A Quarter-Century of Innovation in Informatics Education at OHSU: History and Lessons Learned

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References


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Disclosures

• No relevant financial or commercial interests or disclosures to report

• That said, I teach informatics for a living
Learning objectives

• Define the field and sub-areas of biomedical and health informatics
• Describe competencies in informatics for different learners
• Discuss the OHSU informatics educational programs
• Describe the lessons learned from 25 years of experience
• Demonstrate examples of scholarship emanating from our work

Outline

• Definitions of biomedical informatics and related topics
• Competencies for diverse learners
• Accomplishments of OHSU informatics educational program
• Lessons learned
What is biomedical/clinical/health informatics (Hersh, 2009)?

- *Biomedical and health informatics* is the field concerned with the optimal use of information, often aided by technology, to improve individual health, healthcare, public health, and biomedical research.
  - Informatics applied in a more focused domain is *{X}* informatics, e.g., nursing, dental, pathology, primary care, etc.
- Practitioners of informatics called *informaticians* (sometimes *informaticists*)

Informatics has an “adjective problem” (Hersh, 2009)

- Imaging Informatics
- Research Informatics
- {Clinical field} Informatics
- Consumer Health Informatics
- Bioinformatics (cellular and molecular)
- Clinical (or Medical) Informatics (person)
- Public Health Informatics (population)
- Legal Informatics
- Biomedical and Health Informatics
- Chemoinformatics

Informatics = People + Information + Technology
Informatics is a core competency for health professionals

- According to Institute of Medicine, modern healthcare professionals must have competence in informatics as part of larger goal to provide patient-centered care (Greiner, 2003)
- Informatics competence is not just computer literacy
  - The “Google generation” does not necessarily have good information skills (CIBER, 2008)
- Clinical informatics is a core domain of “health systems science” (Skochelak, 2017)

Important to medicine is clinical informatics

- In 2011, clinical informatics approved by ABMS as first subspecialty of all specialties (Detmer, 2014)
  - Administrative home is American Board of Preventive Medicine
- First board exam offered in 2013
  - Over 1400 certified now
- Board eligibility during grandfathering period through initially 2017, now 2022
  - After which only path to board eligibility will be ACGME-accredited fellowship
Informatics is not just about physicians

- Informatics professionals come from all health professions and non-health professions (e.g., computer science, IT, and more)
  - AMIA developing Health Informatics Certification (AHIC) for other health professionals in informatics (Gadd, 2016; Gadd, 2016)
- Informaticians play professional and academic roles in all missions of healthcare organizations, industry, and academia
  - Research, education, and operations

Diverse competencies for diverse roles

- Informaticians
- Clinicians
- Researchers

- But some foundational elements for all
Core competencies of biomedical informatics (Kulikowski, 2012)

<table>
<thead>
<tr>
<th>Competency</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquire professional perspective</td>
<td>Summarize and explain the history and values of the discipline and its relationship to related fields while demonstrating an ability to read, interpret, and critique the core literature</td>
</tr>
<tr>
<td>Analyze problems</td>
<td>Analyze, understand, abstract, and model a specific biomedical problem in terms of data, information and knowledge components</td>
</tr>
<tr>
<td>Produce solutions</td>
<td>Use the problem analysis to identify and understand the space of possible solutions and generate designs that capture essential aspects of solutions and their components</td>
</tr>
<tr>
<td>Articulate the rationale</td>
<td>Defend the specific solution and its advantage over competing options</td>
</tr>
<tr>
<td>Implement, evaluate, and refine</td>
<td>Demonstrate an ability to carry out the solution, to assess its validity, and iteratively improve its design</td>
</tr>
<tr>
<td>Innovate</td>
<td>Create new theories, typologies, frameworks, representations, methods, and processes to address biomedical and informatics problems</td>
</tr>
<tr>
<td>Work collaboratively</td>
<td>Demonstrate the ability to team effectively with partners from diverse disciplines</td>
</tr>
<tr>
<td>Disseminate and discuss</td>
<td>Communicate effectively to audiences in multiple disciplines in persuasive written and oral form</td>
</tr>
</tbody>
</table>

Competencies for clinical informatics professionals (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
In reality, applicable to all healthcare professional students.

