CLINICAL INFORMATICS: AN ESSENTIAL COMPETENCY FOR 21ST CENTURY HEALTHCARE

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Dr. Hersh has won numerous awards for his educational innovations. These include the OHSU Faculty Senate Distinguished Faculty Award for outstanding teaching in 2007 and the 2008 AMIA Donald A.B. Lindberg Award for Innovation in Informatics. Dr. Hersh was also listed among the Top 25 Clinical Informaticists by Modern Healthcare Magazine in 2010, 2011, and 2012. He was also awarded the HIMSS Physician IT Leadership Award in 2014.

Dr. Hersh has also made many contributions in research. His most recent work has focused on the quantity and characteristics of the workforce needed to implement health information technology, especially in clinical settings. His research originally focused in the area of information retrieval (also known as search), where he has authored over 200 scientific papers and abstracts as well as the book, Information Retrieval: A Health and Biomedical Perspective (Springer, 2009), now in its third edition and which has an associated Web site.

Dr. Hersh received his BS in Biology from the University of Illinois at Champaign-Urbana in 1980 and his MD from the University of Illinois at Chicago in 1984. After
completing a Residency in Internal Medicine at University of Illinois Hospital in 1987, he completed a Fellowship in Medical Informatics at Harvard University in 1990. Since that time, he has been a faculty member in the OHSU School of Medicine.

More information about Dr. Hersh can be found on his Web site. He also maintains the Informatics Professor blog.

**OBJECTIVES:**
Participants should be better able to:

1. Describe recent investments in health information technology, including the electronic health record;

2. Discuss the benefits and adverse consequences of this investment;

3. Describe the role of the discipline of clinical informatics in aiming to improve the value of health information technology;

4. Discuss efforts to define and impart competency in clinical informatics among clinicians and informatics professionals.
Clinical Informatics: An Essential Competency for 21st Century Healthcare

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Dr. Hersh has declared no conflicts of interest related to the content of his presentation.
Outline

• Rationale for use of information technology (IT) in healthcare, including the electronic health record (EHR)
• Recent increase in adoption of EHRs due to the Health Information Technology for Economic and Clinical Health (HITECH) Act
• Results of HITECH – good and bad
• Competence in clinical informatics for informaticians and clinicians

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; Smith 2012)
• Cost – cost growth has slowed, but US still spends more and gets less (Angrisano, 2007; Brill, 2013; Martin, 2016)
• Inaccessible information – missing information common in primary care (Smith, 2005)
Growing evidence that information interventions are part of solution

- Systematic reviews (Chaudhry, 2006; Goldzweig, 2009; Buntin, 2011; Jones, 2014) have identified benefits in a variety of areas, although
  - Quality of many studies could be better
  - Large number of early studies came from a small number of “health IT leader” institutions

What has been holding us back? (Hersh, 2004)

- Cost
- Technical challenges
- Interoperability
- Privacy and confidentiality
- Workforce
American Recovery and Reinvestment Act (ARRA) provided the opportunity

“To improve the quality of our health care while lowering its cost, we will make the immediate investments necessary to ensure that within five years, all of America’s medical records are computerized … It just won’t save billions of dollars and thousands of jobs – it will save lives by reducing the deadly but preventable medical errors that pervade our health care system.”

January 5, 2009

HITECH Act (Blumenthal, 2011)
• Incentives for EHR adoption by physicians and hospitals (up to $27B)
• Direct grants by federal agencies ($2B, including $118M for workforce development)

What did HITECH entail?

• Incentives for “meaningful use” (MU) of the EHR, which required (Blumenthal, 2010)
  – Eligible hospitals and professionals meeting criteria in three stages
  – Using certified EHR technology
  – Adhering to specified standards
  – Able to measure and send quality measures as well as enable health information exchange (HIE)
Results of HITECH

Office-based physicians (DesRoches, 2015)

Non-federal hospitals (Charles, 2015)

Emergency departments (Jamoom, 2015)

Outpatient departments (Jamoom, 2015)

Non-federal hospitals (Charles, 2015)

Although adoption increased, other problems arose

- Incomplete interoperability
- Adverse impact on workflow
- Conundrum of structured vs. unstructured data
- Problems with usability
- Safety
- Security
Lack of interoperability

• Despite large-scale adoption, systems do not communicate well
• Several causes
  – Incomplete adoption of standards
  – Inadequate (?) incentives for health information exchange (HIE) under MU
  – Information blocking (ONC, 2015)?

