Resources for Field – Organizations, Information, Education

What is Biomedical & Health Informatics?
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Resources for field

- Organizations
- Information
- Education

Professional organizations

- AMIA (formerly American Medical Informatics Association)
  - 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) – www.himss.org
- American Health Information Management Association (AHIMA) – www.ahima.org
- Association of Medical Directors of Information Systems (AMDIS) – www.amdis.org
- Alliance for Nursing Informatics (ANI) – www.allianceni.org
- Public Health Informatics Institute (PHII) – www.phii.org
- International Society for Computational Biology (ISCB) – www.iscb.org
- Society for Imaging Informatics in Medicine (SIIM) – www.siim.org
- Association for Computing Machinery (ACM) – www.acm.org
- Medical Library Association (MLA) – www.mlanet.org

Medical and nursing specialty societies (non-exhaustive)

- American Medical Association (AMA) – www.ama-assn.org
- American Nurses Association (ANA) – www.nursingworld.org
- Association of American Medical Colleges (AAMC) – www.aamc.org
- American College of Physicians (ACP) – www.acponline.org
- American Academy of Family Physicians (AAFP) – www.aafp.org

Where does one find more information? Textbooks

- Shortliffe and Cimino (eds.), *Biomedical Informatics: Computer Applications in Health Care and Biomedicine (4th Edition)*, Springer, 2014
- Hoyt and Yoshihashi (eds.), *Health Informatics: Practical Guide for Healthcare and Information Technology Professionals (6th Edition)*, Lulu.com, 2014
- Braunstein, *Contemporary Health Informatics*. Chicago, IL, AHIMA Press, 2016.
- Coiera, *Guide to Health Informatics (Third Edition)*. CRC Press, 2014.
- Saba and McCormick (eds.). *Essentials of Nursing Informatics, (6th Edition)*. McGraw-Hill, 2015.
- Sengstack and Boicey, *Mastering Informatics: A Healthcare Handbook for Success*, Sigma Theta Tau International, 2015
- LaTour and Eichenwald, *Health Information Management – Concepts, Principles, and Practice (4th Edition)*, AHIMA, 2013
- Abdelhak et al., *Health Information: Management of a Strategic Resource (5th Edition)*, Saunders, 2015

Where does one find more information (cont.)? Textbooks

- Weaver et al. (eds.), *Nursing and Informatics for the 21st Century*, HIMSS, 2010
- Richesson and Andrews (eds.), *Clinical Research Informatics*, Springer, 2012
- Kann and Lewitter (eds). *Translational Bioinformatics*, PLoS, 2013
- Magnuson and Fu (eds.), *Public Health Informatics and Information Systems* (2nd Edition) , Springer, 2014
- Bui and Taira (eds.), *Medical Imaging Informatics*, Springer, 2010
- Hersh, *Information Retrieval: A Health and Biomedical Perspective* (3rd Edition), Springer, 2009
- Berkowitz and McCarthy, *Innovation with Information Technologies in Healthcare*, Springer, 2012
- Berner (ed.), *Informatics Education in Healthcare: Lessons Learned*, Springer, 2014
- Sarkar, (ed.), *Methods in Biomedical Informatics: A Pragmatic Approach*, Academic Press, 2014
- Lesk, *Introduction to Bioinformatics* (4th Edition), Oxford University Press, 2014
- Reddy and Agarwal (eds.), *Healthcare Data Analytics*, Chapman & Hall, 2015
- Sittig, *Clinical Informatics Literacy, 1st Edition, 5000 Concepts That Every Informatician Should Know*. Academic Press, 2017.
- Skochelak et al. (eds.). *Health Systems Science*. Elsevier, 2017

More information (cont.), Journals

- Journals of AMIA
  - JAMIA – https://academic.oup.com/jamia
  - JAMIA Open – https://academic.oup.com/jamiaopen
- 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)
- Bioinformatics
- Journal of Digital Imaging (JDI)
- Biomed Central (BMC, www.biomedcentral.com)
  - BMC Medical Informatics and Decision Making
  - BMC Bioinformatics

More information (cont.), Meetings

- AMIA meetings
  - Annual Symposium
  - Informatics Summit
  - Clinical Informatics Conference
  - Informatics Educators Forum
- 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 – www.healthit.gov
  - ONC HIT curriculum – https://www.healthit.gov/providers-professionals/health-it-curriculum-resources-educators
  - AHRQ National Resource Center for Health IT – http://healthit.ahrq.gov
  - HRSA Health IT Toolbox – part of AHRQ National Resource
  - US Health Information Knowledgebase – http://ushik.ahrq.gov
- Other
  - HITECH Answers – www.hitechanswers.net
  - Clinfowiki – http://clinfowiki.org
  - Electronic Medical Informatics Repository of Resources (e-MIR^2; de la Calle, 2012) – http://www.gib.fi.upm.es/eMIR2/

More information (cont.), email lists and blogs

- Email lists
  - HISTalk – http://histalk2.com
  - HIT Strategist – http://www.modernhealthcare.com/section/HITSarchive/
  - From organizations such as AMIA, HIMSS, AMDIS, etc.
- Blogs – (many!)
  - Geek Doctor (John Halamka, MD) – http://geekdoctor.blogspot.com
  - Healthcare Standards (Keith Boone) – http://motorcycleguy.blogspot.com
  - Health IT Buzz (ONC) – http://www.healthit.gov/buzz-blog/
  - The Healthcare Blog – http://thehealthcareblog.com
  - Informatics Professor (Hersh) – http://informaticsprofessor.blogspot.com

