



Welcome to Biomedical and Health Informatics at OHSU

Overview of Field, Department, and Educational Programs

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Overview

- Biomedical and health informatics (BMHI)
- Department of Medical Informatics & Clinical Epidemiology (DMICE)
- DMICE BMHI educational programs
- Discussion and questions



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Who is here today?

- Summer interns
- Some new graduate students
- Possibly, new Clinical Informatics Fellows and National Library of Medicine Fellows
- Anyone else who wishes to be
 - Don't feel obligated to stay if you have heard this talk



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Who are we?

- Department of Medical Informatics & Clinical Epidemiology (DMICE)
 - <http://www.ohsu.edu/informatics>
- One of 26 academic departments in OHSU School of Medicine
- Major foci of department
 - Research
 - Education
 - Leadership and service



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What is biomedical and health informatics (BMHI)?

- I get asked this so often that I keep a Web site
 - <http://informatics.health/>
- And a blog
 - <http://informaticsprofessor.blogspot.com>
- “Biomedical and health informatics (BMHI) is the field concerned with the optimal use of information, often aided by technology, to improve individual health, healthcare, public health, and biomedical research” (Hersh, BMC Med Info & Decis Mak, 2009)



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Other definitions (my italics)

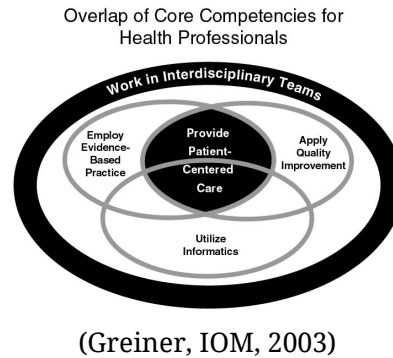
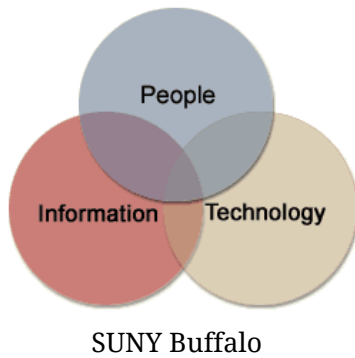
- AMIA: The “interdisciplinary field that studies and pursues the effective uses of biomedical data, information, and knowledge for scientific inquiry, problem solving and decision making, *motivated by efforts to improve human health.*”
 - <https://amia.org/about-amia/why-informatics/informatics-research-and-practice>
- ACGME (clinical informatics): The field 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.*”
 - https://www.acgme.org/globalassets/PFAssets/ProgramRequirements/381_ClinicalInformatics_2020.pdf



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Some additional perspectives on informatics



Fundamental Theorem
(Friedman, JAMIA, 2009)

Goal of informatics is:

$$(\text{Brain} + \text{Computer}) > \text{Brain}$$

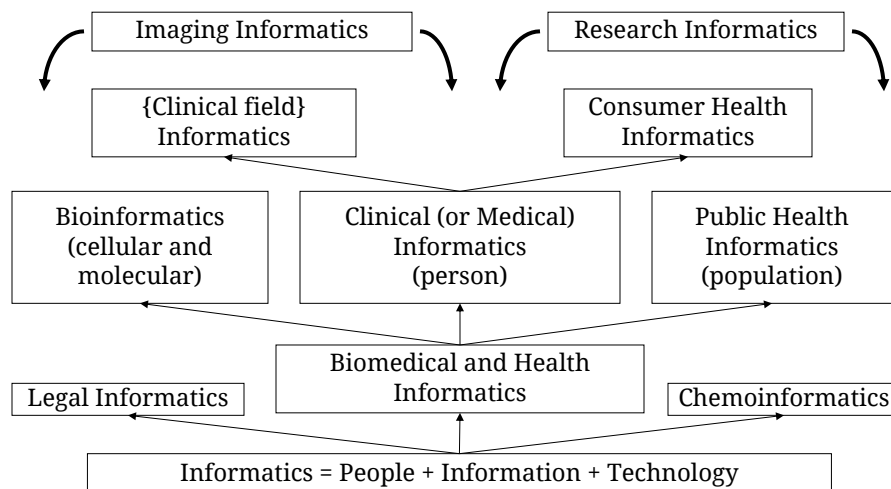
Goal is not:

$$\text{Computer} > \text{Brain}$$



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What are the subareas within BMHI? (aka, its "adjective problem")



(Hersh, 2009; adapted from Shortliffe)



