# Introduction to Biomedical and Health Informatics

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1

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# Outline of talk

- Information-related problems and solutions in healthcare
- 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

2

# 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)

3

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# 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



(Buntin, 2011)

Number of study outcomes

2
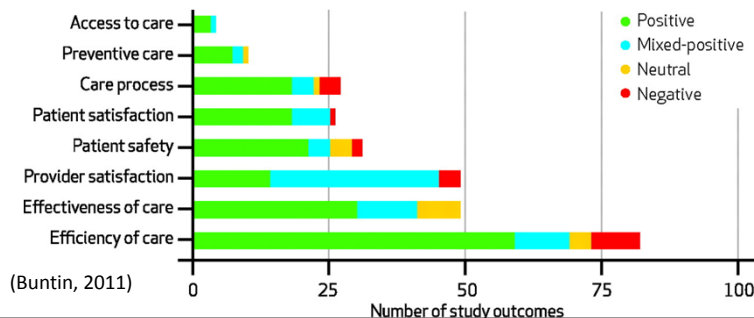
# Biomedical and health informatics underlies the solutions

- *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
- 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
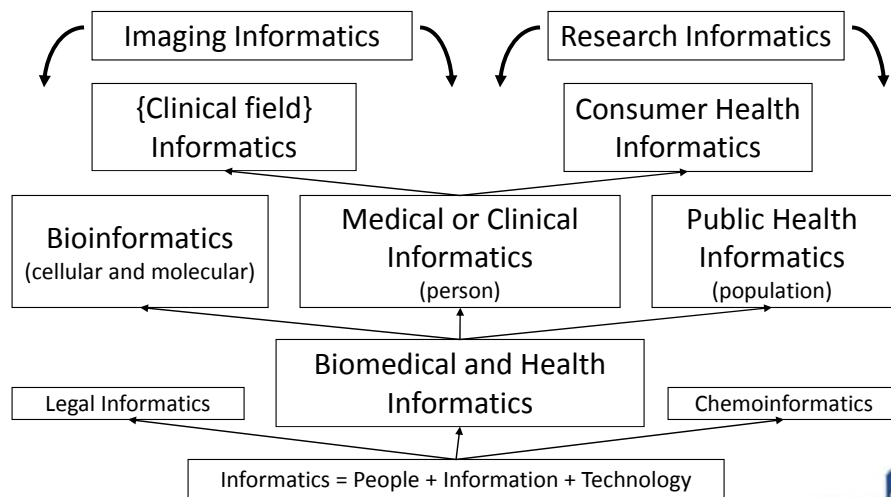
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# Informatics BO (before Obama)

- 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 (Zerhouni, 2007; Bernstam, 2009)
  - Genomics – bioinformatics, personalized medicine (Hamburg, 2010)
  - Individual health – growth of personal health records (PHRs) (Detmer, 2008), including from companies, e.g., Microsoft HealthVault

7

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# But 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

8

4

# …and the US 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

9

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# Why has it been so difficult to get there? (Hersh, 2004)



**Health Care Information Technology**
Progress and Barriers

William Hersh, MD

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

(Reprinted) JAMA, November 10, 2004—Vol 292, No. 18   2273

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## 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 (Jha, 2010) 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.,
  - England (Hayes, 2008)
  - Denmark (Protti, 2010)
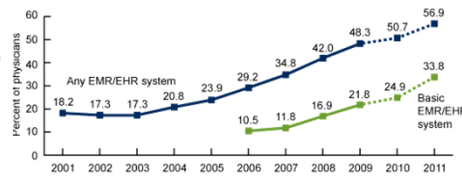


(Hsiao, 2011)
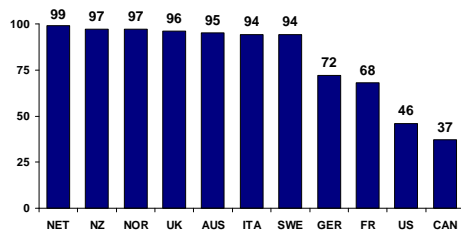


(Schoen, 2009)