Adverse impact on workflow

• Famous JAMA cartoon (Toll, 2012)
• Too much focus on computer than patient – “writing the wrong” (Patel, 2015)
• Dr. Paul Chang and the “demise of radiology rounds” (Jersild, 2012)
• Facilitates workarounds, such as copy-and-paste (or “sloppy and paste?”) (O’Reilly, 2013)
Other adverse impacts

V97.33xD Sucked into jet engine, subsequent encounter

Usability

- Substantial physician dissatisfaction (Lewis, AmericanEHR, 2014)
- Partly due to conundrum of structured vs. unstructured data
  - Structured data facilitates re-use
  - Narrative data tells the patient’s story
    - “Patients do not speak template” (Lewis, 2011)
    - Many physicians do not trust check boxes in EHRs (Personal Communications)
- Vendors not adhering to usability requirements as part of ONC EHR certification (Ratwani, 2015)
The same EHRs we tout for safety may undermine it

- Concerns led to Joint Commission Sentinel Event alerts (42, 2008; 54, 2015)
- IOM report called for more effective monitoring and study (IOM, 2012), including a roadmap for avoiding eiatrogenesis (Ash, 2012)
- Well-known mishaps
  - 38 times dose of antibiotic (Wachter, 2015)
  - Ebola patient in Dallas hospital (Cortese, 2015)
Security

• 2015 was the year of major breaches
  – Anthem – over 80M records (Rubenfire, 2015)
  – Premera Blue Cross – over 11M records (Vinton, 2015)
  – Excellus Blue Cross – over 10M records (Rubenfire, 2015)
• Going forward from 2015-2019, estimated 1 in 13 patients will suffer medical identity theft, at cost of $300B to system (Kalis, 2015)
• Not limited to healthcare
  – https://www.opm.gov/cybersecurity

"Your previous provider refused to share your electronic medical records, but not to worry
— I was able to obtain all of your information online."

(Two-fer, New Yorker)

Clinical informatics can lead to improved use of the EHR

• There is still research evidence that health IT improves care
• Emerging models for more effective use
• Advocacy for improved usability, interoperability
• Robust opportunities, especially related to data science/analytics
There is still a (mostly) positive evidence base (Jones, 2014)

Evidence in support of value of EHR continues

- Enhancing patient-provider communication (Berry, 2011)
- Extracting phenotype from the EHR (Denny, 2013; Wei, 2015)
- Rapid learning in oncology (Yu, 2015)
- Detection and early action on, e.g.,
  - Delays in cancer diagnosis (Murphy, 2014; Murphy, 2015)
  - Risk of readmission (Amarasingham, 2013; Hebert, 2014)
  - Postoperative complications (Menendez, 2015)
Emerging models for more effective exam room use

- POISED model (Frankel, 2015)
  - Prepare
  - Orient
  - Information gathering
  - Share
  - Educate
  - Debrief

Growing advocacy for making systems better

- AMA usability principles (AMA, 2014)
- AMIA white paper (Payne, 2015)
- ACP documentation (Kuhn, 2015)
- ONC Shared Nationwide Interoperability Roadmap (ONC, 2015)
Opportunities still exist

- Optimists note the “data dividend” of MU (Perlin, in Walsh, 2015)
- Predictive analytics has potential to augment modern clinical practice (Sniderman, 2015)
- Rationale for EHRs still exists
  - Diagnostic (IOM, 2015) and therapeutic (James, 2013) errors still abound; informatics part of the solution
  - Precision medicine will require EHRs and mobile devices to build 1M patient cohort (NIH, 2015)

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*)
- Overview textbooks: Shortliffe, 2014; Hoyt, 2014
Informatics has many sub-areas

- Imaging Informatics
- Research Informatics
- {Clinical field} Informatics
- Consumer Health Informatics
- Bioinformatics (cellular and molecular)
- Clinical (Medical) Informatics (person)
- Public Health Informatics (population)
- Legal Informatics
- Biomedical and Health Informatics
- Chemoinformatics

Informatics = People + Information + Technology

Definition of clinical informatics (ACGME)

- Clinical informatics is the subspecialty of all medical specialties that transforms health care by analyzing, designing, implementing, and evaluating information and communication systems to improve patient care, enhance access to care, advance individual and population health outcomes, and strengthen the clinician-patient relationship
Informatics competence is also fundamental to clinician practice

- 21st century physicians and other clinicians must have competence in clinical informatics
- Driven by competencies focused on uses for informatics and not just technology itself
- What are the competencies in clinical informatics for clinicians?

