

BMI 720

Introduction to Clinical Informatics

Spring 2015

This course provides a detailed overview of clinical informatics for professionals who will work at the interface of clinical care, information technology, and the healthcare system. Students will learn how to analyze, design, implement, and evaluate information and communication technologies found in hospitals, physician offices, and other healthcare settings including the home. Emphasis will be placed on the evolution of the electronic health record and its use to promote patient care that is safe, efficient, effective, timely, patient-centered and equitable. Students will also study implementation failures and unintended consequences of systems. The course will cover the fundamental concepts in clinical informatics such as evidence-based care and clinical workflow analysis. Students will not only study health information systems but have assignments to evaluate some real-life systems at local hospitals. Through case-based analysis, students analyze the life-cycle management of complex clinical computing systems. This course is geared towards physicians seeking postgraduate training.

Course Meetings

Weekly on Thursday afternoons, starting at 2pm.
Seminar/Didactics occur from 2-4pm, with time for either group projects or student-led seminars from 4-5pm.

Location

Countway Library, Room 424, within the Department of Biomedical Informatics at Harvard Medical School.

Directors

Charles Safran
csafran@bidmc.harvard.edu

Bradley Crotty
bcrotty@mail.harvard.edu

Course Schedule

		2pm	3pm	4pm
Week	Date	Session 1 (50 mins 10 min break)	Session 2 (50 mins 10 min break)	Student Teaching
1	29-Jan-15	Course Introduction - Crotty	Clinical Informatics as a subspecialty - Safran	Midterm Project assignments
2	5-Feb-15	Emergency Room Systems Larry Nathanson	Anesthesia Information Systems - David Feinstein	Case Study
3	12-Feb-15	Pathology Informatics and Information Systems - Ramy Aranout	Hospital Information Systems - Safran	HL7
4	19-Feb-15	Electronic health records - Henry Feldman	Patient Portals Crotty	HIMSS tools for analysing EHRs
5	26-Feb-15	Regulation and Certification Meghan Dierks	Quality and Safety Ken Sands	Meaningful Use
6	5-Mar-15	CIO perspective	Privacy and Regulatory Environment - Norma Chitvanni	HIPAA/IRB
7	12-Mar-15	Order Entry Systems - Jonathan Teich	Decision Support - Jonathan Teich	Midterm Project Presentations
8	19-Mar-15	Spring Recess		
9	26-Mar-15	Cybermedicine - Warner Slack	eHealth and eLearning - Yuri Quintana	Case Study
10	2-Apr-15	Data Warehousing - Shawn Murphy	Unintended consequences Adam Wright	FHIR
11	9-Apr-15	Governance - Crotty	Reuse of Clinical Data - Safran	SMART
12	16-Apr-15	Health Information Exchange - John Halamka	Data and Network Operations & Security	CDA/CCDA/CCR
13	23-Apr-15	Telemedicine - Joe Kevadar	Strategic use of HIT - Kevin Tabb	Group Time End of Term Project
14	30-Apr-15	Industry perspective & Careers in informatics		
15	7-May-15	End of Term presentations		Wrap up

Course Website

Schedules, announcements, readings, and assignments are to be found on the course website: <http://mycourses.med.harvard.edu> (direct URL: <https://v2mycourses.med.harvard.edu/Course/Overview/BMI720.0/86840>)

Weekly Themes and Learning Content

1. Introduction 1/29/2015

- 1.1. Definitions of informatics
- 1.2. History of Informatics
- 1.3. Key concepts, models, and theories

Gardner, R. M., et al. (2009). "Core content for the subspecialty of clinical informatics." J Am Med Inform Assoc **16**(2): 153-157. PMID: 19074296

Bleich, H. L., et al. (1985). "Clinical computing in a teaching hospital." N Engl J Med **312**(12): 756-764. PMID: 3838364

Slack, W. V. (1997). "Claude Shannon and communication theory." MD Comput **14**(4): 262-264. PMID: 9230586

For those unfamiliar with US-based health system operations

Chapter 1 in Wager, K. A., et al. (2013). Health care information systems : a practical approach for health care management. San Francisco, Jossey-Bass.

