Practicing Medicine in a Data-Rich, Information-Driven Future

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Outline

- Our dysfunctional healthcare system and a vision for fixing and optimizing it
- Part of the solution includes adoption of electronic health records (EHRs) and other technologies
- Toward the data-rich, information-driven learning health system
- Challenges in getting to such a system
- The skills and workforce need to get there, including the new clinical informatics subspecialty

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Our healthcare system is broken in many ways and needs fixin'

- Action must be taken to address (Smith, 2012)
  - $750B in waste (out of $2.5T system)
  - 75,000 premature deaths
- Sources of waste – from Berwick (2012)
  - Unnecessary services provided
  - Services inefficiently delivered
  - Prices too high relative to costs
  - Excess administrative costs
  - Missed opportunities for prevention
  - Fraud
- One vision for repair is the IOM's "learning healthcare system" (Smith, 2012)

http://www.iom.edu/Reports/2012/Best-Care-at-Lower-Cost-The-Path-to-Continuously-Learning-Health-Care-in-America.aspx

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Components of the learning healthcare system (Smith, 2012)

- Records immediately updated and available for use by patients
- Care delivered the has been proven "reliable at the core and tailored at the margins"
- Patient and family needs and preferences are a central part of the decision process
- All healthcare team members are fully informed about each other's activities in real time
- Prices and total costs are fully transparent to all participants in the care process
- Incentives for payment are structured to "reward outcomes and value, not volume"
- Errors are promptly identified and corrected
- Outcomes are routinely captured and used for continuous improvement

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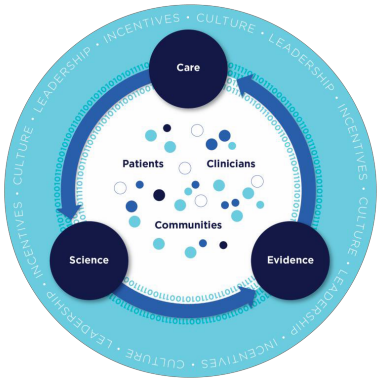
From:

(Smith, 2012)

To:



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Recommendations for *Best Care, Lower Cost* (Smith, 2012)

- Foundational elements
  - Digital infrastructure
  - Data utility
- Care improvement targets
  - Clinical decision support
  - Patient-centered care
  - Community links
  - Care continuity
  - Optimized operations
- Supportive policy environment
  - Financial incentives
  - Performance transparency
  - Broad leadership

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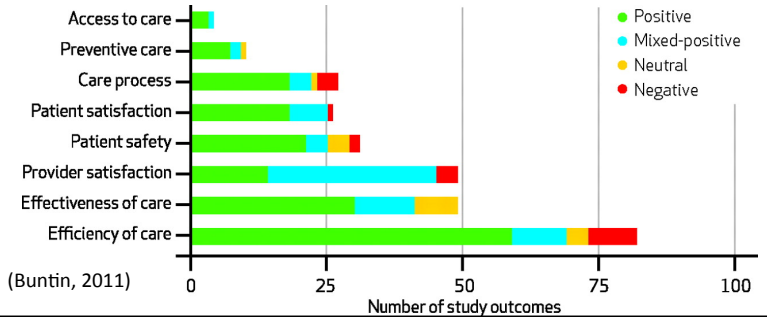
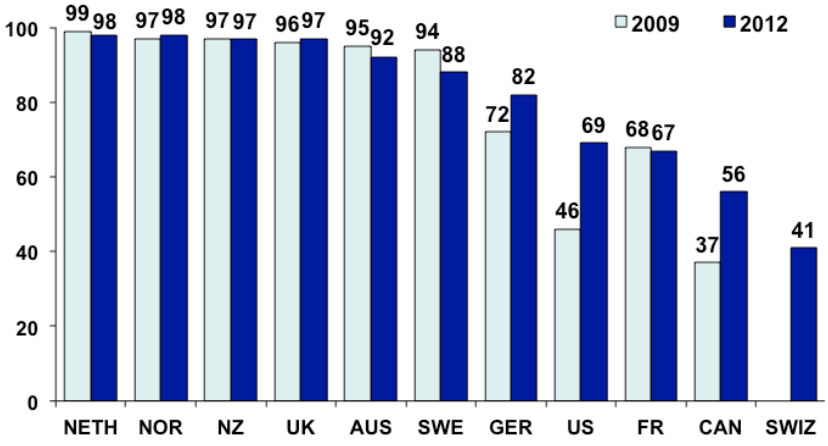
Health information technology (HIT) is part of solution

