Training the Health and Biomedical Informatics Workforce: Competencies and Approaches

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"Education is the most powerful weapon [that] you can use to change the world."

Nelson Mandela

Overview of talk

- A bright future for health information technology (HIT)
- The professional practice of biomedical informatics
- What we know and should know
- Towards an informatics profession
- Educational programs – curriculum and experiences

The picture is bright for HIT in the 21st century

- Recognition of its value, especially the electronic health record (EHR) with clinical decision support (CDS) (Bates, 2005)
- Consensus of vision regarding health information exchange (HIE) embodied in the National Health Information Network (NHIN)
- Prominent role for informatics in the National Institutes of Health (NIH) Roadmap and clinical/translational research (CTSA) initiatives (Zerhouni, 2005)

But there are impediments and challenges

- On the clinical side (Hersh, 2004)
  - Cost and financing
  - Synchronization with clinical workflow
  - Interoperability, standards, and terminology
  - Privacy and confidentiality
- On the research side (Crist, 2004)
  - Inadequate infrastructure
  - Lack of secondary reusability of data
- And for both
  - Developing a workforce of professionals and users (Hersh, 2006)

Existing competencies in informatics

- IMIA Working Group on Education (MIM, 2000)
- ACMI – aimed more at researchers (Friedman, 2004)
- UK NHS Information Authority (Christie, 2003)
- Clinical specialties
  - Medical students – AAMC, 1999
  - Nurses – Staggers, 2002
  - Nurse practitioners – Curran, 2003
  - Public Health – O'Carroll, 2002

Why do we need informatics competence? A case study

- Han (2005) performed retrospective pre (18 months) and post (5 months) analysis of computerized physician order entry (CPOE) in Children's Hospital of Pittsburgh
  - Mortality rate increased from 2.80% to 6.57%
- Problems with CPOE noted to be
  - Inability to write orders before patient arrival
  - Time-consuming nature of order entry
  - Centralization of medications

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Rebuttals to Han study

- Others have not found increased mortality rates
  - University of Washington (Del Baccaro, 2006)
  - Cincinnati Children's Hospital Medical Center (Jacobs, 2006)
- Implementation was flawed; other explanations for outcome
  - Inadequate wireless network, centralization of pharmacy, non-use of order sets (Phibbs, 2005)
- Success of HIT projects known to be dependent upon variety of "special people" (Ash, 2003)

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Lessons learned show need for informatics expertise (Sittig, 2006)

- Roll-out (hospitalwide in six days) too quick
- Order entry is possible before patient arrival – planning should have allowed
- Centralization of pharmacy a confounding factor and not requirement for CPOE
- Variety of communication issues, including keeping nurses and others at bedside
- Adequate network bandwidth essential
- Standardized order sets would have reduced large number of clicks (and time) per order
- Informatics expertise could have been helpful

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Categories of biomedical informatics practice

Category	Jobs
Academic	Informatics researcher or teacher
Professional	CIO, Chief Medical/Nursing Information Officer, Developer, Trainer
Liaison	Represent clinical or research community in IT initiatives

- Adapted from Covvey et al., *Pointing the Way*, 2001
- Elaborated in Hersh, JAMIA, Mar/Apr 2006
  - "Liaison" a better word than "expert"
- The demarcations are admittedly blurry

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Medical informaticians are just part of the larger HIT workforce

- Other professionals in health care IT include
  - Health information management (HIM) professionals
  - IT professionals, often with computer science (CS) or management information systems (MIS) backgrounds
  - Health science librarians
  - Clinicians who gravitate into IT roles with or without formal training

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What do we know about the HIT workforce?

- General IT staff (Gabler, 2003)
  - Assessed 85 integrated delivery systems of varying size
  - Employ about one IT staff per 56 non-IT employees
  - Roles: programmer/analyst (51%), support (28%), telecomm (16%)
- Health care CIOs (Monegain, 2004)
  - Survey of 91 found 88% in agreement that understanding of health care environment is essential to IT practice in health care settings
- Health information management (Wing, 2003)
  - Historic role of medical records departments changing
  - Projected by Bureau of Labor Statistics for 49% growth by 2010 (Hecker, 2001)

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What do we know about the HIT workforce (cont.)?

