Informatics Competencies and Education for Non-Informaticians

Topics

• Informatics competence is essential for 21st century clinical practice
• Clinical informatics competencies and education for medical education
• Clinical informatics competencies and education beyond medical education
Information and the new medical student (Shortliffe, JAMA, 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 (eg, “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 (eg, “Mr Jones has renal failure”).

Information skills – essential for practice (Glasziou, BMJ, 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.
Data points per decision increasing
(Stead, Acad Med, 2011)

Most current medical students “digital natives” but

- Not the same as competence in clinical informatics
- Relationship with information changes as they become a healthcare professional
- 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
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.

Part of (more than?) health systems science (HSS)
Well-represented in EPAs for entering residency

- **Entrustable Professional Activity (EPA)**
  - “unit of professional practice, defined as tasks or responsibilities to be entrusted to the unsupervised execution by a trainee once he or she has attained sufficient clinical competence”
  - Olle ten Cate, 2013

<table>
<thead>
<tr>
<th>EPA 1</th>
<th>EPA 2</th>
<th>EPA 3</th>
<th>EPA 4</th>
<th>EPA 5</th>
<th>EPA 6</th>
<th>EPA 7</th>
<th>EPA 8</th>
<th>EPA 9</th>
<th>EPA 10</th>
<th>EPA 11</th>
<th>EPA 12</th>
<th>EPA 13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gather a history and perform a physical examination</td>
<td>Prioritize a differential diagnosis following a clinical encounter</td>
<td>Recommend and interpret common diagnostic and screening tests</td>
<td>Enter and discuss orders and prescriptions</td>
<td>Document a clinical encounter in the patient record</td>
<td>Provide an oral presentation of a clinical encounter</td>
<td>Form clinical questions and retrieve evidence to advance patient care</td>
<td>Give or receive a patient handover to transition care responsibility</td>
<td>Collaborate as a member of an interprofessional team</td>
<td>Recognize a patient requiring urgent or emergent care and initiate evaluation and management</td>
<td>Obtain informed consent for tests and/or procedures</td>
<td>Perform general procedures of a physician</td>
<td>Identify system failures and contribute to a culture of safety and improvement</td>
</tr>
</tbody>
</table>

Clinical informatics competencies and education at OHSU

- Original efforts dating back to mid-1990s
  - Most course directors agreed on value but “no room in my course”
  - Zero-sum game? (photo courtesy of Mark Gosslein, MD)
  - Some small efforts but no coordination
Facilitated by convergence of many things in mid-2010s

- Supportive Dean (late Mark Richardson, MD)
- Arrival of new supportive Senior Associate Dean for Education (George Mejicano, MD) and
  - New education building
  - Planned curriculum overhaul
- AMA Accelerating Change in Medical Education (ACE) grant
  - Four of 11 sites with informatics activities
- HITECH Act
  - Increased EHR adoption
  - Resources from HIT workforce development
- Strong academic informatics department
- Emergence of clinical informatics subspecialty and
  - ACGME-accredited fellowship
  - Visibility in health system and GME

How should we add clinical informatics to curriculum?

- Environmental scan found few explicit examples
- Three models observed
  - Required block block preclinical – short course, noontime lectures by informatics faculty
    - PLUS optional scholarly concentration in biomedical informatics
  - Required block Y4 – one month full time lecture, discussion, lab exercises, by informatics faculty
  - All students, all years, emphasizing data in Y1, decision making in Y2, efficiency, safety, quality in Y3 PLUS optional 1-month elective
Localize to (new) OHSU curriculum

Preclinical phase
• 18 months, 7 blocks
• Integrated basic + clinical

Clinical phase
• 7 Core rotations
• Individualize w/ electives
• Direct patient care

Intersessions
• Back to classroom
• Revisit basic, clinical, and health systems sciences

Curriculum Threads
• Woven throughout 4 years
  • e.g., anatomy, ethics
  • Includes informatics, health systems sciences

Scholarly Project
• Individual deep dives

Different from what we teach informatics students but applicable to all healthcare professional students

Have stood test of time but recent addition of a 14th competency (Hersh and Ehrenfeld, 2020)

Apply machine learning applications in clinical care
  a. Discuss the applications of artificial/augmented intelligence in clinical settings
  b. Describe the limitations and potential biases of data and algorithms
Implementing in OHSU MD curriculum

