Information is Different Now That You’re a Doctor

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Session Objectives

- Demonstrate the central role that data and information play in the practice of medicine
- Distinguish between the different aspects of information from a medical professional perspective including efficient and speedy retrieval, analysis of quality, and patient friendliness
- Apply the key issues of data in the electronic health record to its use in data analytics, machine learning, and related areas
- Evaluate the discipline of clinical informatics as it pertains to medicine

Part of (but not limited to) Health Systems Science:


For more information:

- Hoyt and Hersh (eds.), *Health Informatics: Practical Guide*, Lulu.com, 2018
- [https://dmice.ohsu.edu/hersh/whatis/](https://dmice.ohsu.edu/hersh/whatis/)
Information and the new medical student (Shortliffe, 2010)

When I first meet with preclinical medical students, I make a point of asking them what they believe will receive the greatest focus of their attention once they are in clinical practice. The most common response, not surprisingly, is patients, and yet it is clear to experienced practitioners that the correct answer is information—in the service of their patients. The need for information underlies essentially all clinical work: the questions asked during a patient history, the tests ordered, the books read, and the questions asked of colleagues. A key correlate to information is knowledge, that elusive concept that justifies all the years of education and training, and that provides the background sense of what is true that allows gathering and interpreting information appropriately. Clinicians often start with data (e.g., “Mr Jones’ creatinine is 5.2 mg/dL”), those individual elements that combine to allow a synthesis of observations with what is known in order to create summary statements of information (e.g., “Mr Jones has renal failure”).

Information skills are essential for medical practice (Glasziou, 2008)

The search engine is now as essential as the stethoscope

What we know about diseases, diagnosis, and effective treatments is growing rapidly. Today health professionals cannot solely rely on what they were first taught if they want to do the best for their patients. It has repeatedly been shown that clinical performance deteriorates over time. A commitment to lifelong learning must be integral to ethical professional practice. However, the speed of the increase in knowledge—more than 2000 new research papers are added to Medline each day—represents a challenge. The skills needed to find potentially relevant studies quickly and reliably, to separate the wheat from the chaff, and to apply sound research findings to patient care have today become as essential as skills with a stethoscope.
Most of you are “digital natives” but

• Not the same as competence in clinical informatics
• Your relationship with information changes as you become a healthcare professional
• You become responsible not only for “knowing” information, but also
  – Using it to provide better care of patients
  – Leveraging it to improve the healthcare system
  – Protecting privacy and confidentiality of patients
  – Acting professionally with information
• Computer literacy is a prerequisite, not an end

Why is information different now that you’re in medicine?

• Growth of medical knowledge
  – 75 new clinical trials and 11 systematic reviews published each day
    • To say nothing of the basic science, especially genomics
• Medical knowledge no longer the exclusive purview of physicians
  – >80% of all Internet users search for personal health information

  Bastian, 2010; Fox, 2013
Many problems in healthcare have information-related solutions

- Quality – not as good as it could be; slightly more than half of patients get care they should get
- Safety – errors cause morbidity and mortality; many preventable
- Cost – rising costs slowing, but US still spends more and gets less
- Inaccessible information – missing information frequent in primary care

McGlynn, 2003; Schoen, 2009; NCQA, 2010; Kohn, 2000; Classen, 2011; van den Bos, 2011; Smith 2012; Angrisano, 2007; Brill, 2013; Hartman, 2015; Smith, 2005

EHR is more than “charting”

- Physicians must be able to
  - Move from one vendor system to another
  - Effectively use clinical decision support to remind us to things to do and warn us about things not to do
  - Access information from other settings where patient received care through health information exchange
  - Apply data analytics, especially in setting of population health management, to achieve quality, safety, and cost-effectiveness

Siittig, 2008; Kuperman, 2011; Hersh, 2014
Patients want more from us too

- They have access to just about all of the same knowledge resources we can access through the *personal health record* (PHR)
  - And increasingly all of their medical record
- They want to interact with us digitally and want to interact with healthcare the way they interact with airlines, retailers, banks, etc.
- They want a say in how we use their data
- We must educate them in the risks and benefits

Those who pay for care want more accountability from us

- Purchasers (employers, government) and payors (insurers) want assurance that care provided is high-quality and cost-effective
  - *Clinical decision support* aims to help physicians make best choices and avoid errors
  - Growing use of *quality measurement and improvement*
We also have responsibilities around information

