Biomedical and Health Informatics: Careers and Opportunities at the Intersection of Computer Science and Biomedicine

William Hersh, MD
Professor and Chair
Department of Medical Informatics & Clinical Epidemiology
Oregon Health & Science University
Portland, OR, USA
Email: hersh@ohsu.edu
Web: www.billhersh.info
Blog: http://informaticsprofessor.blogspot.com
Twitter: @williamhersh

References

Adams, J and Klein, J (2011). Business Intelligence and Analytics in Health Care - A Primer. Washington, DC, The Advisory Board Company. http://www.advisory.com/Research/IT-Strategy-Council/Research-Notes/2011/Business-Intelligence-and-Analytics-in-Health-Care

Anonymous (2015). Compensation Survey 2015. Chicago, IL, Healthcare Information Management Systems Society. https://apps.himss.org/himssorg/compensation/ASP/index.asp

Anonymous (2016). 2016 Healthcare Information Technology Salary Report, HealthITJobs.com. https://www.healthitjobs.com/healthcare-it-careers-resources/2016-healthitjobs-health-it-salary-survey.aspx

Davenport, TH and Patil, DJ (2012). Data Scientist: The Sexiest Job of the 21st Century. Harvard Business Review, October, 2012. http://hbr.org/2012/10/data-scientist-the-sexiest-job-of-the-21st-century/

Friedman, CP (2009). A 'fundamental theorem' of biomedical informatics. *Journal of the American Medical Informatics Association*. 16: 169-170.

Hersh, W (2009). A stimulus to define informatics and health information technology. *BMC Medical Informatics & Decision Making*. 9: 24. http://www.biomedcentral.com/1472-6947/9/24/

Hersh, W (2012). From Implementation to Analytics: The Future Work of Informatics. Informatics Professor, April 1, 2012. http://informaticsprofessor.blogspot.com/2012/04/from-implementation-to-analytics-future.html

Hersh, WR (2014). Healthcare Data Analytics. Health Informatics: Practical Guide for Healthcare and Information Technology Professionals, Sixth Edition. R. Hoyt and A. Yoshihashi. Pensacola, FL, Lulu.com**:** 62-75.

Hersh, WR, Weiner, MG, et al. (2013). Caveats for the use of operational electronic health record data in comparative effectiveness research. *Medical Care*. 51(Suppl 3): S30-S37.

Hillestad, R, Bigelow, J, et al. (2005). Can electronic medical record systems transform health care? *Health Affairs*. 24: 1103-1117.

Johnston, D, Pan, E, et al. (2003). The Value of Computerized Provider Order Entry in Ambulatory Settings. Boston, MA, Center for Information Technology Leadership

Kohn, LT, Corrigan, JM, et al., Eds. (2000). To Err Is Human: Building a Safer Health System. Washington, DC, National Academies Press.

McGlynn, EA, Asch, SM, et al. (2003). The quality of health care delivered to adults in the United States. *New England Journal of Medicine*. 348: 2635-2645.

O'Reilly, T, Loukides, M, et al. (2012). How Data Science Is Transforming Health Care - Solving the Wanamaker Dilemma. Sebastopol, CA, O'Reilly Media.
Safran, C, Bloomrosen, M, et al. (2007). Toward a national framework for the secondary use of health data: an American Medical Informatics Association white paper. *Journal of the American Medical Informatics Association*. 14: 1-9.
Shortliffe, EH and Cimino, JJ, Eds. (2006). Biomedical Informatics: Computer Applications in Health Care and Biomedicine. New York, NY, Springer.
Smith, PC, Araya-Guerra, R, et al. (2005). Missing clinical information during primary care visits. *Journal of the American Medical Association*. 293: 565-571.

Biomedical and Health Informatics

Careers and Opportunities at the Intersection of Computer Science and Biomedicine

William Hersh, MD
Professor and Chair
Department of Medical Informatics & Clinical Epidemiology
School of Medicine
Oregon Health & Science University
Portland, OR, USA

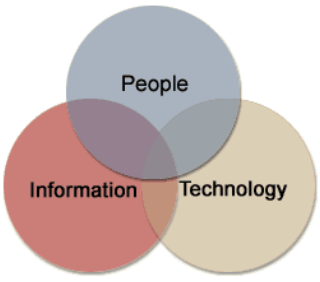
Outline

- Definitions
- Applications and challenges
- Careers and opportunities

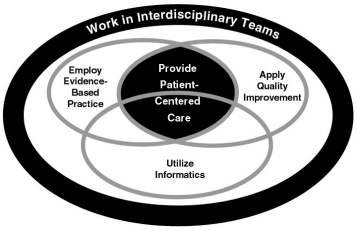
What is biomedical and health informatics (Hersh, 2009)?

