Update on Biomedical and Health Informatics
from the US Perspective

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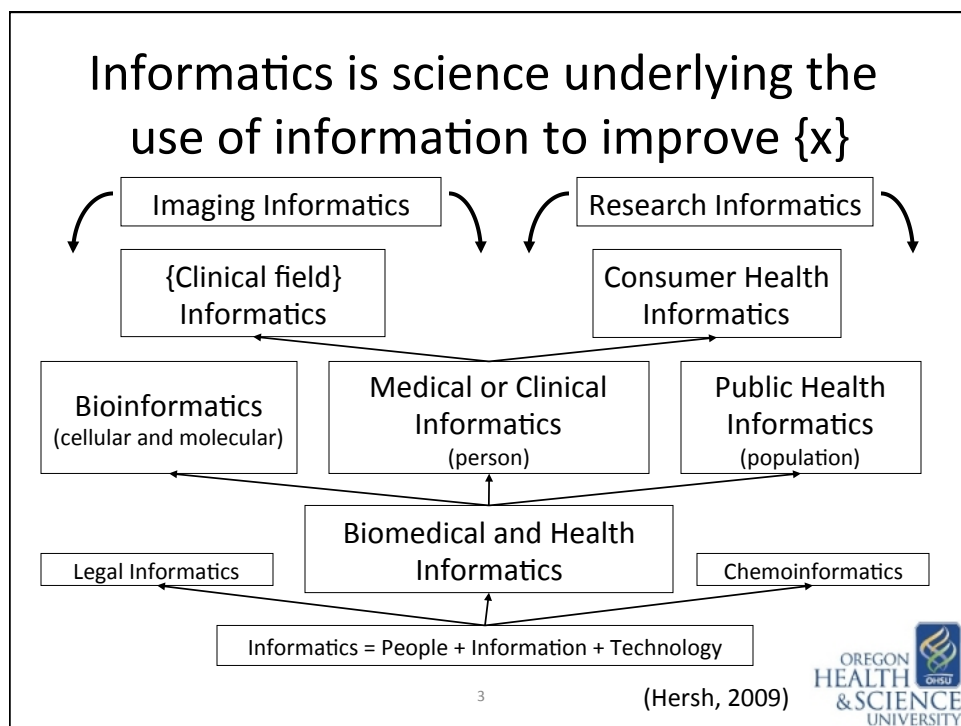Web: www.billhersh.info
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Outline of talk

- Biomedical and health informatics defined
- Meaningful use
- Clinical informatics subspecialty
- Where is the evidence for all this?
- Secondary use of clinical data and clinical research informatics

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Informatics is science underlying the use of information to improve {x}

Imaging Informatics		Research Informatics

{Clinical field} Informatics		Consumer Health Informatics

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

Legal Informatics	Biomedical and Health Informatics	Chemoinformatics

Informatics = People + Information + Technology

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(Hersh, 2009)

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Informatics is essential for a "learning healthcare system"

- Recent IOM report (Smith, 2012) analyzes data to find annual
  - $750B in waste (out of $2.5T system)
  - 75,000 premature deaths
- Sources of waste
  - Unnecessary services provided
  - Services inefficiently delivered
  - Prices too high relative to costs
  - Excess administrative costs
  - Missed opportunities for prevention
  - Fraud

BEST CARE AT LOWER COST

The Path to Continuously Learning Health Care in America

Science → Evidence → Care → Patient Experience

Insights poorly managed   Evidence poorly used   Experience poorly captured

Missed Opportunities, Waste, and Harm

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Health information technology (HIT) is _part_ of the solution (IOM, 2012)

- Features we take for granted in modern banking, transportation, manufacturing, etc.
  - Substantial computational power that is affordable and widely available
  - Network connectivity that allows information to be accessed instantaneously from almost anywhere
  - Human and organizational capabilities that improve the reliability and efficiency of care processes
  - Recognition that effective care must be delivered collaboratively by teams of clinicians and patients, with each playing a vital role in the process
- But also need to be cognizant of safety issues that can arise when HIT not used optimally (IOM, 2012)