- 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)

The world is adopting EHRs (Schoen, 2012)



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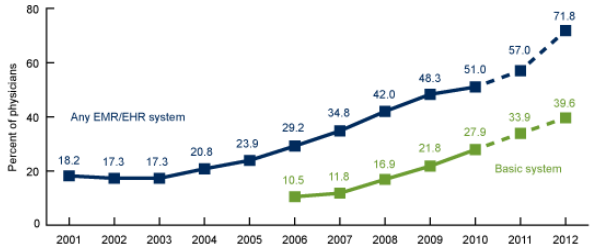
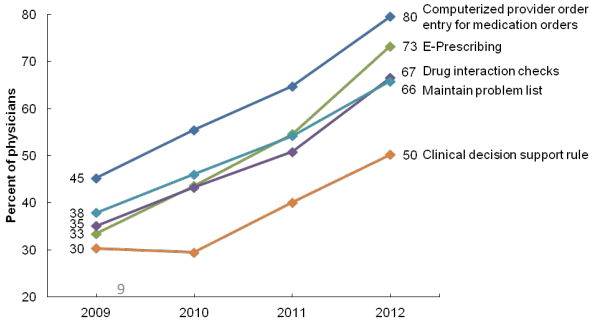
Even in the US

(Hsaio, CDC, 2012)



(King, ONC, 2012)



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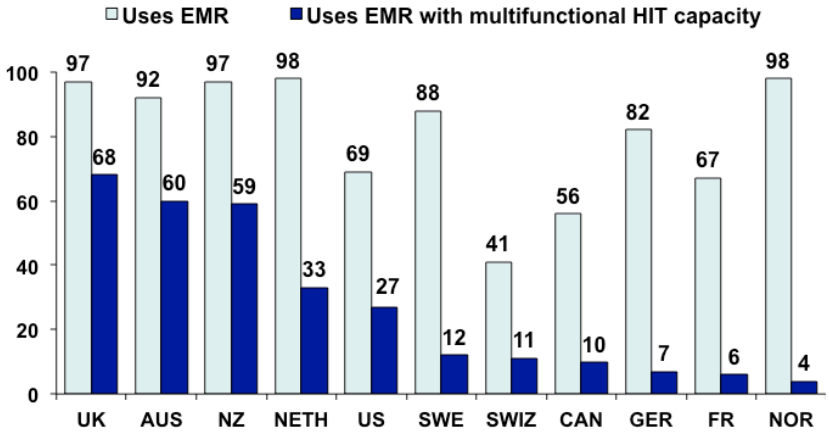
Although advanced functionality is less common (Schoen, 2012)



Multifunctional health IT capacity – use of at least two electronic functions: order entry management, generating patient information, generating panel information, and routine clinical decision support

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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

IN THE 3 DECADES SINCE THE TERM "MEDICAL INFORMATICS" was first used, individuals working at the intersection 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 evidence.[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 innovation 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

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

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See also p 2255.

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

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US investment has been substantial

"To improve the quality of our health care while lowering its cost, we will make the immediate investments necessary to ensure that within five years, all of America's medical records are computerized … It just won't save billions of dollars and thousands of jobs – it will save lives by reducing the deadly but preventable medical errors that pervade our health care system."