• New curriculum
  – Organized into blocks with longitudinal threads
    • Fields like informatics best a longitudinal thread
  – Facilitated by innovative room design and active learning
• Informatics in new curriculum
  – Developed set of competencies
  – Delivered in appropriate manners at appropriate times
• Faculty team critical
  – Paul Gorman, MD (thread leader)
  – Fran Biagioli, MD; Jeff Gold, MD; Vishnu Mohan, MD, MS
  – Gretchen Scholl (educational informaticist)
  – Various OHSU Library staff
  – William Hersh, MD (instigator)

Goals of informatics thread

• At end of preclinical time, learners
  – Can access and appraise latest medical knowledge
  – Protect PHI
  – Can access and enter data in EHR
  – Can engage patients with health IT
• By graduation, learners
  – Are competent users of health IT and data to improve patient and population health and improve health systems
Road map from competencies to curriculum

### Informatics Competencies

<table>
<thead>
<tr>
<th>Informatics Competency</th>
<th>CEMM 2 wk</th>
<th>FUND 7 wk</th>
<th>BHD 6 wk</th>
<th>SBM 5 wk</th>
<th>CARE 11 wk</th>
<th>NRB 7 wk</th>
<th>Teaching Duration</th>
<th>Precertify Target Date</th>
<th>Global Experience</th>
<th>Intro sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access Medical Knowledge (2007 Core)</td>
<td>CHME, CHDS, Integrating genomics</td>
<td>Access medical knowledge resources for background reading (translational use of MEDLINE, BMJ sources for factual science)</td>
<td>Most case sessions per block, integrate in every case</td>
<td>Competency in Ask, Access, Appraise</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protect Patient Data</td>
<td>SMMH, Personal health</td>
<td>Access, Access to EHR</td>
<td>Social Media and PHI</td>
<td>Cloud Storage and PHI</td>
<td>Ethical issues</td>
<td>Competency in Protect PHI</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Clinical informatics curriculum

#### Strategies

- **EHR from Day One**
  - Routine part of learning, practice
  - Weekly case info in EHR
- **“Boards or wards” mantra**
  - Preclinical only if needed for the boards or the wards
- Tailor to weekly curriculum content
  - Relevant and necessary
  - EHR data, knowledge sources
- Blend material into weekly content
  - Cotton ball in water glass*
- Spiraling – return periodically to build on earlier material

#### Methods

- **Weekly Clinical Informatics Pearls**
  - Incremental skill building
- **Clinical Skills Labs**
  - Combine skills into clinical tasks
- **Traditional large group lectures**
- **Embedding and stealth teaching**
  - Informatics assessments
    - Weekly homework, SimLab OSCEs
- **Enrichment and Electives**
- **Clinical Experiences applications**
  - Telemedicine, population health
- **Intersession (planned) EPA teach/test**
Lectures

• Plant HSS flag early – establish importance in first block
  – Epidemiology Fundamentals I: Data
  – Health Disparities and Social Determinants of Health
  – System Safety
  – Epidemiology Fundamentals II: Study Designs
  – Value Based Care and Choosing Wisely with Your Patients
• Including clinical informatics
  – *Information is Different Now That You’re a Doctor*
    • Introduce field, key issues, subspecialty
• Other HSS lectures in preclinical curriculum
  – Medical Decision-Making
  – Improvement Science
  – Health System Reform

Pearls

Approach

• Model traditional “Clinical Pearl”
• Focus on discrete skills
• Asynchronous brief video intro and demo
• Integrate into weekly content if possible
  – e.g., get platelet count, learn about thrombocytopenia
• Three main themes
  – Protecting PHI
  – Using EHR (training sandbox)
  – Knowledge resources

Examples

• Knowledge-based Resources within EHR (Mohan)
• Protecting Patient Privacy (Gorman)
• Efficient Chart Review (Biagioli)
• Organizing chart data (Hasan)
• Trending Lab Data (Scholl)
• Using MeSH in MEDLINE (Gorman)
• VisualDx (Derm resident)
• R-Nought and outbreak modeling (example of measles $R_0 \sim 18$)
Blending – cotton ball in a glass* (Howard Silverman, MD; Paul Gorman, MD)

- Stealth teaching
  - Sensitivity and specificity lecture: not much interest
  - Talk on PSA screening: same content, different frame
- Blended session
  - Example: Serology in rheumatology
  - Faculty collaboration key
  - Active learning, application by students
  - Clinical content – rheumatologist led
  - Testing for lupus, RA, vasculitis
  - Health systems content
  - Bayes theorem, ROC curves, etc.