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IOM recommendations – all have HIT aspects (IOM, 2012)

I – Foundational Elements
1. The digital infrastructure
2. The data utility

II – Care Improvement Targets
3. Clinical decision support
4. Patient-centered care
5. Community links
6. Care continuity
7. Optimized operations

III – Supportive Policy Environment
8. Financial incentives
9. Performance transparency
10. Broad leadership

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Informatics received a boost in 2009 with arrival of a new US president

"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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Leading the US to enter a new "ARRA"

- Health Information Technology for Economic and Clinical Health (HITECH) Act of the American Recovery and Reinvestment Act (ARRA) (Blumenthal, 2011; Blumenthal, 2011)
  - 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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What is "meaningful use" of an EHR (Stark, 2011)?

- Driven by five underlying goals for healthcare system
  - Improving quality, safety and efficiency
  - Engaging patients in their care
  - Increasing coordination of care
  - Improving the health status of the population
  - Ensuring privacy and security
- Consists of three requirements – use of certified EHR technology
  - In a meaningful manner
  - Connected for health information exchange (HIE)
  - To submit information on clinical quality measures

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To be implemented in three stages

HIT-Enabled Health Reform

Meaningful Use Criteria

HITECH Policies

Stage 1 Meaningful Use Criteria (**Capture/ share data**)

Stage 2 Meaningful Use Criteria (**Advanced care processes with decision support**)

Stage 3 Meaningful Use Criteria (**Improved Outcomes**)
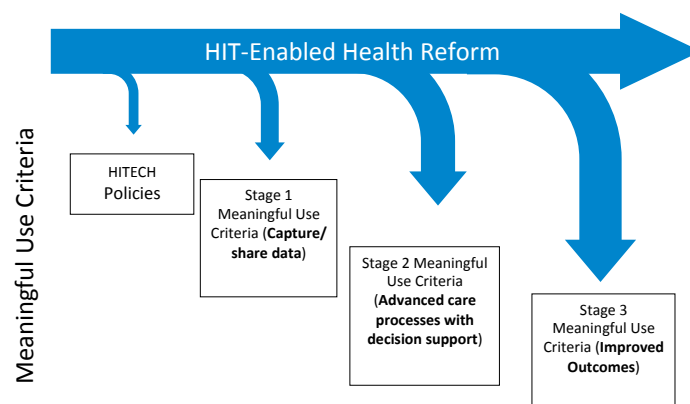
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Implementation of MU

- Implemented through increased Medicare or Medicaid reimbursement to
  - Eligible professionals (EPs)
    - $44-63K (differs based on Medicare vs. Medicaid)
  - Eligible hospitals (EHs, including critical access hospitals)
    - $2-9M (based on size as measured by number of discharges)
- EPs and EHs required to
  - Meet MU objectives
  - Report clinical quality measures (CQMs) – mostly process measures, trying to align with other CMS quality measurement programs (e.g., PQRS)

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Criteria for Stages 1-2 MU
(Marcotte, 2012; CSC, 2012)

	EP	EH
Stage 1	• Meet 15 core and 5 of 10 menu objectives • Report 3 core and 3 of 41 menu CQMs	• Meet 14 core and 5 of 10 menu objectives • Report 15 CQMs
Stage 2	• Meet 17 core and 3 of 6 menu objectives • Report on 9 of 64 CQMs	• Meet 16 core and 3 of 6 menu objectives • Report 16 of 29 CQMs