More information (cont.), acronyms

- Always asked, so here is a list
  - HITECH Answers – http://www.hitechanswers.net/ehr-adoption-2/key-acronyms/
  - AMIA – https://www.amia.org/glossary
  - Shortliffe glossary, which includes acronyms (2014) – http://people.dbmi.columbia.edu/shortliffe/docs/Glossary%20-%204th%20ed.pdf
  - Wikipedia – https://en.wikipedia.org/wiki/List_of_abbreviations_used_in_health_informatics

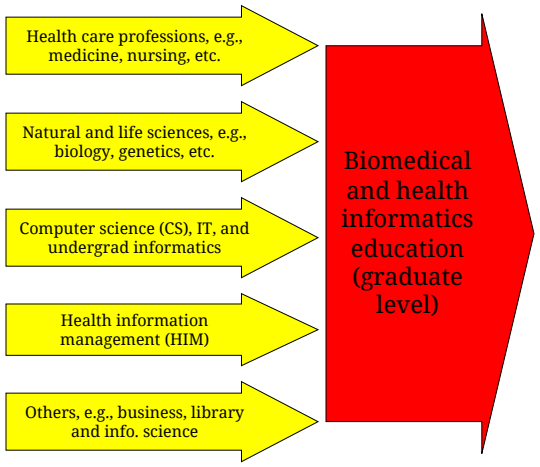
Education and training in informatics

- Since a highly multi-disciplinary field, no standard curriculum or accreditation
  - Many programs with diverse curricula
  - After general overview, description of OHSU program given as an example
  - Consult programs' Web sites for details
- Education historically focused on academics but expanded to meet needs and opportunities for practitioners and users
- Programs come in many flavors: clinical, biomedical, health, bio-, nursing, etc.
- Major funder of programs is NLM, which funds programs to train future researchers at doctoral (PhD) and postdoctoral levels at 14 universities
  - Also funding from other sources, including institutions funding clinical informatics subspecialty fellowships

Educational programs

- List of US informatics programs on AMIA Web site
  - https://www.amia.org/education/programs-and-courses
- NLM-funded programs
  - https://www.nlm.nih.gov/ep/GrantTrainInstitute.html
- Also continuing education programs, such as AMIA 10x10 ("ten by ten")
  - Flagship course of program developed by OHSU
  - https://dmice.ohsu.edu/hersh/10x10.html

Career pathways have diverse inputs and outputs (Hersh, 2009)



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 $= f($ What you did before you started + What you learned in the program $)$

Key attributes of OHSU informatics educational program

- Building-block structure
  - Work done at one level can be carried forward to next, i.e., 10x10 → Certificate → MS/MBI → PhD
- Tracks
  - Clinical informatics – original program; focused on health and healthcare areas
  - Bioinformatics and computational biology (BCB) –focus on genomics but has expanded to biomedicine

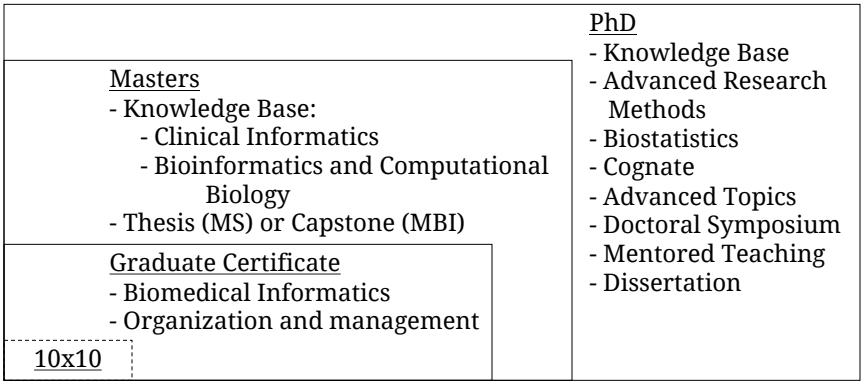
OHSU biomedical informatics core curriculum domains

High-Level Competency	Domain Names for Clinical Informatics (CI) Track	Domain Names for Bioinformatics & Computational Biology (BCB) Track
Apply core concepts of using data, information, and knowledge to advance health and biomedicine	Health & Clinical Informatics	Bioinformatics & Computational Biomedicine
Apply knowledge of appropriate area(s) of health and biomedicine to informatics practice and research	Health Care	Biomedical Science
Apply computing skills to biomedical informatics	Computer Science	Computer Science
Apply quantitative methods to biomedical informatics	Evaluative Sciences	Biostatistics
Apply people and organizational knowledge to informatics	Organizational Behavior and Management	N/A
Apply advanced scholarship to biomedical and health informatics	Thesis/Capstone/Dissertation Requirements	Thesis/Capstone/Dissertation Requirements

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 clinical informatics track
  - Biomedical informatics
  - Organizational and management sciences
- Master's programs add other domains plus either
  - Thesis – MS
  - Capstone or Internship – MBI
- PhD program adds specialized research training, cognate area of interest, doctoral seminar, and dissertation

Another view of "building block" approach



http://www.ohsu.edu/informatics-education

Overview of programs available

Degree/Certificate Track	PhD	MS	MBI	Grad Cert
Clinical Informatics (HCI)	On-campus	On-campus On-line	On-campus On-line	On-campus On-line
Bioinformatics and Computational Biology (BCB)	On-campus	On-campus	On-campus	

OHSU informatics – by the numbers

Degree/Certificate	Total	BCB	CI
Doctor of Philosophy	24	6	18
Master of Biomedical Informatics	206	14	192
Master of Science	88	17	71
Certificate Program	420	0	420
Total	738	37	701

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

How have OHSU students and graduates done?

- Over 20 years 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

Future of the field

- 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