- I get asked this so often that I keep a Web site
  - http://www.billhersh.info/whatis/
- And a blog
  - http://informaticsprofessor.blogspot.com
- Biomedical and health informatics (BMHI) is the field concerned with the optimal use of information, often aided by technology, to improve individual health, healthcare, public health, and biomedical research

Other views of informatics



Overlap of Core Competencies for Health Professionals



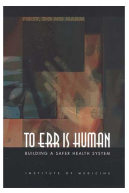
Fundamental Theorem (Friedman, 2009)

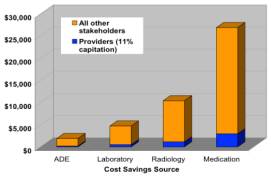
Goal of informatics is:

Goal is not:

Problems in healthcare motivating informatics

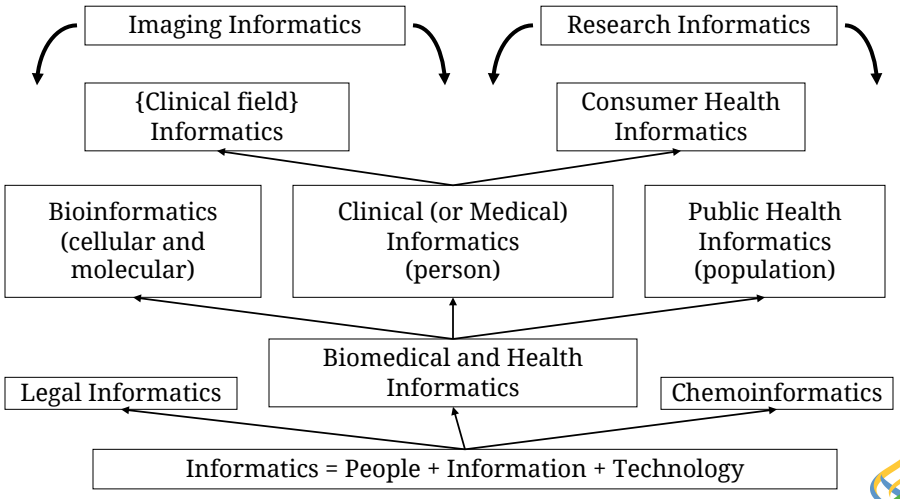
- Safety – IOM "errors report" documented 48-96K deaths per year due to medical errors (Kohn, 2000)
- Quality – patients receive appropriate care only 55% of time (McGlynn, 2003)
- Cost
  - Electronic health records (EHRs) cost-effective overall, but benefits do not accrue to those making the investment (Johnston, 2003)
  - Widespread interoperable EHRs could save $77B per year (Hillestad, 2005)
- Access to information – physicians unable to access known information about patients in 44% of ambulatory visits (Smith, 2005)
- Access to data for "re-use" difficult (Safran, 2007)





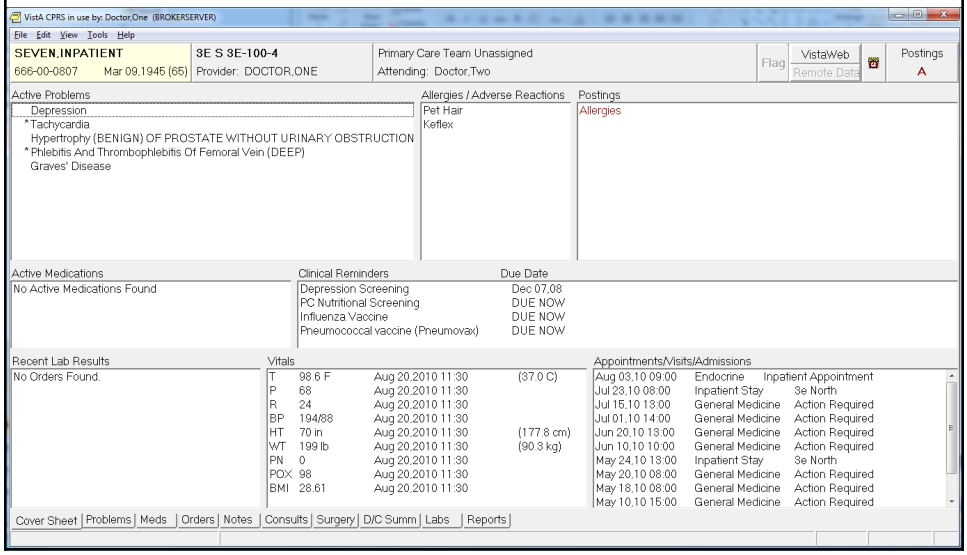
5

Many subareas of informatics



(Hersh, 2009; adapted from Shortliffe, 2006)

Programming an EHR is simple, right?