Objectives, e.g.,
- Computerized provider order entry (CPOE) – 60% for meds in Stage 2
- Clinical decision support rules – 5 in Stage 2
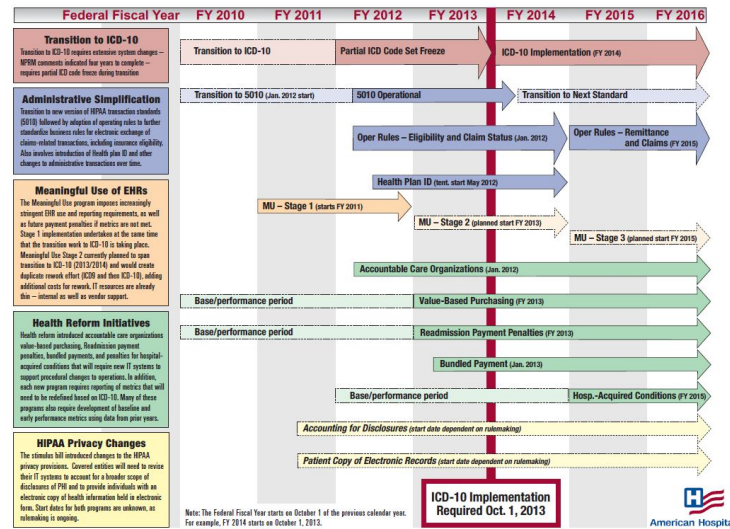- Provide summary of care record for care transition

CQMs, e.g.,
- EP: Blood pressure measurement
- EH: Diabetic foot exam, eye exam, etc.

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MU is just one of several challenges

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

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

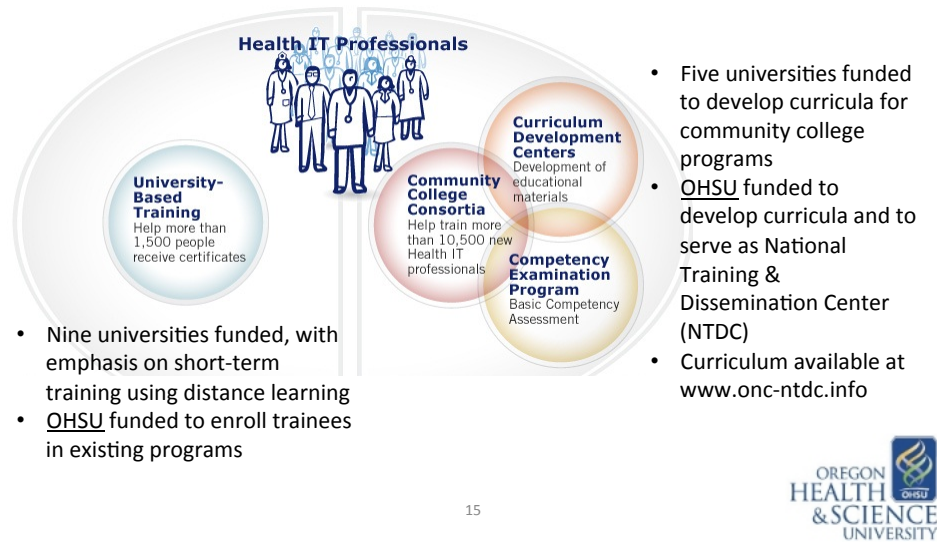# Other HITECH funding initiatives

- HIT Regional Extension Centers (RECs)
  - $677 million to fund 62 RECs that will provide guidance, mainly to small primary care practices and critical access hospitals, in achieving meaningful use (Maxson, 2010)
- State-based health information exchange (HIE)
  - $547 million in grants to states to develop HIE programs (Williams, 2012)
- 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 (Rea, 2012)

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ONC Workforce Development Program

Based on estimated need for 51,000 professionals in 12 workforce roles (Hersh, 2012)

- Five universities funded to develop curricula for community college programs
- OHSU funded to develop curricula and to serve as National Training & Dissemination Center (NTDC)
- Curriculum available at www.onc-ntdc.info

