Resources for Field – Organizations, Information, Education
Resources for field

- Organizations
- Information
- Education
Professional organizations

• AMIA (formerly American Medical Informatics Association)
  – https://www.amia.org/

• Mission
  – AMIA advances the informatics professions relating to health and disease. To this end it advances the use of health information and communications technology in clinical care and clinical research, personal health management, public health/population, and translational science with the ultimate objective of improving health.
Other professional organizations

• Healthcare Information and Management Systems Society (HIMSS) – https://www.himss.org/
• American Health Information Management Association (AHIMA) – http://www.ahima.org/
• Association of Medical Directors of Information Systems (AMDIS) – https://amdis.org/
• Alliance for Nursing Informatics (ANI) – https://www.allianceni.org/
• Public Health Informatics Institute (PHII) – https://phii.org/
• International Society for Computational Biology (ISCB) – http://www.iscb.org/
• Society for Imaging Informatics in Medicine (SIIM) – https://siim.org/
• Association for Computing Machinery (ACM) – https://www.acm.org/
• Medical Library Association (MLA) – https://www.mlanet.org/
Medical and nursing specialty societies (non-exhaustive)

• American Medical Association (AMA) – https://www.ama-assn.org/
• American Nurses Association (ANA) – https://www.nursingworld.org/
• Association of American Medical Colleges (AAMC) – https://www.aamc.org/
• American College of Physicians (ACP) – https://www.acponline.org/
• American Academy of Family Physicians (AAFP) – https://www.aafp.org/
Where does one find more information?

Textbooks


Where does one find more information (cont.)?

Many more textbooks

<table>
<thead>
<tr>
<th>Unit</th>
<th>Textbook(s)</th>
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</table>
More information (cont.), Journals

• Journals of AMIA
  – JAMIA – https://academic.oup.com/jamia
• Methods of Information in Medicine (MIM)
• International Journal of Medical Informatics (IJMI)
• Journal of Medical Internet Research (JMIR)
  – JMIR Medical Informatics
• Journal of Biomedical Informatics (JBI)
• Applied Clinical Informatics (ACI)
  – ACI Open
• BMJ Health & Care Informatics
• Bioinformatics
• Journal of Digital Imaging (JDI)
• Biomed Central (BMC, https://www.biomedcentral.com/)
  – BMC Medical Informatics and Decision Making
  – BMC Bioinformatics
More information (cont.), Meetings

• AMIA meetings
  – Annual Symposium
  – Informatics Summit
  – Clinical Informatics Conference

• Medinfo (biennial)

• Other clinical informatics meetings
  – HIMSS, national meeting and local chapters
  – AMDIS Physician-Computer Connection

• Bioinformatics meetings
  – Pacific Symposium on Biocomputing (PSB)
  – International Society for Computational Biology (ISCB)
More information (cont.), Web sites

• US government
  – HHS ONC – https://www.healthit.gov/
  – Health IT Playbook – https://www.healthit.gov/playbook/
  – ONC HIT curriculum – https://www.healthit.gov/topic/health-it-resources/health-it-curriculum-resources-educators

• Other
  – HealthIT Answers – https://www.healthitanswers.net/
  – Clinfowiki – http://clinfowiki.org
More information (cont.), email lists, blogs, and podcasts

- Email lists
  - HISTalk – [https://histalk2.com/](https://histalk2.com/)
  - HIT Strategist
  - From organizations such as AMIA, HIMSS, AMDIS, etc.

- Blogs
  - Geek Doctor (John Halamka, MD) – [https://geekdoctor.blogspot.com/](https://geekdoctor.blogspot.com/)
  - Healthcare Standards (Keith Boone) – [https://motorcycleguy.blogspot.com/](https://motorcycleguy.blogspot.com/)
  - Health IT Buzz (ONC) – [https://www.healthit.gov/buzz-blog](https://www.healthit.gov/buzz-blog)
  - Informatics Professor (Hersh) – [https://informaticsprofessor.blogspot.com/](https://informaticsprofessor.blogspot.com/)

- Podcasts
    - Women in AMIA
    - AMIA Clinical Informatics Fellows (ACIF) Go-Live
  - Jason Moore, Biomedical Informatics Roundtable, [http://bmipodcast.org/](http://bmipodcast.org/)
  - Dirk Stanley, CMIO Podcast
More information (cont.), acronyms