But programming the EHR is actually the easy part

- Mixing IT with clinical workflow has been difficult
- Some health IT has had safety issues
- Many issues with privacy and security, which go beyond healthcare
- Larger problems in healthcare organization and financing make change difficult

OHSU

Informatics is also essential for modern biomedical research

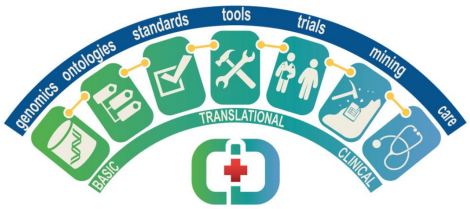
- Embodied in the National Institutes of Health (NIH) Roadmap to accelerate biomedical research discovery (http://commonfund.nih.gov)
  - *Today's biomedical researcher routinely generates … billions of bytes of data. … What researchers need are computer programs and other tools to evaluate, combine, and visualize these data. In some cases, these tools will greatly benefit from the awesome strength of supercomputers or the combined power of many smaller machines in a coordinated way but, in other cases, these tools will be used on modern personal computers and workstations.*

9

OHSU

OHSU to pioneer digital health innovation for the benefit of patients nationwide

October 03, 2017 Portland, Oregon



OHSU has been awarded two grants totaling $62 million from the National Center for Advancing Translational Sciences, part of the National Institutes of Health, to support the use of health data, algorithms and information systems to bridge basic science and clinical research.

The newly awarded grant provides OHSU with $25 million over five years to establish and lead the new National Center for Data to Health, or CD2H, which aims to foster collaboration across more than 50 premier medical research institutions within the prestigious Clinical and Translational Science Awards, or CTSA, network.

Downloads

Melissa Haendel, Ph.D.

Melissa Haendel, Ph.D., co-director of the NCATS-funded Biomedical Data Translator. (OHSU)


Related

Translational research institute at OHSU receives $37 million

OHSU

Informatics is increasingly becoming a "data science"

- EHR (and probably all informatics) work changing from "implementation" to "analytics" (Hersh, 2012)
- Data science is the "sexiest job of the 21st century?" (Davenport, 2012)
- Growing importance of role for analytics in healthcare (Adams, 2011; O'Reilly, 2012; Hersh, 2014)
  - But we must use caution to make sure that clinical data is complete, correct, and otherwise sound (the role of informatics?) (Hersh, 2013)

INFORMATICS PROFESSOR

THIS BLOG MAINTAINS THE THOUGHTS ON VARIOUS TOPICS RELATED TO BIOMEDICAL AND HEALTH INFORMATICS BY DR. WILLIAM HERSH, PROFESSOR AND CHAIR, DEPARTMENT OF MEDICAL INFORMATICS & CLINICAL EPIDEMIOLOGY, OREGON HEALTH & SCIENCE UNIVERSITY.

FRIDAY, NOVEMBER 3, 2017

Why Pursue a Career in Biomedical and Health Informatics?

There are an ever-growing number of career opportunities for those who enjoy working with data, information, and knowledge to improve the health of individuals and the population in the field of *biomedical and health informatics*. This field develops solutions to improve the health of individuals, the delivery of healthcare, and advancing of research in health-related areas. Jobs in informatics are highly diverse, running the spectrum of the highly technical to those that are very interpersonal. All are driven, however, by the goal of using data, information, and knowledge to improve all aspects of human health [1, 2].