January 5, 2009

Health Information Technology for Economic and Clinical Health (HITECH) Act of the American Recovery and Reinvestment Act (ARRA) (Blumenthal, 2011)

- Incentives for electronic health record (EHR) adoption by physicians and hospitals (up to $27B)
- Direct grants administered by federal agencies ($2B, including $118M for workforce development)

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Centerpiece of HITECH is incentives for "meaningful use" of EHRs

- 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 – criteria mapped to above goals
  - Connected for health information exchange (HIE)
  - To submit information on clinical quality measures

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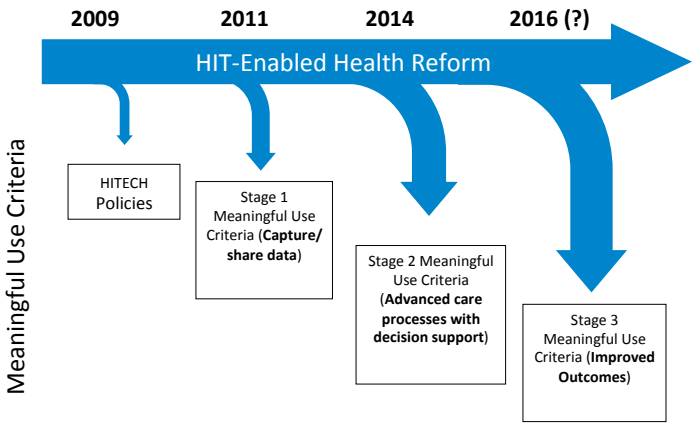
Implemented in three stages – www.healthit.gov



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Toward a data-rich, information-driven future for healthcare

- Some call this the use of analytics and/or business intelligence (BI)
- Analytics is the use of data collection and analysis to optimize decision-making (Davenport, 2010)
- BI is the "processes and technologies used to obtain timely, valuable insights into business and clinical data" (Adams, 2011)
- As in many areas of advanced information and technology, healthcare and biomedicine are behind the curve of other industries (Miller, 2011; Rhoads, 2012)

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Who employs analytics and BI outside of healthcare?

- Amazon and Netflix recommend books and movies with great precision
- Many sports teams, such as the Oakland Athletics and New England Patriots, have used "moneyball" to select players, plays, strategies, etc. (Lewis, 2004; Davenport, 2007)
- Facebook can target advertising very precisely knowing your friends, your interests, where you go, etc. (Ugander, 2011)
- Twitter volume and other linkages can predict stock market prices (Ruiz, 2012)
- Recent US election showed value of using data: re-election of President Obama (Scherer, 2012) and predictive ability of Nate Silver (Salant, 2012)

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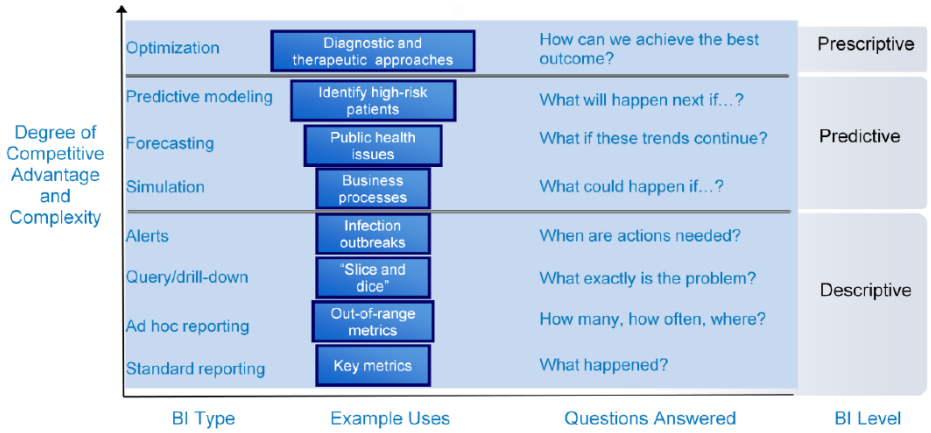
Levels of BI (Adams, 2011)



Analytics part of larger "secondary use" or "re-use" of clinical data

- Many secondary uses or re-uses of electronic health record (EHR) data (Safran, 2007); these include
  - Using data to improve care delivery – predictive analytics
  - Healthcare quality measurement and improvement
  - Clinical and translational research – generating hypotheses and facilitating research
  - Public health surveillance – including for emerging threats
  - Implementing the learning health system