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

Subspecialty of clinical informatics

- Recognition of importance of EHRs and other IT applications focused on facilitating clinical care, clinical and translational research, quality improvement, etc. (Detmer, 2010)
  - Core curriculum (Gardner, 2009)
- Growing number of health care organizations hiring physicians into informatics roles, exemplified by (but not limited to) the Chief Medical Informatics Officer (CMIO)
- Approval by ABMS in Sept., 2011 to apply to all specialties (Shortliffe, 2011)
  - Administrative board: American Board of Preventive Medicine (ABPM) with cooperation from American Board of Pathology (ABP)

Qualifications

- MD degree from LCME-accredited institution
- Current valid license to practice medicine
- ABMS member board certification
- Training pathway, one of
  - Accreditation Council for Graduate Medical Education (ACGME)-accredited fellowship
    - None yet; criteria soon
  - Practice pathway (first five years)
    - Minimum of 25% time over 36 months (half time for education)
  - Non-accredited fellowship (first five years)

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Next steps

- ABPM
  - Define explicit criteria for "grandfathering" of training requirements
  - Develop certification exam, with first administration in October, 2013
- ACGME
  - Define criteria for accredited fellowships
- Institutions like OHSU with existing graduate programs and research fellowships
  - Adapt programs to new requirements

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Where is the evidence for informatics?

- Problems in healthcare motivating information-driven 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)

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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
  - Quality of many studies could be better
  - 18-25% of studies come from a small number of "health IT leader" institutions

(Buntin, 2011)
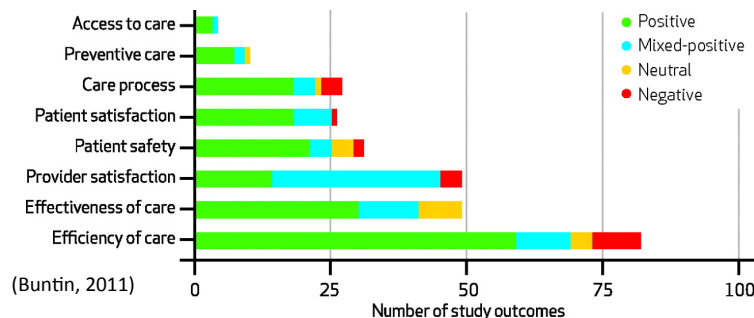
But it has been difficult to get there (Hersh, 2004)

Health Care Information Technology
Progress and Barriers

William Hersh, MD

IN THE 3 DECADES SINCE THE TERM "MEDICAL INFORMAT-ics" was first used, individuals working at the intersec-tion of information technology (IT) and medicine have developed and evaluated computer applications aim-

in this issue of *JAMA*, Slack demonstrates the value that patient-physician e-mail can have in improving patient care, and also catalogs the incomplete but encouraging underlying evi-dence.[11] As with many applications of IT, the technology can improve the existing situation but also empower clinicians and patients to think more fundamentally about how inno-vation can lead to changes in the way medicine is practiced

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

care IT.[8,9] It is no exaggeration to declare that the years ahead portend the "decade of health information technology."[10]

Informatics is poised to have a major impact in patient-clinician communication. In the Clinical Crossroads article

See also p 2255.

ment. The rest goes to those who typically do not pay for

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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., Denmark (Protti, 2010)

(Hsiao, 2011)

(Schoen, 2009)

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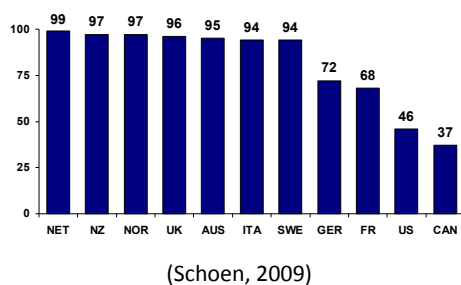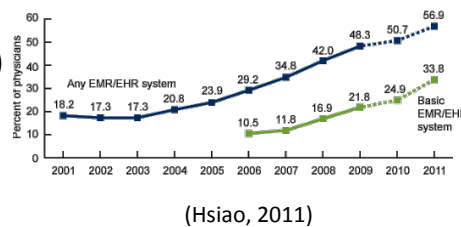
EHRs also allow and align "secondary use" (or "re-use") of clinical data