WILLIAM HERSH

http://www.billhersh.info/

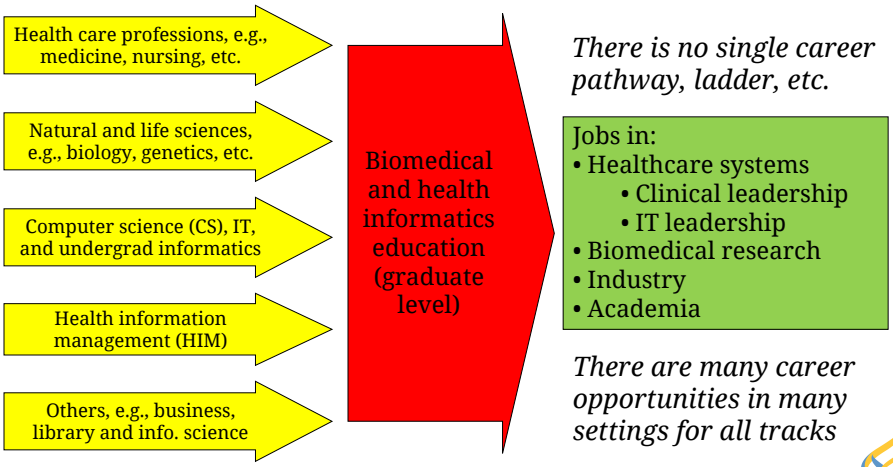
https://informaticsprofessor.blogspot.com/

Many opportunities for informatics careers

- Most prevalent in clinical informatics (in healthcare settings), but plenty of other opportunity in other areas of informatics
  - Bioinformatics – leading and assisting computational analysis of genomics and related technologies
  - Clinical and translational research – using informatics to aid biomedical research
  - Public health – using information to protect the public and promote health
  - Consumer health – helping the general population maintain and improve health
  - Imaging informatics – using images for biomedical research, clinical care, etc.

13

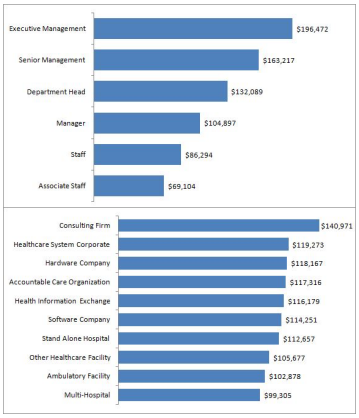
Career pathways have diverse inputs and outputs (Hersh, 2009)

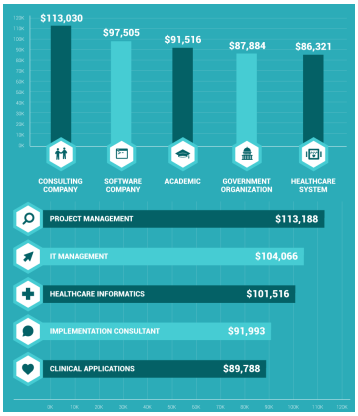


14

Show me the money: how much do informatics professionals make?

- HIMSS compensation survey (2015) and HealthITJobs.com (2016) for health IT
- Salaries vary by level, region, experience, organizational size and type
- Even higher for some: physicians, academics, and advanced data science/analytics





15

Graduate study at OHSU

http://www.ohsu.edu/informatics

Degrees/Certificates Awarded 1998-2017 (666 people)			
Degree/Certificate	Total	BCB	CI
Doctor of Philosophy	24	6	18
Master of Biomedical Informatics	206	14	192
Master of Science	88	17	71
Certificate Program	420	0	420
Total	738	37	701

International students from: Argentina, Singapore, Egypt, Israel, Saudi Arabia, Zimbabwe, Thailand, China, and other countries

Track Degree/Certificate	PhD	MS	MBI	Grad Cert
Clinical Informatics	On-campus	On-campus On-line	On-campus On-line	On-campus On-line
Bioinformatics and Computational Biology	On-campus	On-campus		

16

Many research opportunities with faculty

- Care coordination and value-based care – David Dorr
- Machine learning – Aaron Cohen
- Information retrieval (search) – Bill Hersh
- Data quality – Nicole Weiskopf
- Simulation and safe use of EHR – Jeff Gold, Vishnu Mohan
- Patient decision aids – Karen Eden
- Imaging and telemedicine – Michael Chiang
- Drug repurposing – Shannon McWeeney
- Microbiome – Lisa Karstens
- Ontologies – Melissa Haendel

17

Questions?

William Hersh, MD
Professor and Chair
Department of Medical Informatics & Clinical Epidemiology
School of Medicine
Oregon Health & Science University
Portland, OR, USA
http://www.ohsu.edu/informatics

Email: hersh@ohsu.edu
Web: www.billhersh.info
Blog: http://informaticsprofessor.blogspot.com
Twitter: @williamhersh

18