Using data analytics to improve healthcare

- With shift of payment from "volume to value," healthcare organizations will need to manage information better to provide better care (Diamond, 2009; Horner, 2012)
- Being applied by many now to problem of early hospital re-admission, in particular within 30 days (Sun, 2012)
- Prediction not only of patient response but also behavior, e.g., regimen adherence (Steffes, 2012)
- A requirement of coming "precision medicine" (Mirnezami, 2012)

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Quality measurement and improvement

- Quality measures increasingly used in US and elsewhere
- Use has been more for process than outcome measures (Lee, 2011), e.g., Stage 1 meaningful use

NQF Measure Number & PQRI Implementation Number	Clinical Quality Measure Title
Core Clinical Quality Measures	
NQF 0013	Hypertension: Blood Pressure Measurement
NQF 0028	Preventive Care and Screening Measure Pair: a) Tobacco Use Assessment, b) Tobacco Cessation Intervention
NQF 0421 PQRI 128	Adult Weight Screening and Follow-up
Alternate Clinical Quality Measures	
NQF 0024	Weight Assessment and Counseling for Children and Adolescents
NQF0041 PQRI 110	Preventive Care and Screening: Influenza Immunization for Patients 50 Years Old or Older
NQF 0038	Childhood Immunization Status

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Quality measurement and improvement

- In UK, pay for performance schemes achieved early value but fewer further gains (Serumaga, 2011)
- In US, some quality measures found to lead to improved patient outcomes (e.g., Wang, 2011), others not (e.g., Jha, 2012)
- Desire is to derive automatically from EHR data, but this has proven challenging with current systems (Parsons, 2012; Kern, 2013)

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Public health

- "Syndromic surveillance" aims to use data sources for early detection of public health threats, from bioterrorism to emergent diseases
- Interest increased after 9/11 attacks (Henning, 2004; Chapman, 2004; Gerbier, 2011)
- One notable success is Google Flu Trends (http://www.google.org/flutrends/) – search terms entered into Google predict flu activity, but not enough to intervene (Ginsberg, 2009)

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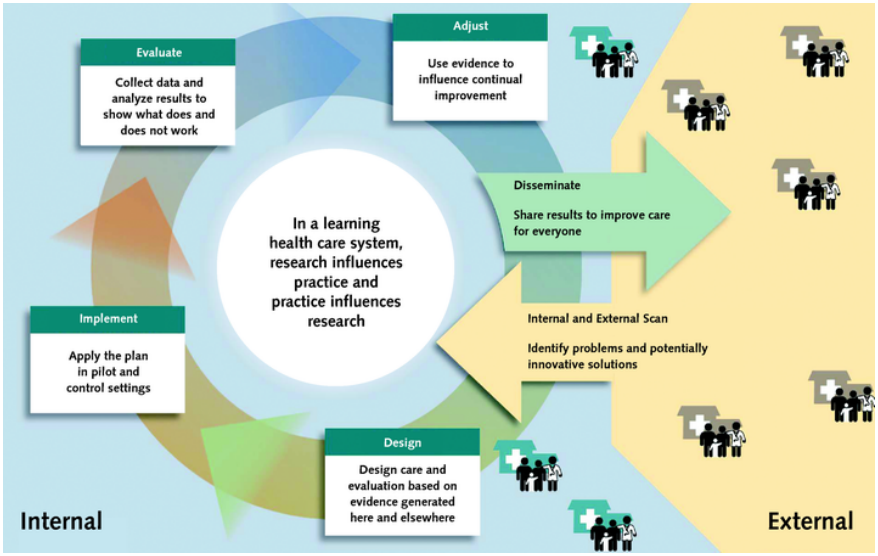
Implementing the learning healthcare system (Greene, 2012)



Follow the rules of EBM?

- Ask an answerable question
  - Can question be answered by the data we have?
- Find the best evidence
  - In this case, the best evidence is the EHR data needed to answer the question
- Critically appraise the evidence
  - Does the data answer our question? Are there confounders?
- Apply it to the patient situation
  - Can the data be applied to this setting?

