Introduction to Biomedical and Health Informatics for OHSU Summer College Interns

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References


Bernstam, E., Hersh, W., et al. (2009). Synergies and distinctions between computational disciplines in biomedical research: perspective from the Clinical and Translational Science Award programs. Academic Medicine, 84: 964-970.


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Goals for talk

• Welcome new summer interns
• Introduce you to field of biomedical and health informatics broadly
• Introduce you to myself and my work
• Highlight the big-picture issues that motivates the field and drives its work
• Describe the educational opportunities in the field
Outline of talk

• Information-related problems and solutions in healthcare
• What is biomedical and health informatics?
• Why do we need more informatics?
• Why are we not there?
• Details of ARRA programs
• The workforce need for informatics
• Educational and career opportunities in informatics

Many problems in healthcare have information-related solutions

• Quality – not as good as it could be (McGlynn, 2003; Schoen, 2009; NCQA, 2010)
• Safety – errors cause morbidity and mortality; many preventable (Kohn, 2000; Classen, 2011; van den Bos, 2011)
• Cost – rising costs not sustainable; US spends more but gets less (Angrisano, 2007)
• Inaccessible information – missing information frequent in primary care (Smith, 2005)
Growing evidence that information interventions are part of solution

- Systematic reviews (Chaudhry, 2006; Goldzweig, 2009; Buntin, 2011) have identified benefits in a variety of areas
  - Although 18-25% of studies come from a small number of ‘health IT leader” institutions

Biomedical and health informatics underlies the solutions

- *Biomedical and health informatics* (BMHI) is the science of using data and information, often aided by technology, to improve individual health, health care, public health, and biomedical research (Hersh, 2009)
  - It is about information, not technology
  - [http://www.billhersh.info/whatis](http://www.billhersh.info/whatis)
- Practitioners are BMHI are usually called *informaticians* (sometimes *informaticists*)
BMHI has many sub-areas

Informatics = People + Information + Technology

Informatics before the Obama era

- Growing recognition of value in healthcare
  - Evidence for improved safety, quality, and cost of healthcare
  - Widespread usage worldwide (Schoen, 2009; Protti, 2010)
  - Research and demonstration funding by NLM, AHRQ, and others
  - Actions of Bush Administration – e.g., appointment of first National Coordinator for HIT, establishment of AHIC, HITSP, etc.
- Emerging importance in other areas
  - Clinical and translational research – prominent role in CTSA programs (Bernstam, 2009; Richesson, 2012)
  - Genomics – bioinformatics, personalized medicine (Hamburg, 2010)
  - Consumer health – growth of personal health records (PHRs) (Detmer, 2008; Miller, 2009), including from companies, e.g., Microsoft HealthVault
Then a new US president came along...

“To lower health care cost, cut medical errors, and improve care, we’ll computerize the nation’s health records in five years, saving billions of dollars in health care costs and countless lives.”

First Weekly Address
Saturday, January 24, 2009

...and we entered a new “ARRA”

• Health Information Technology for Economic and Clinical Health (HITECH) Act of the American Recovery and Reinvestment Act (ARRA)
  – Incentives for electronic health record (EHR) adoption by physicians and hospitals (up to $27B)
  – Direct grants administered by federal agencies ($2B)
• Other provisions in other areas of ARRA, e.g.,
  – Comparative effectiveness research
  – NIH and other research funding
  – Broadband and other infrastructure funding
Why has it been so difficult to get there? (Hersh, 2004)

- Cost
- Technical challenges
- Interoperability
- Privacy and confidentiality
- Workforce

US has low rates of adoption in inpatient and outpatient settings

- Adoption in the US is low for both outpatient (Hsiao, 2011) and inpatient settings (DesRoches, 2012) though improving
- By most measures, US is a laggard and could learn from other countries (Schoen, 2009)
- Most other developed countries have undertaken ambitious efforts, e.g.,
  - Denmark (Prorti, 2010)
  - England (Payne, 2011)

(Hsiao, 2011)