Clinical skills labs (CSLs)

Approach

- Combine discrete skills into clinically meaningful tasks
- Emphasize meaning and use of clinical information
  - Technical skills in service of clinical reasoning, management
- Small group learning
  - Technical support for EHR skills
  - Faculty for clinical perspective
- By clinicians wherever possible
  - Chief residents, clinic faculty

Examples

- EBM—ask, access, appraise, apply
- “How to be a star on the wards”
  - New patient, pre-round tasks
  - EHR prep night before clinic
- Writing clinical notes
  - Organize information to support reasoning
- Clinical Problems, EHR Problem Lists
- Advanced EHR skills
  - Chart hygiene, population health, decision support
Clinical skills important to demonstrate context and relevance

Practice two tasks
1. List clinical problems (Clinical reasoning task)
   - Gather information
   - Sort out findings
   - Recognize relationships
   - Note anomalies
   - Prioritize
   - Use information hierarchy of Evans & Gadd
2. Create EHR Problem List (EHR skills task)
   - Technical constraints
   - Institutional policy
   - EHR system variation

Choice of EHR

- Need to balance principles vs. hands-on
- Had several options, including
  - VA VistA from HITECH funding
  - Indiana Teaching EHR
- Selected Epic for local reasons
  - Four major health systems in Portland, plus OCHIN, use Epic
Some failures – Intersessions

• Intersession approach v1.0 – failed
  – Advanced EHR workshops (with informatics educator)
    • Not useful – students at mixed skill levels, impossible to tailor to everyone
  – Advanced EBM workshops (with librarians)
    • Not useful – redundant and students at mixed skill levels
• Future plans
  – EPA-targeted
    • Training opportunity for early learner
    • Testing opportunity for more advanced learner to qualify for EPA

Assessments

• Aim – assess everything
  – “If there’s no assessment, it’s not curriculum”
• Pearls – weekly assignments part of grade
• CSLs – pair-and-share with rubric; end-of-session deliverables
• CSAs (clinical skills assessments)
  – Laptop-based (EBM, written note)
  – SimLab interact with standardized patient
• Didactics – MCQs on weekly quizzes
• Clinical rotations
  – Telemedicine OSCE, EHR skills, (FM)
  – EBM (IM)
• Intersessions (planned) EPAs
A work in progress...

Challenges

- Variable student background
- Instagram, Facebook, etc. are not computer or informatics savvy
- Deer in the headlights of Step 1
- HSS not perceived to be relevant
  - Backward-facing students – vision of doctoring, stories from seniors
  - Backward-facing faculty – letting go of 20th (or 19th) century
- Technical – EMR not built with student in picture
- Faculty – few possess breadth and depth (and have time)
- Note authorship issues in EHR era
Clinical informatics fellowship also relevant

- OHSU informatics not a “homegrown” EHR informatics program, so little prior involvement in health system
- Positions funded by OHSU, Portland VA, and OCHIN
  - Hospital CEO: “This is more strategic than many other things we spend money on”
  - OCHIN recognition of need for clinical informatics capacity
- Puts learners in view of health system
- Makes us part of GME, but some downsides
  - ACGME application and bureaucracy time-consuming
  - Fellows postponed from some sites due to Medicare “clock” starting date
  - Houseofficer union removed them from some strategic activities

Clinical informatics education for others – calibration and synergy

- Biomedical and health informatics students
  - OHSU Biomedical Informatics Graduate Program
  - NLM T15 and Clinical Informatics Fellowship Programs
- Biomedical science graduate students
  - OHSU Basic Science PhD Programs
- Undergraduate college students
  - Health Informatics course in OHSU-Portland State University School of Public Health
- Continuing education
  - 10x10 – OHSU original and largest course
  - Annual Update for informatics professionals, including physicians needing CME or MOC-II
Informatics – a field of global truths

Thank You!

William Hersh, MD
Professor and Chair
Department of Medical Informatics & Clinical Epidemiology
School of Medicine
Oregon Health & Science University
Portland, OR, USA

Email: hersh@ohsu.edu
Web: www.billhersh.info
Blog: https://informaticsprofessor.blogspot.com/
Twitter: @williamhersh