- Additional uses of EHR data include (Safran, 2007)
  - Clinical and translational research – generating hypotheses and facilitating research
  - Healthcare quality measurement and improvement
  - Public health surveillance for emerging threats
  - Personal health records (PHRs)
  - Health information exchange (HIE)
- One important tool for re-use of clinical data is *natural language processing* (NLP), which has been challenging but is seeing growing successes (Stanfill, 2010; Nadkarni, 2011; Chapman, 2011)

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Another area of growing importance is clinical research informatics (CRI), which helps achieve integration of
- Research systems
- Research activities
- Clinical systems
(Payne, 2005; Richesson, 2012)
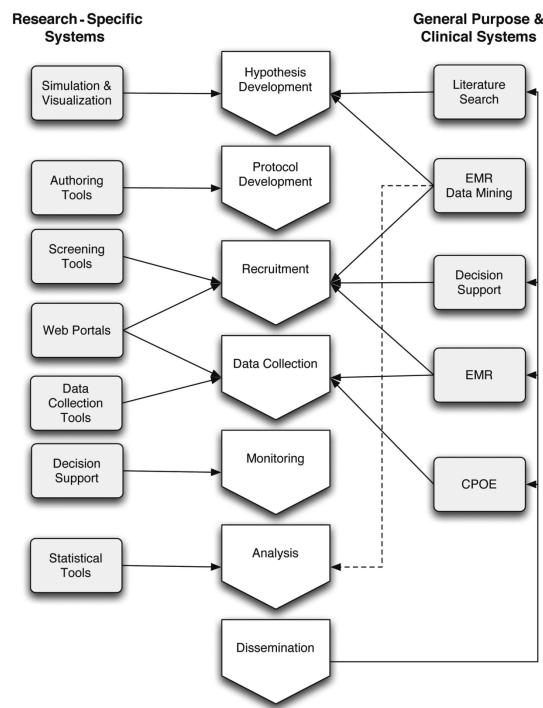
6.6a

NIH initiative especially critical to CRI

- Clinical & Translational Science Award (CTSA) Program (Zerhouni, 2007)
  - www.ctsacentral.org
  - Goal is to accelerate translation of research into clinical care and community
- Funding 60 centers around country in pursuit of goal
  - OHSU among first 12 centers funded in 2006; renewed in 2011
- Is informatics important? (Bernstam, 2009)
  - All CTSA centers required to have a biomedical informatics component
  - Data point: the word "informatics" appeared 34 times in original Request for Applications (RFA)!

6.6a

CTSA Clinical & Translational ®
Science Awards

Motivations for CRI

- Increased digitization of clinical data provides new opportunities for its secondary use (Safran, 2007)
- Growing quantity and understanding of genomic data can be combined with clinical data (Altman, 2012)
- Practice-based research networks can more closely address pertinent research questions and are enabled by informatics (Westfall, 2007; DeVoe, 2011)
- Informatics can enable the learning healthcare system" – learning from data collected in care (Eden, 2008), leveraging HITECH investment (Friedman, 2010)

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Opportunities for CRI

- Convergence of technologies in informatics, genomics, imaging, and other areas providing great opportunity, e.g.,
  - Development of registries (Wright, 2009; Backus, 2009; Fleurant, 2011; Navaneethan, 2011) to support research (Dreyer, 2009), converging into national data networks (Maro, 2009)
  - Biorepositories, aka biolibraries, that facilitate retrieval of biological specimens and link to with clinical data (Ginsburg, 2008; Prokosch, 2010)
  - Development of tools that create "federated" query mechanisms across distributed databases (e.g., SHRINE; Weber, 2009)

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SHRINE i2b2 query tool (Weber, 2009)

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Conclusions

- Informatics 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 informatics

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For more information

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

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