(Schoen, 2009)
The new “ARRA” of health information technology (HIT) in the US

- HITECH provides financial incentives for “meaningful use” (MU) of HIT
  - Inspired by Stark (2011); operationalized by Blumenthal (2011)
  - All initiatives administered by the Office of the National Coordinator for Health IT (ONC, http://healthit.hhs.gov/)
- MU is driven by five goals for the US healthcare system
  - Improving quality, safety and efficiency
  - Engaging patients in their care
  - Increasing coordination of care
  - Improving the health status of the population
  - Ensuring privacy and security

MU to be implemented in three stages
Implementation of MU

- Implemented through Medicare or Medicaid reimbursement to
  - Eligible professionals (EPs)
    - $44-63K (differs based on Medicare vs. Medicaid)
    - Must achieve 15 core and 5 of 10 menu objectives (one in public health)
  - Eligible hospitals (EHs)
    - $2-9M (based on size as measured by number of discharges)
    - Must achieve 14 core and 5 of 10 menu objectives (one in public health)

Stage 1 core criteria (14 EH, 15 EP)
Stage 1 menu criteria (5 of 10)

Quality measures – differ for EP and EH but required for both

- EP (outpatient) – three required or alternate measures plus three of 13 others, e.g.,
  - Hypertension – blood pressure measurement
  - Tobacco use assessment and cessation intervention
  - Adult weight screening and follow-up
- EH (inpatient) – 15 required measures, e.g.,
  - Diabetes: Hemoglobin A1c, low-density lipoprotein, and blood pressure control
  - Influenza immunization for patients > 50 years old
  - Pneumonia vaccination status for older adults
  - Breast cancer screening
  - Colorectal cancer screening
MU is just one of several challenges

http://www.aha.org/advocacy-issues/hit/mu/overvw-time.shtml

Other HITECH funding initiatives

- HIT Regional Extension Centers (RECs)
  - $677 million to fund 62 RECs that will provide guidance, mainly to small primary care practices, in achieving meaningful use (Maxson, 2010), e.g., in Oregon: OHITEC
- State-based health information exchange (HIE)
  - $547 million in grants to states to develop HIE programs (Kuperman, 2011)
- Beacon communities
  - $250 million to fund 17 communities that provide exemplary demonstration of the meaningful use of EHRs (McKethan, 2011)
- Strategic health information advanced research projects (SHARP)
  - $60 million for four collaborative research centers
ONC Workforce Development Program

Based on estimated need for 51,000 professionals in 12 workforce roles

- Nine universities funded, with emphasis on short-term training using distance learning
- OHSU funded to enroll trainees in existing programs
- Five universities funded to develop curricula for community college programs
- OHSU funded to develop curricula and to serve as National Training & Dissemination Center (NTDC)
- Curriculum available at www.onc-ntdc.info

ONC workforce roles to implement the HITECH agenda

- Mobile Adoption Support Roles
  - Implementation support specialist*
  - Practice workflow and information management redesign specialist*
  - Clinician consultant*
  - Implementation manager*
- Permanent Staff of Health Care Delivery and Public Health Sites
  - Technical/software support staff*
  - Trainer*
  - Clinician/public health leader†
  - Health information management and exchange specialist†
  - Health information privacy and security specialist†
- Health Care and Public Health Informaticians
  - Research and development scientist†
  - Programmers and software engineer†
  - Health IT sub-specialist†

(being trained in *community colleges and † universities)
What competencies must informaticians have? (Hersh, 2009)

**Health and biological sciences:**
- Medicine, nursing, etc.
- Public health
- Biology

**Computational and mathematical sciences:**
- Computer science
- Information technology
- Statistics

**Management and social sciences:**
- Business administration
- Human resources
- Organizational behavior

Competencies required in Biomedical and Health Informatics

Opportunities for career development and study in BMHI

- Formal certification in various disciplines
  - Baccalaureate certification in nursing informatics for many years
  - Long-standing certification in HIM, e.g., CCS, RHIT, RHIA
  - New subspecialty for physicians recently approved (Shortliffe, 2011)
- Educational programs at growing number of institutions
  - [http://www.amia.org/informatics-academic-training-programs](http://www.amia.org/informatics-academic-training-programs)
- OHSU program one of largest and well-established (Hersh, 2007)
  - Graduate level programs at Certificate, Master’s, and PhD levels
  - “Building block” approach allows courses to be carried forward to higher levels
Career pathways have diverse inputs and outputs (Hersh, 2009)

Health care professions, e.g., medicine, nursing, etc.
Natural and life sciences, e.g., biology, genetics, etc.
Computer science (CS), IT, and undergrad informatics
Health information management (HIM)
Others, e.g., business, library and info. science

Biomedical and health informatics education (usually graduate level)

There is no single career pathway!