- "Informatics" workforce in the UK (Eardley, 2006)
  - Estimated 25,000 full-time equivalents
    - Out of 1.3 million workers in NHS, or one IT staff per 52 non-IT workers
  - Distributed in following categories
    - Senior managers – 7%
    - Health records staff – 26%
    - Knowledge management staff – 9%
    - ICT staff – 37%
    - Information management staff – 18%
    - Clinical informatics staff – 3%
  - Other issues
    - Retention problems – attributed to uncompetitive pay
    - Future skills shortages anticipated
    - Strong support for establishment of formal informatics profession

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Do we know anything about informaticians?

- Hoffman and Ash (2001)
  - Survey of potential employers of informatics graduates
  - Most important skills desired included
    - Knowledge of clinical information
    - Interpersonal skills
    - Change management
    - Relational databases
    - Project management
- Knaup et al. (2003)
  - Survey of first 1024 University of Heidelberg and Heilbronn graduates
  - Most important topics of study included
    - Database and information systems
    - Software development/ engineering
    - Economics
    - Information systems in health care

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Do we know anything about informatics leaders?

- AMDIS survey (Conn, 2003)
  - 82 AMDIS members
  - Little formal training in informatics
  - Value managerial and clinical over technical skills
- Analysis of five Chief Medical Information Officers (CMIOs) Leviss (2006)
  - Leadership, communication, and consensus-building among most important skills
  - Part of senior physician executive team
  - Do not want to be see as just "techie" doctors

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Questions we need to answer (Hersh, 2006)

- What, if anything, distinguishes medical informatics from other areas of HIT?
- If there is a difference, where does HIT end and informatics begin?
- What jobs or roles within HIT that require formal training in medical informatics?
- What is optimal organization of the workforce within organizations to best achieve the value of HIT?
- What is the best training for the various individuals who assume those roles in the workforce?
- How can professionalization of this workforce improve implementation of HIT?

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Is medical informatics a "profession?"

- According to SWEBOK (www.swebok.org), a profession is characterized by
  - An initial professional education in a curriculum validated through accreditation
  - Registration of fitness to practice via voluntary certification or mandatory licensing
  - Specialized skill development and continuing professional education
  - Communal support via a professional society
  - A commitment to norms of conduct often prescribed in a code of ethics
- Also assessed by Joyub (2004)
- By these definitions, medical informatics is <u>not</u> (yet) a profession

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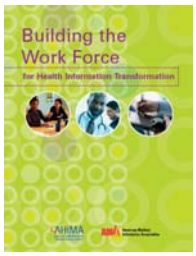
Some answers are emerging

- Summit in Nov., 2005 to address issues of building workforce
- Report published in 2006
- Based on premise that HIT benefits will not accrue without well-trained workforce to implement systems



http://www.ahima.org/emerging_issues/Workforce_web.pdf

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Major recommendations from workforce report

- Adopt IOM "Quality Chasm" vision
- Create incentives to adopt "systems" that promote quality through use of HIT
- Establish industry-wide advocacy for workforce training and development
- Build awareness of need for workforce development
- Utilize innovative learning environments to train workforce
- Develop formal educational programs and promote their value
- Disseminate tools and best practices for these new professionals to succeed

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Categories of informatics education

Category	Typical Programs
Academic	- PhD - Postdoc ± master's degree
Professional	- Postdoc ± master's degree - Master's Degree - Graduate Certificate
Liaison	- 10x10

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Education and training in the United States

- Since a highly multi-disciplinary field, no standard curriculum or accreditation
  - Listing of programs on Web site of American Medical Informatics Association (www.amia.org)
  - Description of OHSU program to follow as an example; consult other programs' Web sites for details on their programs
- Education has historically focused on academics but is evolving to meet the needs of practitioners and users

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Biomedical informatics education at OHSU

- Academic
  - Predoc/Postdoc Fellowship funded by NLM and VA
  - PhD in Biomedical Informatics degree
  - Master of Science in Biomedical Informatics degree for postdocs from other fields
- Professional
  - Master of Science and Master of Biomedical Informatics degrees
  - Graduate Certificate Program (distance learning)
- Liaison
  - OHSU-AMIA 10x10 program

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Informatics curriculum at OHSU – general principles