• Always asked, so here is a list
  – Health IT Answers – [https://www.healthitanswers.net/health-it-key-acronyms/](https://www.healthitanswers.net/health-it-key-acronyms/)
More information: US government reports and plans

• **ONC Federal Health IT Strategic Plan 2020-2025**
  – Reducing burden of use of EHRs (2020)
  – Health IT priorities for research (2020)

• **National Library of Medicine Strategic Plan 2017-2027**
NLM Strategic Plan (2017)

**GOAL 1**
Accelerate discovery and advance health through data-driven research
1.1 Connect the resources of a digital research enterprise
1.2 Advance research and development in biomedical informatics and data science
1.3 Foster open science policies and practices
1.4 Create a sustainable institutional, physical, and computational infrastructure

**GOAL 2**
Reach more people in more ways through enhanced dissemination and engagement
2.1 Know NLM users and engage with persistence
2.2 Foster distinctiveness of NLM as a reliable, trustable source of health information and biomedical data
2.3 Support research in biomedical and health information access methods and information dissemination strategies
2.4 Enhance information delivery

**GOAL 3**
Build a workforce for data-driven research and health
3.1 Expand and enhance research training for biomedical informatics and data science
3.2 Assure data science and open science proficiency
3.3 Increase workforce diversity
3.4 Engage the next generation and promote data literacy
Sampling from the popular press

Sampling from the popular press (cont).


• Johnson, K.B., 2021. *I’m A Biomedical Informatics Expert Now!* Ws Education.


Education and training in informatics

• Inter-disciplinary field
  – Many programs with diverse curricula
  – Programs come in many flavors: clinical, biomedical, health, bio-, nursing, etc.

• Education historically focused on academics but expanded to meet needs and opportunities for practitioners and users
  – Large growth in applied master’s degree programs – about 75-80 in US (Cox, 2021)

• Major funder of programs is NLM, which funds programs to train future researchers at doctoral (PhD) and postdoctoral levels at 16 universities
  – Also funding from other sources, including institutions funding clinical informatics subspecialty fellowships

• After general overview, description of OHSU program given as an example
  – Consult programs’ Web sites for details
Academic programs

• List of US informatics programs on AMIA Web site
  – [https://amia.org/careers-certifications/informatics-academic-programs](https://amia.org/careers-certifications/informatics-academic-programs)

• NLM-funded programs (Greenes, 2022)
Career pathways have diverse inputs and outputs (Hersh, 2009)

- Health care professions, e.g., medicine, nursing, etc.
- Natural and life sciences, e.g., biology, genetics, etc.
- Computer science (CS), IT, and undergrad informatics
- Health information management (HIM)
- Others, e.g., business, library and info. science

There is no single career pathway, ladder, etc.

Jobs in:
- Healthcare systems
- Clinical leadership
- IT leadership
- Biomedical research
- Industry
- Academia

There are many career opportunities in many settings for all tracks
Cardinal rule (formula) of informatics education

What you do when you get out = \( f \left( \text{What you did before you started} + \text{What you learned in the program} \right) \)
Key attributes of OHSU informatics educational program

• Building-block structure
  – Work done at one level can be carried forward to next, i.e.,
    10x10 → Graduate Certificate → MS (thesis or non-thesis)
    → PhD

• Majors
  – Health & Clinical Informatics (HCIN) – original program;
    focused on health and healthcare areas
  – Bioinformatics & Computational Biomedicine (BCB) –
    initial focus on genomics but has expanded to biomedicine
## OHSU biomedical informatics core curriculum domains

