Impact of HIT on Quality, Safety, and Cost and the Workforce Needed for Implementation

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Outline

- Impact of HIT on
  - Quality
  - Safety
  - Cost
- Workforce Needed for Implementation
  - Including new physician subspecialty in US

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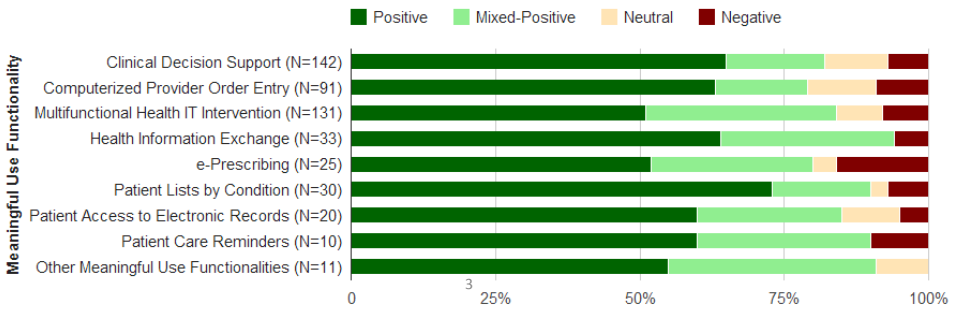
Some studies address quality, safety, and cost

- Series of systematic reviews (Chaudhry, 2006; Goldzweig, 2009; Buntin, 2011; Jones, 2014) have identified benefits in a variety of areas, including by categories of meaningful use



Is EHR use associated with better quality? Inpatient

- Texas hospitals with clinical decision support and computerized provider order entry had lower complications, mortality rates, and costs (Amarasingham, 2009)
- Other studies show mixed results for improved quality after EHR adoption, but generally positive (Yu, 2009; Jones, 2010; DesRoches, 2010; McCullough, 2010; Restuccia, 2012)
- Higher quality hospitals more likely to adopt EHRs (Elnahal, 2011)
- Before-after study of adoption found shorter length of stay (0.11 days) and lower mortality rate (0.18%) but higher readmission rate (0.19%) (Lee, 2013)

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Is EHR use associated with better quality? Outpatient

- Studies of direct EHR intervention show improvement in most but not all quality measures
  - Diabetes quality measures (Cebul, 2011; Persell, 2011; Reed, 2012; Herrin, 2013)
    - Cebul and Herrin studies also showed better intermediate outcomes, such as blood sugar control
  - Preventive measures (Loo, 2011; Kern, 2012)
- Better quality "not automatic" and requires substantial effort (Baron, 2007; Benin, 2011; Mishuris, 2012)

Other quality outcomes – positive

- Massachusetts physicians who were "high users" of EHRs were less likely than "low users" of EHR users to have paid malpractice claims (but not statistically significant) (Virapongse, 2008)
- IT-assisted chronic care management reduced mortality and hospital usage (Dorr, 2008)
- In pediatric setting, computer-based documentation led to improved parent-clinician communication (Johnson, 2008)
- HIMSS Analytics found hospitals at Stages 6-7 reported many benefits (2012) and had association with another measure of hospital quality, the Thomson Reuters Top 100 Hospitals (2012)

Other quality outcomes – negative

- For new aortic dilatations on CT, 58% not recorded within 3 months; median time to recognition was 237 days (Gordon, 2009)
- About 18% of alerts not acknowledged for abnormal imaging studies; timely follow-up lacking in 7.7% (Singh, 2009)
- Transfusion guidelines with CPOE still had over half of orders inappropriate (Scheurer, 2010)
- No effect for HIT intervention in nursing home resident outcomes (Pillemer, 2012)
- British National Programme for HIT "dismantled" due to under-performance (UK DOH, 2011); failure attributed to top-down nature of program (Lohr, 2011)

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HIT can reduce error but also increase it

- Wrong patient identification (Gray, 2006; McDonald, 2006)
- Copy and paste function can (still) propagate outdated or wrong information (Hirschtick, 2006; Yackel, 2006; Hersh, 2007; Siegler, 2009; Thornton, 2013)
- Barcode administration systems may result in workarounds that lead to harm (Koppel, 2008)
- "Hard stop" order entry may reduce error but also caused relevant treatment delays (Strom, 2010)
- Transitioning between EHR systems associated with error (Abramson, 2011)
- Information overload and hidden in plain sight (Singh, 2013; March, 2013)
- Collection of lessons learned ("HIT or Miss," Leviss, 2013)