(Hersh, 2014)
Accomplishments of OHSU informatics education program

• Graduate program
• NIH training grant
• Clinical informatics fellowship
• Use of distance learning
• Medical student education
• Education for other learners

Biomedical informatics graduate program

• First program was Master of Science, launched in 1996
• Current degree and certificate programs (Hersh, 2007)
  – PhD – since 2003
  – Two master’s degrees
    • Master of Science – first program
    • Master of Biomedical Informatics – “professional” master’s since 2002
  – Graduate Certificate – since 2001
OHSU informatics – current delivery

<table>
<thead>
<tr>
<th>Degree/Certificate Track</th>
<th>PhD</th>
<th>MS On-campus</th>
<th>MBI On-campus</th>
<th>Grad Cert On-campus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Informatics</td>
<td>On-campus</td>
<td>On-campus On-line</td>
<td>On-campus On-line</td>
<td></td>
</tr>
<tr>
<td>Bioinformatics &amp; Computational Biology</td>
<td>On-campus</td>
<td>On-campus</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In process of some changes:
- From “tracks” to “majors”
- From MBI to Master of Science Without Thesis
- Name changes to reflect evolution of field
  - Health & Clinical Informatics
  - Bioinformatics & Computational Biomedicine

OHSU informatics – by the numbers

<table>
<thead>
<tr>
<th>Degree/Certificate</th>
<th>Total</th>
<th>BCB</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctor of Philosophy</td>
<td>24</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>Master of Biomedical Informatics</td>
<td>206</td>
<td>14</td>
<td>192</td>
</tr>
<tr>
<td>Master of Science</td>
<td>88</td>
<td>17</td>
<td>71</td>
</tr>
<tr>
<td>Certificate Program</td>
<td>420</td>
<td>0</td>
<td>420</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>738</strong></td>
<td><strong>37</strong></td>
<td><strong>701</strong></td>
</tr>
</tbody>
</table>

Where domestic online students live

738 degrees and certificates awarded to 666 people since 1998

International collaborations in:
- Egypt
- Argentina
- Singapore
- Thailand
- And many international students coming to or accessing courses from OHSU
Training grant and clinical fellowship – family of fellows

• NIH/National Library of Medicine training grant continually since 1992
  – Currently funds 9 predoc (PhD) and 4 postdoc trainees
  – Renewed in 2017 for 6th five-year cycle
    • Including 2 trainees funded by NIEHS

• ACGME-accredited Clinical Informatics Fellowship since 2015
  – Among first 4 programs launched (Longhurst, 2016)
  – Knowledge learning from graduate courses
  – 5 other fellowship programs using our online courses

Success also due to use of distance learning

• Growing interest led to launching of first online course in 1999 (Hersh, 2001)
  – BMI 510 – Introduction to Biomedical Informatics

• Next developed credentials
  – Graduate Certificate
    • 8-course subset of master’s
  – Master of Biomedical Informatics
    • Professional master’s, differing mainly in
    • On-line, with requirement of 2 on-campus short/hybrid courses
Use of distance learning (cont.)