<table>
<thead>
<tr>
<th>High-Level Competency</th>
<th>Domain Names for Health &amp; Clinical Informatics (HCIN)</th>
<th>Domain Names for Bioinformatics &amp; Computational Medicine (BCB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apply core concepts of using data, information, and knowledge to advance health and biomedicine</td>
<td>Health &amp; Clinical Informatics</td>
<td>Bioinformatics &amp; Computational Biomedicine</td>
</tr>
<tr>
<td>Apply knowledge of appropriate area(s) of health and biomedicine to informatics practice and research</td>
<td>Health Care</td>
<td>Biomedical Science</td>
</tr>
<tr>
<td>Apply computing skills to biomedical informatics</td>
<td>Computer Science</td>
<td>Computer Science</td>
</tr>
<tr>
<td>Apply quantitative methods to biomedical informatics</td>
<td>Evaluative Sciences</td>
<td>Biostatistics</td>
</tr>
<tr>
<td>Apply people and organizational knowledge to informatics</td>
<td>Organizational Behavior and Management</td>
<td>N/A</td>
</tr>
<tr>
<td>Apply advanced scholarship to biomedical and health informatics</td>
<td>Thesis/Capstone/Dissertation Requirements</td>
<td>Thesis/Capstone/Dissertation Requirements</td>
</tr>
</tbody>
</table>
Application of curriculum to specific programs

• 10x10 program is version of introductory course in clinical informatics track
• Graduate Certificate program focuses mainly on first two domains of HCIN major
  – Biomedical informatics
  – Organizational and management sciences
• Master of Science adds other domains plus either
  – Thesis
  – Capstone or Internship – Non-thesis (formerly MBI)
• PhD program adds specialized research training, cognate area of interest, doctoral seminar, and dissertation
Another view of “building block” approach

<table>
<thead>
<tr>
<th>Master of Science</th>
<th>PhD</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Knowledge Base:</td>
<td>- Knowledge Base</td>
</tr>
<tr>
<td>- Health &amp; Clinical Informatics</td>
<td>- Advanced Research Methods</td>
</tr>
<tr>
<td>- Bioinformatics &amp; Computational Biomedicine</td>
<td>- Biostatistics</td>
</tr>
<tr>
<td>- Thesis or Capstone/Internship</td>
<td>- Cognate</td>
</tr>
<tr>
<td>Graduate Certificate</td>
<td>- Advanced Topics</td>
</tr>
<tr>
<td>- Biomedical Informatics</td>
<td>- Doctoral Symposium</td>
</tr>
<tr>
<td>- Organization and management</td>
<td>- Mentored Teaching</td>
</tr>
<tr>
<td>10x10</td>
<td>- Dissertation</td>
</tr>
</tbody>
</table>

[http://www.ohsu.edu/informatics-education](http://www.ohsu.edu/informatics-education)
# Overview of programs available

<table>
<thead>
<tr>
<th>Degree/Certificate Track</th>
<th>PhD</th>
<th>MS Thesis</th>
<th>MS Non-Thesis</th>
<th>Graduate Certificate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health &amp; Clinical Informatics (HCIN)</td>
<td>On-campus</td>
<td>On-campus</td>
<td>On-campus</td>
<td>On-campus</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>On-line</td>
<td>On-line</td>
</tr>
<tr>
<td>Bioinformatics &amp; Computational Biomedicine (BCB)</td>
<td>On-campus</td>
<td>On-campus</td>
<td>On-campus</td>
<td>N/A</td>
</tr>
</tbody>
</table>
OHSU informatics – by the numbers

International students from: Argentina, Singapore, Egypt, Israel, Saudi Arabia, Zimbabwe, Thailand, China, and other countries

<table>
<thead>
<tr>
<th>Degree</th>
<th>Total</th>
<th>BCB</th>
<th>HCIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grad Cert</td>
<td>483</td>
<td>0</td>
<td>483</td>
</tr>
<tr>
<td>MS</td>
<td>422</td>
<td>71</td>
<td>351</td>
</tr>
<tr>
<td>PhD</td>
<td>38</td>
<td>15</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td>943</td>
<td>86</td>
<td>857</td>
</tr>
</tbody>
</table>
How have OHSU students and graduates done?

• A quarter-century of experience...
• General observation: What people do when they graduate is partially dependent on what they did when they entered, e.g.,
  – Physicians, nurses, public health, etc. draw on their clinical/professional background
  – Information technology professionals draw on their unique background and experience
• Graduates have obtained jobs in a variety of settings, e.g., clinical, academic, and industry
• Some have obtained jobs before finishing the program
Conclusions

• These are exciting times for biomedical and health informatics, with many opportunities in a wide variety of settings
• Attention must also be paid to the professional practice and education of informaticians
• But the main focus of the field must be how to optimally use information and technology properly to advance human health