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Actions to reduce HIT error

- Joint Commission Sentinel Event Alert 42 (2008)
  - Added as one of many safety alerts
  - Calls for monitoring safety of IT implementation and usage, i.e., cannot assume IT will only improve safety
- High-profile IOM report (2012) documented state of problem and called for
  - More comprehensive documentation of risks
  - Freer exchange of information about risks
  - Mandatory reporting for serious risks
  - Safety council to monitor risk and make recommendations
  - Process requirements for quality and risk management by vendors
  - Federal entity to investigate problems and regulate where necessary
  - Roadmap for "preventing e-Iatrogenesis" (Ash, 2012)
- Led ONC to launch HIT Patient Safety Action and Surveillance Plan (2013)
  - http://www.healthit.gov/policy-researchers-implementers/health-it-and-patient-safety

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Cost-benefit for HIT

- Hillestad (2005) applied results of known research in attempt to scale to entire US healthcare system, finding
  - Savings of $81B per year above costs of HIT
  - Reduction of 200,000 ADEs/year
  - Reduced deaths due to increased screening and vaccination
- Congressional Budget Office (Orszag, 2008) analysis took exception to these projections, noting Hillestad focused on "potential" instead of "likely" gains and ignored some negative studies
- Authors acknowledged "as-yet-unfulfilled" promises due to (Kellermann, 2013)
  - Slow adoption of EHRs
  - Lack of interoperability and ease of use of systems
  - Failure to re-engineer care
- The "IT productivity paradox" that has diminished in business appears to remain in healthcare (Lapointe, 2011)

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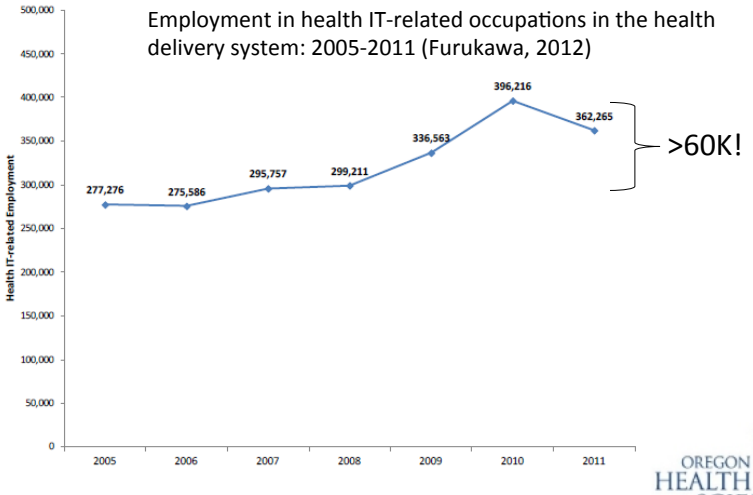
Other cost-benefit studies (cont.)

- Natural experiment of 806 clinicians in Massachusetts in 3 communities with EHR subsidies (pre-HITECH) matched with other communities not subsidized (Adler-Milstein, 2013)
  - Overall costs not impacted but cost reduced in growth of care (0.35%) and of radiology (1.6%)
- In same communities, costs reduced in one but increased in another for Medicaid patients (Adler-Milstein, 2013)

Growth of field has led to increased job opportunities

- Analysis of HIMSS Analytics Database™ estimated need for 41,000 additional HIT professionals as we moved to more advanced clinical systems (Hersh, 2008)
- ONC increased estimate of need to 50,000, leading to Workforce Development Program being part of HITECH Program (Hersh, 2012)
- Actual numbers hired have been even higher (Furukawa, 2012; Schwartz, 2013) – see next slide

Although we all underestimated the growth



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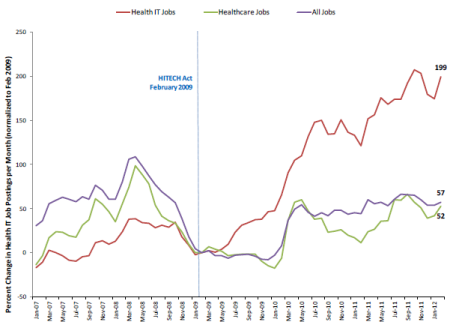
Job postings in health IT

- Percent change in online health IT job postings per month increased much more relative to healthcare jobs and all jobs (Furukawa, 2012)
- Between 2007-2011, 226,356 health IT jobs posted (Schwartz, 2013)



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Still, shortages persist for experienced health IT workforce