  – One listing focused on medical students (Hersh, 2014) – probably applicable to all health professional students
Educational programs for achieving competence

• Informaticians
• Clinicians

Educational programs for informaticians

• An ever-growing number of programs – list of US informatics programs on AMIA Web site
  – http://www.amia.org/education/programs-and-courses
• Programs come in many flavors: medical, clinical, biomedical, health, bio-, nursing, etc.
• Funding available for research programs from National Library of Medicine (NLM), which funds fellowships to train future researchers at doctoral and postdoctoral levels at 14 universities
• New fellowships forthcoming for clinical informatics subspecialists under ACGME model
OHSU Biomedical Informatics Graduate Program

- Aims to train future professionals, leaders, and researchers
- Graduate level programs
  - Graduate Certificate
  - Master’s – research, professional
  - PhD
- Graduate Certificate and Master’s available online
- Innovations in online learning, including AMIA 10x10 Program

Clinical informatics subspecialty

- Following usual path of five years of “grandfathering” training requirements to take certification exam before formal fellowships required
- Two paths to eligibility for exam in first five years
  - Practice pathway – practicing 25% time for at least three years within last five years (education counts at half time of practice)
  - Non-traditional fellowships – qualifying educational or training experience, e.g., NLM, VA, or other fellowship or educational program (e.g., master’s degree)

Graduates | CI | BCB | HIM | Total
--- | --- | --- | --- | ---
GC | 321 | 0 | 37 | 358
MBI | 146 | 6 | 2 | 154
MS | 68 | 9 | 0 | 77
PhD | 10 | 6 | 0 | 16
Total | 545 | 21 | 39 | 605

http://www.ohsu.edu/informatics
Clinical training model presents some challenges

- Fragmentation and funding challenges (Detmer, 2014)
- Subspecialty designation limits those without a primary specialty
- After 2018, only pathway to board certification will be a two-year ACGME-accredited fellowship
  - Many clinicians pursue informatics in mid-career
- Informatics is not only for physicians – AMIA exploring certification for others in informatics, the Advanced Interprofessional Informatics Certification (AIIC)
  - http://www.amia.org/advanced-interprofessional-informatics-certification

What about informatics education for clinicians?

- Our competencies a starting point (Hersh, 2014)
- Working with other grantee institutions of AMA Accelerating Change in Education (ACE) initiative to develop
  - Milestones
  - Entrustable professional activities (EPAs)
  - Assessments
  - Addition to board exams, e.g., USMLE
Implementing competencies and curricula for OHSU medical students

• Interactive lectures and series, e.g.,
  – “Information is Different Now That You’re a Doctor”
  – “Informatics, EBM, and Critical Thinking”
• Pearls – weekly 7-10 minute asynchronous recording
• Clinical skills – e.g.,
  – Using EHR
  – Applying quality measures
• Enrichment (optional) – in-depth topics (EHR), clinical informatics careers, etc.

Conclusions

• Some problems in healthcare have informatics solutions
• Competence in clinical informatics is essential for 21st century healthcare professionals
• Many opportunities for clinical informatics professionals who will lead the way
Question 1

Which of the following has occurred as a result of the HITECH Act?

a. The adoption of electronic health record use has increased substantially
b. The cost of healthcare has decreased
c. Physicians are able to complete their clinical documentation more quickly
d. Physician satisfaction with clinical practice has increased

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Question 2

At this time in the US, electronic health records are more likely to be used by
a. Emergency departments
b. Hospitals
c. Long-term care facilities
d. Office-based physicians
Question 3

The field focused on the optimal use of information in healthcare settings is best described as

a. Bioinformatics
b. Clinical informatics
c. Computer science
d. Consumer health informatics
Question 4

Clinical informatics is now recognized as which of the following by the American Board of Medical Specialties (ABMS)?

a. A certificate of completion
b. A medical specialty
c. A medical subspecialty of all specialties
d. A medical subspecialty of internal medicine

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6% 10% 73% 12%