- Patients expect us to keep their information private and secure
  - **Health Insurance Portability and Accountability Act (HIPAA)** regulations guide our actions
    - Treatment, payment, and operations (TPO) allowed
    - Other uses require patient to consent

- Our public-facing persona must be professional, especially on social media
EHR also allows many re-uses of patient data

- Use data to improve care delivery
- Healthcare quality measurement and improvement
- Clinical and translational research
- Precision medicine
- Public health surveillance
  - Safran, 2007

Data allows us to implement the *learning health system*

- Unlike other industries (e.g., aviation), medicine does not learn as well from its mistakes
  - Need to move away from culture of blame
  - Many problems based on systems, not individuals
- Growing amount of clinical data in EHR and other systems allow us to learn and improve
  - Can only be done with high-quality and usable information

Smith, 2012
Importance of information goes beyond the EHR

- **Professionalism** – proper use of social media and other public sources of information
- **Telemedicine/telehealth** – providing care when separated by time and/or distance from patients
- **Clinical and translational research** – advancing the knowledge base of medicine
- **Precision medicine** – tailoring diagnosis and treatment more precisely, especially around the patient’s genome

Built on a foundation of data

- We have unprecedented amounts of data, not only from EHR but
  - Patient-collected data, e.g., wearables, tracking, etc.
  - -Omics, e.g., genes, their expression, proteins, microbiome, etc.
- And new techniques to make use of that data
  - **Data science** – “science of learning from data”
  - **Data analytics** – “extensive use of data, statistical and quantitative analysis … to drive decisions and actions”
  - **Big Data** – the four Vs: volume, velocity, variety, and variability
  - **Machine learning** – computer programs that learn from data
  - **Deep learning** – new approaches to machine learning based on neural networks
  - **Artificial (augmented?) intelligence** – computer programs that perform tasks associated with human intelligence

- Kelleher, 2018; Davenport, 2017; NIST, 2015; Hersh, 2018; Donoho, 2015; Esteva, 2019; Topol, 2019; Topol 2019
Machine learning will soon impact clinical practice

- Most success has been with image interpretation
  - Radiology – chest x-rays
  - Ophthalmology – retinal images
  - Dermatology – skin lesions
  - Pathology – breast cancer slides
- But success in other areas
  - Predicting adverse events in hospitals
  - Generating clinical notes from patient and physician verbal interaction
  - Classifying age and gender from retina, electrocardiogram
- Now need to translate basic science into clinical practice
  - Diagnosing diabetic retinopathy
  - Implementing a sepsis prediction rule

Rajkomar, 2018; Rajkomar, 2019; Poplin, 2018; Attia, 2019; Abràmoff, 2018; Shimabukuro, 2019

Clinical informatics

- Part of larger biomedical and health informatics, the field concerned with the optimal use of information, often aided by technology, to improve
  - Individual health
  - Healthcare
  - Public health
  - Biomedical research

Hersh, 2009; Kulikowski, 2012
**Clinical informatics**

- Competence required of all; career opportunities available for some
- Growing number of physicians work in roles such as *Chief Medical Informatics Officer* (CMIO) or others in academia or industry
  - Clinical informatics is now a subspecialty of all medical specialties
- OHSU is a national leader in research and education; MD informatics curriculum probably more advanced than any other medical school
  - [http://www.ohsu.edu/informatics](http://www.ohsu.edu/informatics)

* Hersh, 2010; Detmer, 2014; Hersh, 2017
How is clinical informatics different from data science?

• There is more to using data science in medicine than just number-crunching
• Informatics addresses the larger issues of putting data science into clinical practice

• Payne, 2018

What can you do in clinical informatics?

• Informatics skills are essential to the practice of the 21st century physician
  – You should master informatics just as you master any other clinical skill
• For those interested as a career, plenty of opportunities in medical school and beyond
  – Scholarly projects, electives, and more
  – Advanced study – e.g., graduate degree and/or fellowship
  – Clinical informatics subspecialty
Discussion

- What are the most important issues in medicine for clinical informatics, i.e., at the intersection of medicine and data/information?
- How can we make sure that we attain the most benefit and least harm in our use of information technology in medicine?
- How can and should we engage patients in the use of informatics tools we have discussed today?

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