2. Departmental Information Systems 2/5/2015

- 2.1. Health Information Systems and Applications
- 2.2. Needs Analysis
- 2.3. System Implementation, Maintenance, and Evaluation

Chapter 3 in Pantanowitz, L., et al. (2012). Pathology informatics : theory & practice. Chicago, Ill., American Society for Clinical Pathology Press.

3. The Hospital Information System 2/12/2015

- 3.1. Principles of Information Technology Systems
- 3.2. Architecture of Systems
- 3.3. Clinical Data standards
- 3.4. Flow of data, information, and knowledge within the health system
- 3.5. Lifecycle management

Chapters 5 and 7 in Pantanowitz, L., et al. (2012). Pathology informatics : theory & practice. Chicago, Ill., American Society for Clinical Pathology Press.

Chapter 9 in Wager, K. A., et al. (2013). Health care information systems : a practical approach for health care management. San Francisco, Jossey-Bass.

HBS Case Study: BIDMC Information Systems (on MyCourses)

4. Electronic Health Records for Clinicians and Patients 2/19/2015

- 4.1. EHR as foundational tools
- 4.2. Human factors engineering, interface design, and usability
- 4.3. Effective communication for teams

Reading:

Chapter 14 in Pantanowitz, L., et al. (2012). Pathology informatics : theory & practice. Chicago, Ill., American Society for Clinical Pathology Press.

Chapter 3 in Wager, K. A., et al. (2013). Health care information systems : a practical approach for health care management. San Francisco, Jossey-Bass.

Slack, W. V. (2004). "A 67-year-old man who e-mails his physician." JAMA **292**(18): 2255-2261. PMID: 15536113

Walker, J., et al. (2014). "The road toward fully transparent medical records." N Engl J Med **370**(1): 6-8. PMID: 24304001

Optional:

Goldzweig, C. L., et al. (2013). "Electronic patient portals: evidence on health outcomes, satisfaction, efficiency, and attitudes: a systematic review." Ann Intern Med **159**(10): 677-687. PMID: 24247673

5. Safety and Quality Assurance 2/26/2015

- 5.1. Regulations governing Health IT
- 5.2. IOM Quality Components
- 5.3. Evidence-based patient care
- 5.4. Clinical workflow evaluation, process redesign, and quality improvement

Reading:

Chapter 19 in Pantanowitz, L., et al. (2012). Pathology informatics : theory & practice. Chicago, Ill., American Society for Clinical Pathology Press.

6. Leadership 3/5/2015

- 6.1. Leading and managing change
- 6.2. leadership models, processes, and practices
- 6.3. Strategic planning for Clinical Information Systems
- 6.4. Policy and regulatory framework
- 6.5. Privacy regulations

Chapters 10 & 11 in Wager, K. A., et al. (2013). Health care information systems : a practical approach for health care management. San Francisco, Jossey-Bass.

7. Computerized Order Entry and Decision Support 3/12/2015

- 7.1. Evidence based medicine
- 7.2. Process engineering
- 7.3. Knowledge Lifecycles
- 7.4. Decision science

Reading:

Bates, D. W., et al. (1998). "Effect of computerized physician order entry and a team intervention on prevention of serious medication errors." JAMA **280**(15): 1311-1316. PMID: 9794308

Bates, D. W., et al. (1999). "The impact of computerized physician order entry on medication error prevention." J Am Med Inform Assoc **6**(4): 313-321. PMID: 10428004

Schiff, G. D., et al. (2015). "Computerised physician order entry-related medication errors: analysis of reported errors and vulnerability testing of current systems." BMJ Qual Saf. PMID: 25595599

8. No Class 3/19/2015 - Spring Recess

9. e for Engagement 3/26/2015

- 9.1. Determinants of individual and population health
- 9.2. Forces shaping healthcare delivery
- 9.3. Effective teams and communication

Slack WV. (2000) "Patient-Computer Dialogue: A Review." Yearbook of Medical Informatics.

Quintana, Y., et al. (2003). "Cure4Kids - building online learning and collaboration networks." AMIA Annu Symp Proc: 978. PMID: 14728482

Optional:

Johnson, Jimison, Mandl. Consumer Health Informatics and Personal Health Records (CH 17) in Shortliffe, E. H. and J. J. Cimino (2006). Biomedical informatics : computer applications in health care and biomedicine. New York, NY, Springer.