- Survey of healthcare CIOs (CHIME, 2012)
  - 71% said IT staff shortages could jeopardize an enterprise IT project, while 58% said they would definitely or possibly affect meeting meaningful use criteria for incentive funding
  - 85% also expressed concerns about being able to retain current staff
- Survey of health IT leaders (HIMSS, 2013)
  - Found comparable picture in both healthcare organizations and vendors having challenges recruiting and maintaining staff

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Clinical informatics subspecialty for physicians

- History
  - 2009 – American Medical Informatics Association (AMIA) develops and publishes plans for curriculum and training requirements
  - 2011 – American Board of Medical Specialties (ABMS) approves; American Board of Preventive Medicine (ABPM) becomes administrative home (Shortliffe, 2011)
  - 2013 – First certification exam offered by ABPM; 455 physicians pass (91%)
  - 2014 – ACGME fellowship rules released
- Subspecialty open to physicians of all primary specialties
  - But not those without a specialty or whose specialty certification has lapsed

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Definition of clinical informatics (ACGME)

- Clinical informatics is the subspecialty of all medical specialties that transforms health care by analyzing, designing, implementing, and evaluating information and communication systems to improve patient care, enhance access to care, advance individual and population health outcomes, and strengthen the clinician-patient relationship

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Competencies of clinical informaticians (Safran, 2009)

- Search and appraise the literature relevant to clinical informatics
- Demonstrate fundamental programming, database design, and user interface design skills
- Develop and evaluate evidence-based clinical guidelines and represent them in an actionable way
- Identify changes needed in organizational processes and clinician practices to optimize health system operational effectiveness
- Analyze patient care workflow and processes to identify information system features that would support improved quality, efficiency, effectiveness, and safety of clinical services
- Assess user needs for a clinical information or telecommunication system or application and produce a requirements specification document
- Design or develop a clinical or telecommunication application or system
- Evaluate vendor proposals from the perspectives of meeting clinical needs and the costs of the proposed information solutions
- Develop an implementation plan that addresses the sociotechnical components of system adoption for a clinical or telecommunication system or application
- Evaluate the impact of information system implementation and use on patient care and users
- Develop, analyze, and report effectively (verbally and in writing) about key informatics processes

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Core content for clinical informatics (Gardner, 2009)

1. Fundamentals
1.1. Clinical Informatics
1.1.1. The discipline of informatics
1.1.2. Key informatics concepts, models, theories
1.1.3. Clinical informatics literature
1.1.4. International clinical informatics practices
1.1.5. Ethics and professionalism
1.1.6. Legal and regulatory issues
1.2. The Health System
1.2.1. Determinants of individual and population health
1.2.2. Primary domains, organizational structures, cultures, and processes
1.2.3. The flow of data, information, and knowledge within the health system
1.2.4. Policy & regulatory framework
1.2.5. Health economics and financing
1.2.6. Forces shaping health care delivery
1.2.7. Institute of Medicine quality components

2. Clinical Decision Making and Care Process Improvement
2.1. Clinical Decision Support
2.1.1. The nature and cognitive aspects of human decision making
2.1.2. Decision science
2.1.3. Application of clinical decision support
2.1.4. Transformation of knowledge into clinical decision support tools
2.1.5. Legal, ethical, and regulatory issues
2.1.6. Quality and safety issues
2.1.7. Supporting decisions for populations of patients
2.2. Evidence-based Patient Care
2.2.1. Evidence sources
2.2.2. Evidence grading
2.2.3. Clinical guidelines
2.2.4. Implementation of guidelines as clinical algorithms
2.2.5. Information retrieval and analysis
2.3. Clinical Workflow Analysis, Process Redesign, and Quality Improvement
2.3.1. Methods of workflow analysis
2.3.2. Principles of workflow re-engineering
2.3.3. Quality improvement principles and practices

3. Health Information Systems
3.1. Information Technology Systems
3.1.1. Computer Systems
3.1.2. Architecture
3.1.3. Networks
3.1.4. Security
3.1.5. Data
3.1.6. Technical approaches that enable sharing data
3.2. Human Factors Engineering
3.2.1. Models, theories, and practices of human-computer (machine) interaction (HCI)
3.2.2. HCI Evaluation, usability testing, study design and methods
3.2.3. Interface design standards and design principles
3.2.4. Usability engineering
3.3. Health Information Systems and Applications
3.3.1. Types of functions offered by systems
3.3.2. Types of settings where systems are used
3.3.3. Electronic health/medical records systems as the foundational tool
3.3.4. Telemedicine
3.4. Clinical Data Standards
3.4.1. Standards development history and current process
3.4.2. Data standards and data sharing
3.4.3. Transaction standards
3.4.4. Messaging standards
3.4.5. Nomenclatures, vocabularies, and terminologies
3.4.6. Ontologies and taxonomies
3.4.7. Interoperability standards
3.5. Information System Lifecycle
3.5.1. Institutional governance of clinical information systems
3.5.2. Clinical information needs analysis and system selection
3.5.3. Clinical information system implementation
3.5.4. Clinical information system testing, before, during and after implementation
3.5.5. Clinical information system maintenance
3.5.6. Clinical information system evaluation