11

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## The new "ARRA" of health information technology (HIT) in the US

- HITECH provides financial incentives for "meaningful use" (MU) of HIT (Blumenthal, 2010; Blumenthal, 2010)
  - Incentives for EHR adoption by physicians and hospitals (up to $27B)
  - Direct grants administered by federal agencies ($2B)
  - All initiatives administered by the Office of the National Coordinator for Health IT (ONC, http://healthit.hhs.gov/)

12

## MU is just one of several challenges

**Overlapping Timelines of ICD-10, Meaningful Use of EHRs, and Health Reform Initiatives**

| Federal Fiscal Year | FY 2010 | FY 2011 | FY 2012 | FY 2013 | FY 2014 | FY 2015 | FY 2016 |
|---|---|---|---|---|---|---|---|

**Transition to ICD-10** — Transition to ICD-10 requires extensive system changes — NPRM comments indicated four years to complete — requires partial ICD code freeze during transition
- Transition to ICD-10
- Partial ICD Code Set Freeze
- ICD-10 Implementation (FY 2014)

**Administrative Simplification** — Transition to new version of HIPAA transaction standards (5010) followed by adoption of operating rules to further standardize business rules for electronic exchange of claims-related transactions, including insurance eligibility. Also involves introduction of Health plan ID and other changes to administrative transactions over time.
- Transition to 5010 (Jan. 2012 start)
- 5010 Operational
- Transition to Next Standard
- Oper Rules – Eligibility and Claim Status (Jan. 2012)
- Oper Rules – Remittance and Claims (FY 2015)
- Health Plan ID (tent. start May 2012)

**Meaningful Use of EHRs** — The Meaningful Use program imposes increasingly stringent EHR use and reporting requirements, as well as future payment penalties if metrics are not met. Stage 1 implementation undertaken at the same time that the transition work to ICD-10 is taking place. Meaningful Use Stage 2 currently planned to span transition to ICD-10 (2013/2014) and would crea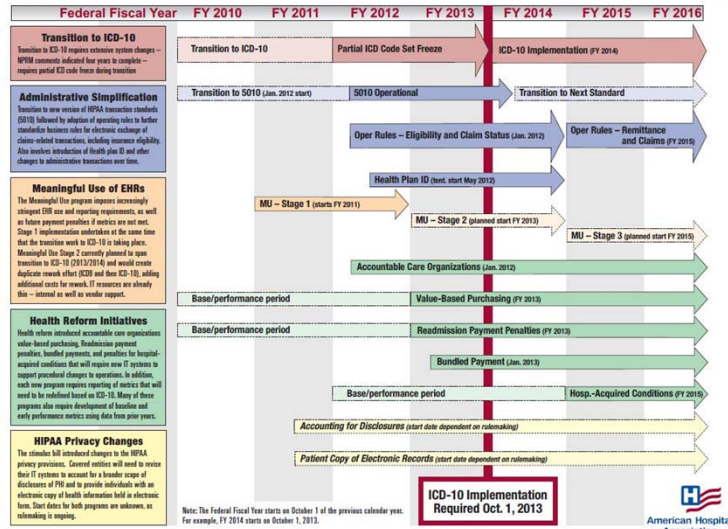te duplicate rework effort (ICD9 and then ICD-10), adding additional costs for rework. IT resources are already thin — internal as well as vendor support.
- MU – Stage 1 (starts FY 2011)
- MU – Stage 2 (planned start FY 2013)
- MU – Stage 3 (planned start FY 2015)

**Health Reform Initiatives** — Health reform introduced accountable care organizations, value-based purchasing, Readmission payment penalties, bundled payments, and penalties for hospital-acquired conditions that will require new IT systems to support procedural changes to operations. In addition, each new program requires reporting of metrics that will need to be redefined based on ICD-10. Many of these programs also require development of baseline and early performance metrics using data from prior years.
- Accountable Care Organizations (Jan. 2012)
- Base/performance period — Value-Based Purchasing (FY 2013)
- Base/performance period — Readmission Payment Penalties (FY 2013)
- Bundled Payment (Jan. 2013)
- Base/performance period — Hosp.-Acquired Conditions (FY 2015)