10. Data Management 4/2/2015

- 10.1.Data integrity, mapping, and manipulation
- 10.2.Data warehousing
- 10.3.Data mining and knowledge discovery

Chapter 3 in Pantanowitz, L., et al. (2012). Pathology informatics : theory & practice. Chicago, Ill., American Society for Clinical Pathology Press.

Safran, C., et al. (1989). "ClinQuery: a system for online searching of data in a teaching hospital." Ann Intern Med **111**(9): 751-756. PMID: 2802433

11. Governance of Clinical Data 4/9/2015

- 11.1.Leadership Models, Processes, and Practices
- 11.2.Decision-Making
- 11.3.Interdisciplinary teams

Chapter 13 in Wager, K. A., et al. (2013). Health care information systems : a practical approach for health care management. San Francisco, Jossey-Bass.

Safran, C., et al. (2007). "Toward a national framework for the secondary use of health data: an American Medical Informatics Association White Paper." J Am Med Inform Assoc **14**(1): 1-9. PMID: 17077452

12. Health Information Exchange and Networking 4/16/2015

- 12.1.Networks
- 12.2.Technical approaches to enable sharing
- 12.3.Clinical data standards, and interoperability standards

Chapters 4 & 8 in Pantanowitz, L., et al. (2012). Pathology informatics : theory & practice. Chicago, Ill., American Society for Clinical Pathology Press.

13. Telemedicine and Strategic Use of Health Information Technology 4/23/2015

- 13.1.Principles of telemedicine
- 13.2.Health economics and financing

Chapter 12 in Wager, K. A., et al. (2013). Health care information systems : a

practical approach for health care management. San Francisco, Jossey-Bass.

14. Industry Perspectives and Careers in Informatics 4/30/2015

14.1. Career opportunities in clinical informatics

Reading:

Chapter 11 in Wager, K. A., et al. (2013). Health care information systems : a practical approach for health care management. San Francisco, Jossey-Bass.

End of term presentations take place on 5/7/2015

Assignments

Seminars

Students are to take one of seven informatics topics and lead a teaching session during the 4pm hour for your peers. Sign up by the end of the first class. Topics are:

- HL7, including principles of standards, structure, and usage
- HIMSS tool for analyzing EHRs
- HIPAA/IRB, including what protections, policies, and procedures must be undertaken to protect patient data
- Meaningful Use, including goals, components, criteria, certification, attestation, and outcomes of the program
- CDA/CCDA/CCR - principles of clinical document architecture for transmitting data
- FHIR - describe draft standard put forth by HL7 group, including structure, use, and problems
- SMART - substitutable apps in healthcare.

Midterm Project

Your assignment is to divide into teams of 2-3 each and choose a hospital information system (not your own) to do an evaluation of strengths and weaknesses of one component. Examples would be to choose an evaluation of order entry, e-prescribing, or results management (among other possibilities). Teams are encouraged to be formal in their assessment, and use available tools and metrics.

Final Project

Design a healthcare innovation or intervention that:

1. Addresses a significant problem
2. Improves cost/quality/access
3. Is sustainable after a period of time

The class should divide into 3-4 teams.

You will have 30 min to present your project on May 7th. You will also have 10 min to answer questions. Your peers will score your project as well as the course faculty.

Your team must also produce a 15-20 page report of your project and submit it with your slide set May 11th. This report should be in the form of a business plan.

An example of an innovation could be a mobile app to improve care coordination for frail elders or medication adherence for children with asthma.

Your work should draw upon the themes in the course and reading material provided by faculty. You may choose to use other sources (e.g., interviews) if helpful. A working prototype or demonstration environment is encouraged.

The team idea for a project should be discussed with either Dr. Crotty or Dr. Safran by the class of March 12th.

Grading

Evaluation is pass/fail, and based upon class discussions and participation, group work, and seminars.

Academic Honesty

Work submitted by students must be original, and students are expected to follow the standards of academic honesty as found in section 4.09 of the Student Handbook (<http://hms.harvard.edu/content/409-academic-dishonesty-and-plagiarism>).