Computer Science Meets Medicine: Biomedical Informatics

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1

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# Many problems in healthcare have information-related solutions

- Quality of care is not as good as it can be
- Rising costs are not sustainable; US spends more but gets less
- Information does not go where the patient goes, unlike your ATM card or Facebook profile
- Research is expensive and does not take advantage of growing quantity of available data

2

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Growing evidence that information interventions are part of solution

- Buntin, 2011
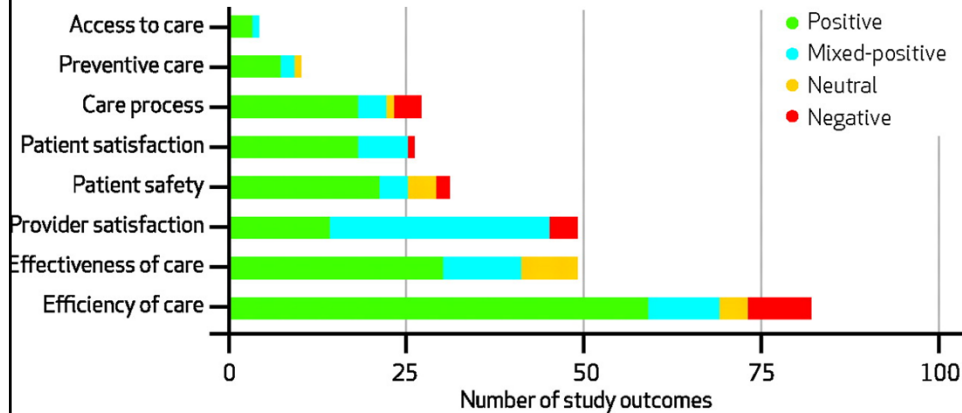
Improved use of information enables other benefits to healthcare

- Access to clinical data improves
  - Quality of care delivered
  - Patient safety through error detection and reduction
  - Reduced costs through more efficiency
- "Secondary use" of increasing amount of data (aka, "big data") enable
  - Clinical and translational research
  - Public health surveillance and reporting
- Also provides for better patient/consumer engagement and empowerment
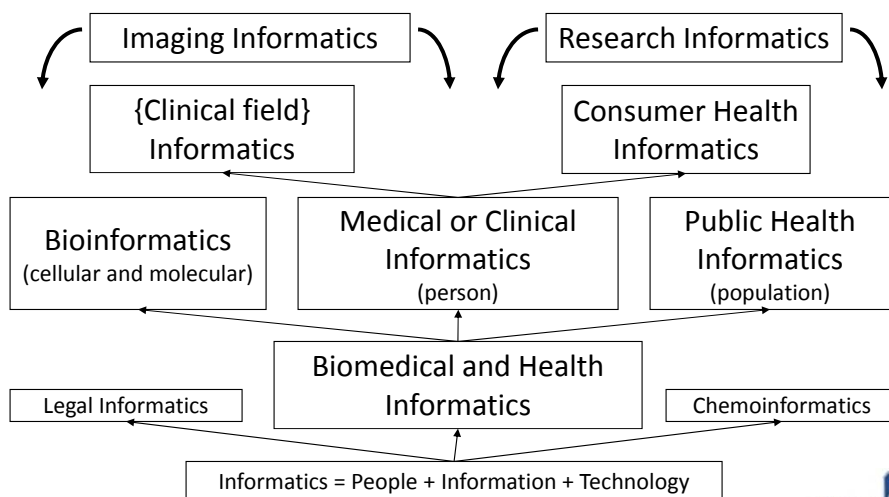
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Biomedical and health informatics underlies the solutions

- *Biomedical and health informatics* (BMHI) is the science of using data and information, often aided by technology, to improve individual health, healthcare, public health, and biomedical research (Hersh, 2009)
  - It is about information, not technology
  - Differs from pure computer science in its focus on subject domain
- Practitioners are BMHI are usually called *informaticians* (sometimes *informaticists*)

5

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BMHI has many sub-areas

Imaging Informatics		Research Informatics

{Clinical field} Informatics		Consumer Health Informatics

Bioinformatics (cellular and molecular)	Medical or Clinical Informatics (person)	Public Health Informatics (population)

Biomedical and Health Informatics

Legal Informatics

Chemoinformatics

Informatics = People + Information + Technology

6

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3

Informatics has been boosted by a "stimulus"

CNN.com

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updated 7:42 a.m. EST, Mon January 12, 2009

Obama's big idea: Digital health records

President-elect Barack Obama, as part of his effort to revive the economy, is proposing a massive effort to modernize health care by making all health records standardized and electronic. The government estimates about 212,000 jobs could be created by this program, CNNMoney reports. full story