- Aims to cover the "full spectrum" of biomedical informatics (Hersh, 2005; Hersh, 2007)
- Curriculum centered around "knowledge base"
  - Core knowledge at master's level
  - PhD adds advanced courses and research
  - "Building block" approach allows progression to higher levels
- Have established two "tracks"
  - Medical informatics
  - Bioinformatics
  - Could establish others: public health informatics, health information management

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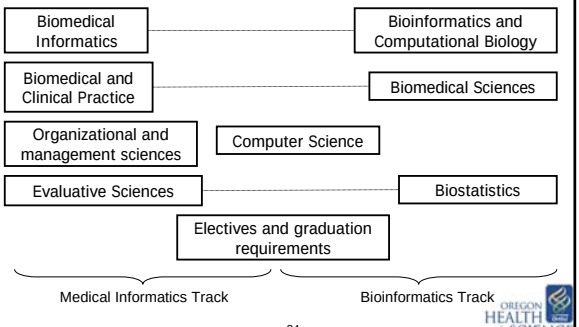
"Knowledge base" and its "domains"



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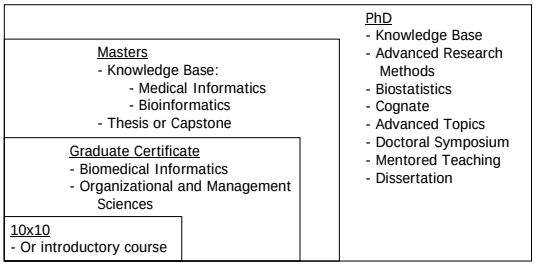
Building block approach to curriculum



Educating the liaisons – 10x10

- Partnership with American Medical Informatics Association (AMIA) to meet Charles Safran's goal of educating one physicians and one nurse from each US hospital in informatics
  - Or, put another way, aim to educate 10,000 health care providers by 2010
- Course consists of introductory on-line course and adding one-day face-to-face session
  - Initial offering well-received (Hersh, 2007)
  - Other partners are also offering courses

AMIA 10x10™ 10,000Trained by 2010

Topics of OHSU 10x10 course

- Overview of Discipline and Its History
- Biomedical Computing
- Electronic Health Records and Health Information Exchange
- Decision Support and Health Care Quality
- Standards, Privacy and Security, Costs and Implementation
- Evidence-Based Medicine and Medical Decision-Making
- Information Retrieval and Digital Libraries
- Bioinformatics
- Imaging Informatics and Telemedicine
- Other Informatics: Consumer Health, Public Health, and Nursing
- Organization and Management Issues in Informatics

Educating beyond our site – distance learning

- (Hersh, JAMIA, 2001)
- Initially in Graduate Certificate, now master's
- Teaching modalities include
  - Voice-over-Powerpoint lectures
  - Threaded discussions
  - Readings, virtual projects, etc.
- Courses are not correspondence courses; interaction is a core component
- Have created a virtual community
  - Meet at AMIA, HIMSS, OHSU, etc.

New models for education can be developed with this technology

- Translation of 10x10 course into Spanish for Latin American audience
- Offered in partnership with *Hospital Italiano* of Buenos Aires, Argentina
- Over 150 participants from 10 countries have completed course so far

How have OHSU informatics students done?

- General observation: What people do when they graduate often depends on what they did when they entered, e.g.,
  - Physicians, nurses, and other clinicians draw on their clinical background
  - Biomedical researchers draw on their unique background and experience
- Graduates have obtained jobs in a variety of settings, e.g., clinical, academic, and industry
- Some have obtained jobs before finishing the program; a few before starting

Conclusions

- Probably the most important factor for the success of HIT will be the competencies of those who use and implement it
- A skilled and knowledgeable workforce must emerge to implement HIT most effectively
- There are challenges and opportunities for those of us who are passionate about leading the way

For more information

- Bill Hersh
  - http://www.billhersh.info
- OHSU Department of Medical Informatics & Clinical Epidemiology
  - http://www.ohsu.edu/dmice
- OHSU educational programs
  - http://www.ohsu.edu/dmice/education
- American Medical Informatics Association
  - http://www.amia.org
- AMIA 10x10
  - http://www.amia.org/10x10