Jobs in:
- Health care systems
- Clinical leadership
- IT leadership
- Biomedical research
- Industry
- Academia

Experience of the OHSU program (http://www.ohsu.edu/informatics/)

- Graduate level programs at Certificate, Master’s, and PhD levels
  - “Building block” approach allows courses to be carried forward to higher levels
- Two “populations” of students
  - “First-career” students more likely to be full-time, on-campus, and from variety of backgrounds
  - “Career-changing” students likely to be part-time, distance, mostly (though not exclusively) from healthcare professions
- Many of latter group prefer “a la carte” learning
  - This has led to the successful 10x10 (“ten by ten”) program that began as OHSU-AMIA partnership (Hersh, 2007; Feldman, 2008)
    - Overview and access to demo: http://www.billhersh.info/10x10.html
  - Significant minority of these adult learners do not complete a program but still use knowledge and skills gained
Overview of OHSU graduate programs

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<thead>
<tr>
<th>Masters</th>
<th>PhD</th>
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<tr>
<td>- Tracks:</td>
<td>- Knowledge Base</td>
</tr>
<tr>
<td>- Clinical Informatics</td>
<td>- Advanced Research Methods</td>
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<tr>
<td>- Bioinformatics</td>
<td>- Biostatistics</td>
</tr>
<tr>
<td>- Thesis or Capstone</td>
<td>- Cognate</td>
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<tr>
<td>Graduate Certificate</td>
<td>- Advanced Topics</td>
</tr>
<tr>
<td>- Tracks:</td>
<td>- Doctoral Symposium</td>
</tr>
<tr>
<td>- Clinical Informatics</td>
<td>- Mentored Teaching</td>
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<tr>
<td>- Health Information Management</td>
<td>- Dissertation</td>
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10x10
- Or introductory course

Opportunities in BMHI are not limited to healthcare

- Bioinformatics – genomics and personalized medicine (Sarkar, 2011; Fernald, 2011)
- Clinical and translational research – building a “learning” healthcare system (Friedman, 2010; Richesson, 2012)
- Public health – protecting the public and promoting health (Araujo, 2009)
- Consumer health – for all ages, especially aging Internet-savvy baby boomers (Detmer, 2008; Gibbons, 2009)
- Imaging informatics – use of images for biomedical research, clinical care, etc. (Bui, 2008)
My own research

• Information Retrieval (aka, Search)
  – Access to online information, from journals, Web sites, images, etc. to medical records with major effort now focused on latter
    • TREC Medical Records Track (Voorhees, 2011) – part of larger interest in “secondary use” of clinical data (Safran, 2007)
  – Hosting ACM SIGIR 2012 conference this summer
    • http://sigir.org/sigir2012/

Conclusions

• BMHI is an important science and profession for improving health, healthcare, public health, and biomedical research with data and information
  – Most resources in clinical informatics but plenty of other opportunity in bioinformatics, public health informatics, consumer health informatics, clinical research informatics, imaging informatics, etc.

• The grand experiment of HITECH is going on in the US – results not yet in

• There are many opportunities for practitioners, researchers, and others in BMHI
For more information

- Bill Hersh
  - http://www.billhersh.info
- Informatics Professor blog
  - http://informaticsprofessor.blogspot.com
- OHSU Department of Medical Informatics & Clinical Epidemiology (DMICE)
  - http://www.ohsu.edu/informatics
  - http://www.youtube.com/watch?v=T-74duDDvwU
  - http://www.informatics-scholarship.info
  - http://ioninformatics.com
- What is Biomedical and Health Informatics?
  - http://www.billhersh.info/whatis
- Office of the National Coordinator for Health IT (ONC)
  - http://healthit.hhs.gov
- American Medical Informatics Association (AMIA)
  - http://www.amia.org
- National Library of Medicine (NLM)