**HIPAA Privacy Changes** — The stimulus bill introduced changes to the HIPAA privacy provisions. Covered entities will need to revise their IT systems to account for a broader scope of disclosures of PHI and to provide individuals with an electronic copy of health information held in electronic form. Start dates for both programs are unknown, as rulemaking is ongoing.
- Accounting for Disclosures (start date dependent on rulemaking)
- Patient Copy of Electronic Records (start date dependent on rulemaking)

Note: The Federal Fiscal Year starts on October 1 of the previous calendar year. For example, FY 2014 starts on October 1, 2013.

**ICD-10 Implementation Required Oct. 1, 2013**

American Hospital Association

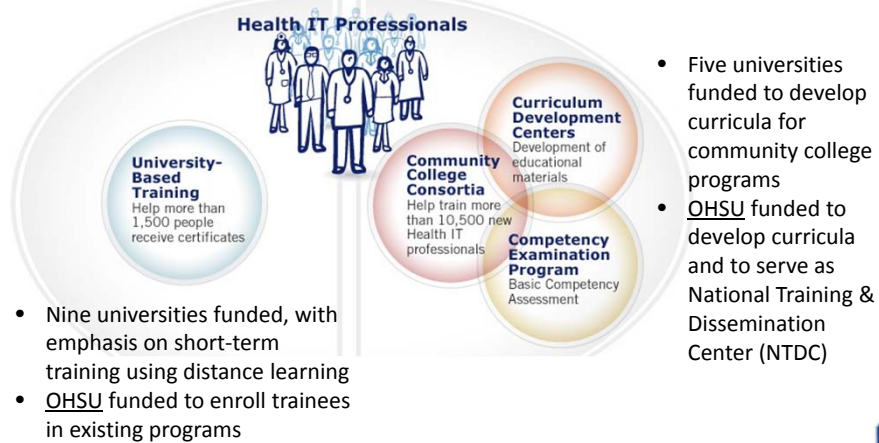http://www.aha.org/advocacy-issues/hit/mu/overvw-time.shtml

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# 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

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14

## ONC Workforce Development Program

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



- Five universities funded to develop curricula for community college programs
- OHSU funded to develop curricula and to serve as National Training & Dissemination Center (NTDC)

- Nine universities funded, with emphasis on short-term training using distance learning
- OHSU funded to enroll trainees in existing programs

15

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## Who are the HIT workforce and what do know about them? (Hersh, 2010)

- Three historical groups of professionals in HIT
  - Information technology (IT) – usually with computer science or information systems background
  - Health information management (HIM) – historical focus on medical records
  - Clinical informatics (CI) – often from healthcare backgrounds
- Problematic HIT implementations often attributable to lack of understanding of clinical environment and use of IT within it (Leviss, 2010)

16

## How many IT personnel does the US have and need?

- IT – to reach level of known benefit and meaningful use, may need 40,000 (Hersh, 2008)
- HIM – from US Bureau of Labor Statistics occupational employment projections 2008-2018 (BLS, 2009)
  - Medical Records and Health Information Technicians (RHITs and coders) – about 172,500 employed now, increasing to 207,600 by 2018 (20% growth)
- CI – estimates less clear for this emerging field
  - One physician and nurse in each US hospital (~10,000) (Safran, 2005)
  - About 13,000 in health care (Friedman, 2008) and 1,000 in public health (Friedman, 2007)
  - Growing role of CMIO and other CI leaders (Leviss, 2006; Shaffer, 2009)

17

## 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

18

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

- Bioinformatics – genomics and personalized medicine (Sarkar, 2011; Fernald, 2011)
- Clinical and translational research – building a "learning" healthcare system (Embi, 2009; Friedman, 2010)
- 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)



19

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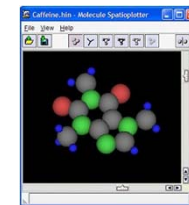
# Conclusions

- 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

20

# 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://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
- National Library of Medicine (NLM)
  - http://www.nlm.nih.gov

21

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