*"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

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7

And we have 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
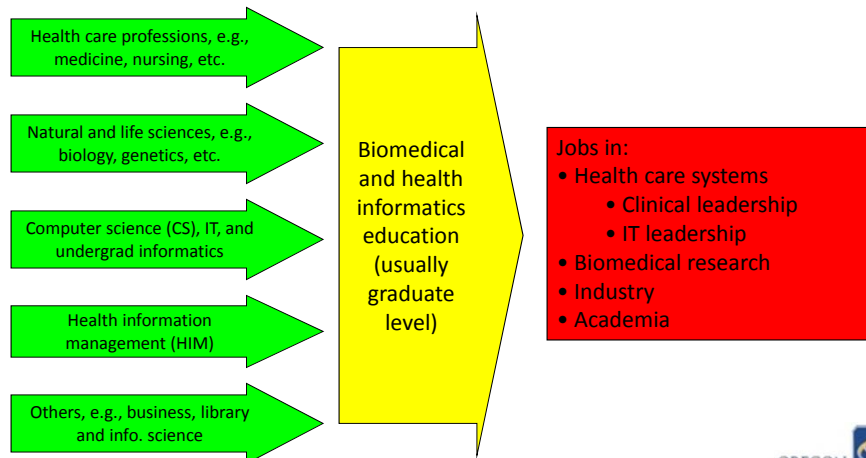
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8

Opportunities for career development and study in BMHI

- Educational programs at growing number of institutions
  - http://www.amia.org/informatics-academic-training-programs
- OHSU program one of largest and well-established
  - Graduate level programs at Certificate, Master's, and PhD levels
  - "Building block" approach allows courses to be carried forward to higher levels
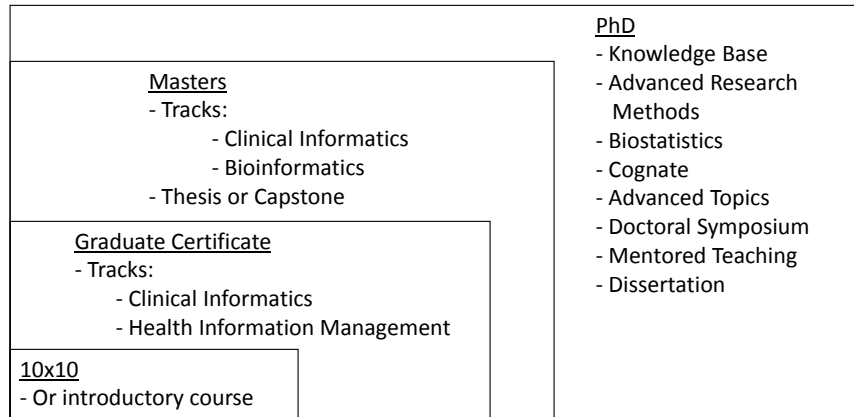- Formal certifications within health professions, e.g., nursing and now medicine

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9

Career pathways have diverse inputs and outputs

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)

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

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10

Overview of OHSU graduate programs

PhD
- Knowledge Base
- Advanced Research
  Methods
- Biostatistics
- Cognate
- Advanced Topics
- Doctoral Symposium
- Mentored Teaching
- Dissertation

Masters
- Tracks:
  - Clinical Informatics
  - Bioinformatics
- Thesis or Capstone

Graduate Certificate
- Tracks:
  - Clinical Informatics
  - Health Information Management

10x10
- Or introductory course

http://www.ohsu.edu/informatics-education

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What competencies must those work in informatics have? (Hersh, 2009)

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

Competencies required in Biomedical and Health Informatics

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

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

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Opportunities in BMHI are <u>not</u> limited to healthcare

- Bioinformatics – genomics and personalized medicine
- Clinical and translational research – building a "learning" healthcare system
- Public health – protecting the public and promoting health
- Consumer health – for all ages, especially aging Internet-savvy baby boomers
- Imaging informatics – use of images for biomedical research, clinical care, etc.

13

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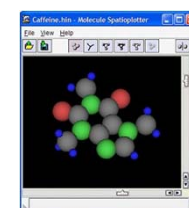
Women colleagues of mine

- Joan Ash, PhD, Professor and Vice Chair, DMICE
- Karen Eden, PhD, Assoc. Prof. and PhD Program Director, DMICE
- Bridget Barnes, CIO, OHSU
- Carolyn Clancy, MD, Director, Agency for Healthcare Research & Quality (AHRQ)
- Judith Faulkner, President and CEO, Epic Systems

14

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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://oninformatics.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

15

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