand the concept of "big data"; the common technical approaches to modeling and simulation and the common applications of each. They should be familiar with the specific case studies of analytic applications to healthcare problems as diverse as improved clinical decision support, understanding clinical processes, modeling care spaces and providing optimal patient-specific treatments.