• Has also enabled repackaging of material in continuing education framework – 10x10 (“ten by ten”) course
  – Adaptation of on-line BMI 510
  – Partnership with professional association, AMIA
  – Name derived from goal of educating one physician and nurse in each of 6000 US hospitals by 2010 (Hersh, 2007)
    • Although open to anyone with any background
  – Evaluations showed high satisfaction and, for about 15-20%, pursuit of further education (Feldman, 2008; Williamson, 2011)
  – 1000 completed by 2010; continued interest since, with over 2300 completed to date
  – Translated and revised in Spanish for Latin America (Otero, 2010)

Other educational grants to program

• 2009 – Informatics Training for Global Health training grant by NIH Fogarty International Center in collaboration with Hospital Italiano de Buenos Aires ($1M)
• 2010 –ARRA HITECH Act for workforce and curriculum development ($5.8M)
• 2014 – NIH Big Data to Knowledge (BD2K) Initiative, development of open educational resources ($1M)
• 2015 – Update of ARRA HITECH curriculum ($1M)
Teaching clinical informatics to medical students (Hersh, 2017)

• Based on competencies
• With stated learning objectives
• Delivered by appropriate modality
  – Large group lecture or interactive
  – Small group skills – e.g., EHR, quality measures
  – Clinical informatics pearls (asynchronous 7-15 minute online lecture)
  – Enrichment (optional) – in-depth topics (EHR), clinical informatics careers
• Each with appropriate assessment

Education for other learners

• Clinical and translational researchers
  – Courses in Human Investigations Program (HIP)
  – Mapping of grant-funded curricular modules to competencies
    • https://dmice.ohsu.edu/bd2k/mapping.html
• Basic science graduate students
  – Participating in Creative IDEAS
• Undergraduates at Portland State University
  – Long-standing 3+2 articulation with Computer Science
  – Newer developments with School of Public Health
    • Undergraduate course in health informatics this year
    • Undergraduate degree?
Lessons learned

• Students
• Technology and modalities
• Program and support

Students

• Evolution of an academic field to a professional one
  – Parallels changes in work, e.g., home-grown to commercial EHRs
• First-careers vs. career-changers
  – Entry by many into field, especially from health professions, after initial training
• Virtual community
  – Emerged among students leading to professional connections, common interests, and even (in two instances) marriage
Students (cont.)

• Most students (at least those in our program) prefer courses online
  – Even many who live locally
  – Now difficult to fill classrooms
• Almost all learning can occur remotely
  – All distance learning does not need to be online, e.g., internships and practicums

Technology and modalities

• In most fields, technology replicates classroom
  – Lectures
  – Interaction
  – Assessment
• Technology has improved
  – As has OHSU support of it
Lectures

- Have used voice-over-Powerpoint for many years
- Through successive tools
  - Real Media
  - Adobe Presenter
  - Articulate Presenter
- Adds a somewhat “active learning” approach to lectures
  - Chunked into smaller segments
  - Can start and stop, re-listen
  - Can provide interaction
Articulate Presenter – pros and cons

Pro
• Best tool available
• Works as plug-in to Windows Powerpoint
• Allows narration one slide at a time
• Outputs in standard formats
  – Flash and HTML 5
  – MP3 audio
  – Mobile

Con
• Expensive
• No native Mac version (but runs under Windows virtual machines)

Interaction

• Threaded discussion forums
  – Moderation of discussion essential
• Real-time video
  – Transitioning from Sakai to Cisco Meeting
• Virtual projects
  – Builds team skills but challenges due to other life commitments and time zone differences
Assessment

• Just about anything that can done in person can be done online
• Homework assignments – I’ve come to love multiple-choice questions
• High-stakes exams – virtual proctoring

Program

• Can’t ignore business aspects
• Sakai and its support has been critical
• Response to students also essential
  – Rapid response to problems and inquiries important, even if only acknowledgement with follow-up
  – Program policy is for faculty to respond to all student communications in their courses within 2 business days
Other lessons

• Living the asynchronous life
• Human connection to learners still essential
• Our success has spawned competitors
• Facing competition from new models of learning, e.g., MOOCs

Conclusions

• Faculty and staff of DMICE have provided innovative education and training leading to career success of informatics professionals in diverse jobs and settings
• Of increasing importance is dissemination of knowledge and skills in informatics to other health professionals and the larger public
• Technology is important but understanding of competencies, student needs, and program management is much more critical
• Have also achieved scholarship and grant funding