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EHR data use for clinical research

- Replication of randomized controlled trial (RCT) outcomes using EHR data and statistical corrections (Tannen, 2007; Tannen, 2008; Tannen, 2009)
- Associating "phenotype" with genotype to replicate known associations as well as identify new ones in eMERGE (Kho, 2011; Denny, 2010)
- Promise of genomics and bioinformatics yielding other successes as well (Kann, 2013)

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Challenges for secondary use of clinical data

- EHR data does not automatically lead to knowledge
  - Data quality and accuracy is not a top priority for busy clinicians (de Lusignan, 2005)
  - Standards and interoperability – mature approaches but lack of widespread adoption (Kellermann, 2013)
- Little research, but problems identified
  - EHR data can be incorrect and incomplete, especially for longitudinal assessment (Berlin, 2011)
  - Much data is "locked" in text (Hripcsak, 2012)
  - Many steps in ICD-9 coding can lead to incorrectness or incompleteness (O'Malley, 2005)

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Challenges (cont.)

- Many data "idiosyncrasies" (Weiner, 2011)
  - "Left censoring": First instance of disease in record may not be when first manifested
  - "Right censoring": Data source may not cover long enough time interval
  - Data might not be captured from other clinical (other hospitals or health systems) or non-clinical (OTC drugs) settings
  - Bias in testing or treatment
  - Institutional or personal variation in practice or documentation styles
  - Inconsistent use of coding or standards

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Challenges (cont.)

- Patients get care at multiple sites
  - Study of 3.7M patients in Massachusetts found 31% visited 2 or more hospitals over 5 years (57% of all visits) and 1% visited 5 or more hospitals (10% of all visits) (Bourgeois, 2010)
  - Study of 2.8M emergency department (ED) patients in Indiana found 40% of patients had data at multiple institutions, with all 81 EDs sharing patients in a completely connected network (Finnell, 2011)
- Volume of information can be challenging
  - Average pediatric ICU patient generates 1348 information items per 24 hours (Manor-Shulman, 2008)

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Most important need may be changing healthcare system

- US healthcare system still mostly based on fee for service model – little incentive for managing care in coordinated manner
- Informatics tools can help in care coordination (Dorr, 2007; Dorr, 2008)
- Primary care medical home (PCMH) might be first step to improving value and providing incentive for better use of data (Longworth, 2011)
- Affordable Care Act (ACA, aka Obamacare) implements accountable care organizations (ACOs), which provide bundled payments for conditions (Longworth, 2011)

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Need for skilled clinicians and informaticians

- Knowledge of informatics essential for data-rich, information-driven future – both for clinicians as well informatics professionals (Hersh, 2010)
- 21st century physicians need skills, not only in using EHRs and knowledge sources, but the full range of vision in the IOM *Best Care, Lower Cost* report (Hersh, 2013)
- For informatics professionals, this may be aided by coming certification, starting with physicians (Shortliffe, 2011)

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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)
  - Training requirements (Safran, 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 home: American Board of Preventive Medicine (ABPM)

Qualifications

- ABPM makes the rules but my interpretations (Hersh, 2013)
- MD degree from LCME-accredited institution
- Current valid license to practice medicine
- ABMS member board certification
- In first five years, one of
  - Practice pathway – minimum of 25% time over 36 months (education/training time counts as half)
  - Non-accredited fellowship – two-year minimum in fellowships offered by approved training programs (such as OHSU)
- After first five years
  - Accreditation Council for Graduate Medical Education (ACGME)-accredited fellowship

Next steps

- ABPM
  - First certification exam to be administered in October, 2013 – registration to open in March, 2013
  - Board review courses coming from American Medical Informatics Association (AMIA)
- ACGME
  - Define criteria for accredited fellowships by 2018
- Institutions like OHSU with existing graduate programs and research fellowships
  - Adapt programs to new requirements

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Conclusions

- A growing body of evidence supports EHR and other IT to improve health and healthcare
- The world is gradually adopting EHRs and other IT
- The next step is to make use of the increasing data through analytics and BI to achieve the learning healthcare system
- There are challenges, but also benefits, to this use data-driven, information-driven evolution
- There are growing opportunities for physicians who want to subspecialize in clinical informatics

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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://www.healthit.gov
- American Medical Informatics Association (AMIA)
  - http://www.amia.org
- National Library of Medicine (NLM)
  - http://www.nlm.nih.gov

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