4. Leading and Managing Change
4.1. Leadership Models, Processes, and Practices
4.1.1. Dimensions of effective leadership
4.1.2. Governance
4.1.3. Negotiation
4.1.4. Conflict management
4.1.5. Collaboration
4.1.6. Motivation
4.1.7. Decision making
4.2. Effective Interdisciplinary Teams
4.2.1. Human resources management
4.2.2. Team productivity and effectiveness
4.2.3. Group management processes
4.2.4. Managing meetings
4.2.5. Managing group deliberations
4.3. Effective Communications
4.3.1. Effective presentations to groups
4.3.2. Effective one-on-one communication
4.3.3. Writing effectively for various audiences and goals
4.3.4. Developing effective communications program to support system implementation
4.4. Project Management
4.4.1. Basic principles
4.4.2. Identifying resources
4.4.3. Resource allocation
4.4.4. Project management tools (non-software specific)
4.4.5. Informatics project challenges
4.5. Strategic and Financial Planning for Clinical Information Systems
4.5.1. Establishing mission and objectives
4.5.2. Environmental scanning
4.5.3. Strategy formulation
4.5.4. Action planning and strategy implementation
4.5.5. Capital and operating budgeting
4.5.6. Principles of managerial accounting
4.5.7. Evaluation of planning process
4.6. Change Management
4.6.1. Assessment of organizational culture and behavior
4.6.2. Change theories
4.6.3. Change management strategies
4.6.4. Strategies for promoting adoption and effective use of clinical information systems

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Clinical informatics subspecialty eligibility (Hersh, 2013)

- Following usual path of five years of "grandfathering" training requirements to take certification exam before formal fellowships required
- Two paths to eligibility for exam in first five years
  - Practice pathway – practicing 25% time for at least three years within last five years (education counts at half time of practice)
  - Non-traditional fellowships – qualifying educational or training experience, e.g., NLM fellowship, or educational program (master's degree)
- After 2018, only pathway to certification will be ACGME-accredited fellowship

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Clinical informatics is not just for physicians

- Informatics is the ultimate interprofessional area of healthcare
  - Very little in clinical informatics core competencies and curricular content specific to medicine
- Only 30% of OHSU informatics enrollment is physicains
- AMIA has established Advanced Interprofessional Informatics Task Force to explore certification for non-physicians
  - Most likely initial efforts at doctoral (research and professional) level, with focus on professional roles

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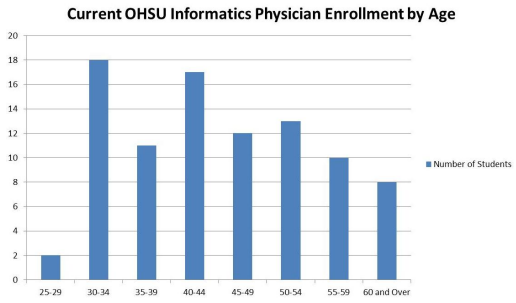
Concerns regarding capacity-building for the subspecialty (Hersh, 2012)

- Age at which many physicians enter informatics
  - OHSU experience shows many physicians (and others) enter field mid-career
- Ability of programs to provide both education and training
  - Will ACGME be flexible regarding educational portions?
- Paying for cost of training



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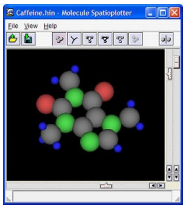
Opportunities in informatics are <u>not</u> limited to healthcare

- Bioinformatics – genomics and personalized medicine (Altman, 2012)
- Clinical and translational research – building the "learning" healthcare system (Richesson, 2012)
- Public health – protecting the public and promoting health (Magnusson, 2013)
- Consumer health – for all ages, especially aging Internet-savvy baby boomers (Detmer, 2008; Miller, 2009)
- Imaging informatics – use of images for biomedical research, clinical care, etc. (Bui, 2010)



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Conclusions

- There is some evidence for benefit for HIT in increasing quality and safety while reducing costs
- There is continued need and career opportunity for informatics professionals, researchers, and others

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