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Some applications of BMHI

- Electronic and personal health records
- Machine learning and artificial intelligence
- Information retrieval (search)
- Decision aids
- Data standards and interoperability
- Re-use of clinical data
- Precision/personalized medicine
- Evaluation of the above

The screenshot shows a clinical data interface. At the top, it displays patient information: "SEVERIN PATIENT", "ID: 530-100-4", and "Primary Care Team: Emergency Medicine, Infectious". Below this, there are tabs for "Clinical Events", "Diagnosis", "Medication", "Vital Signs", and "Lab Results". The "Clinical Events" tab is active, showing a table of clinical events. The table has columns for "Event Type", "Event Date", "Event Time", "Event Location", and "Event Description". The events listed include "Admission", "Discharge", "Transfer", "Consult", "Referral", "Follow-up", "Surgery", "Immunization", "Screening", "Diagnosis", "Medication", "Vital Signs", and "Lab Results".



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Where does BMHI fall short?

- Electronic health record and clinicians – current systems slow work of clinicians, prioritize non-clinical aspects of care, and lead to clinician burnout
 - Clinicians want to read and write the story, which can be at odds with structured data we might want to use for decision support, research, public health, etc.
- Standards and interoperability – systems do not talk well to each other
- Privacy and security – not limited to healthcare, but growing concern
- Bias in data and algorithms



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Department of Medical Informatics & Clinical Epidemiology (DMICE)

- One of 26 departments in OHSU School of Medicine
- Mission is to provide leadership, discovery, and dissemination of knowledge in the areas of biomedical informatics and clinical epidemiology
 - Fulfilled through programs of research, education, and service
- Department leadership
 - William Hersh, MD - Chair
 - Shannon McWeeney, PhD, Head, Division of Bioinformatics & Computational Biology
 - David Dorr, MD, MS - Vice Chair for Clinical Informatics
 - Karen Eden, PhD - Vice Chair for Faculty Development
 - Cynthia Morris, PhD - Vice Chair for Education and Training



MEDICAL INFORMATICS
& CLINICAL EPIDEMIOLOGY



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DMICE is a national leader

- No official rankings, but OHSU informatics program is
 - 1 of 18 programs to have a National Library of Medicine NIH Training Grant for PhD and postdoctoral students
 - Among first 4 programs to develop clinical informatics subspecialty fellowship for physicians (now over 50)
 - Consistent recipient of research funding, appointment to national leadership positions, publication in high-profile journals, etc.
 - Highly accomplished alumni being productive in many different settings
- Clinical epidemiology program similarly successful in areas of evidence-based medicine, systematic reviews, and meta-analysis



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OHSU Biomedical Informatics Graduate Program

- <https://www.ohsu.edu/school-of-medicine/medical-informatics-and-clinical-epidemiology/prospective-students>
- Overall goal of program is to train future professionals, researchers, and leaders in area of biomedical and health informatics
 - Majors focus on different areas of larger field
 - All programs at graduate level, i.e., require a baccalaureate degree
- Diverse students who typically fall into one of two categories
 - “First-career” students more likely to be full-time, on-campus, and from variety of backgrounds
 - “Career-changing” students likely to be part-time, distance, mostly (though not exclusively) from healthcare professions

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Program majors (originally tracks)

- Health & Clinical Informatics (HCIN)
 - Original track, focused on informatics and applied data analytics in health, healthcare, public health, and clinical research settings
- Bioinformatics & Computational Biomedicine (BCB)
 - Focused on data science and other methods applied across omics, imaging, clinical medicine, and public health

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Program faculty and leadership

- Overall program director – William Hersh, MD
- Leadership
 - William Hersh, MD – HCIN
 - Shannon McWeeney, PhD – BCB
 - Nicole Weiskopf, PhD – HCIN
 - Karen Eden, PhD – PhD program
- Over 30 other faculty who teach, advise, mentor projects, etc.

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One of oldest and largest programs in world – established 1996



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

Degree	Total	BCB	HCIN
BCRT	473	0	473
MS	398	64	334
PHD	34	14	20
Total	905	78	827



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Degrees and certificates

- Doctor of Philosophy (PhD)
 - For those who wish to pursue research, academia, or leadership careers
- Master of Science (MS) thesis
 - Research master's, including for those with doctoral degrees in other fields who wish to pursue research careers
- Master of Science (MS) non-thesis
 - Professional master's degree for practitioners and leaders
- Graduate Certificate
 - Subset of master's degree as an introduction or career specialization (HCIN major only)

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Majors, degrees and certificates, and availability

Degree/Certificate Track	PhD	MS Thesis	MS Non-Thesis	Graduate Certificate
Health & Clinical Informatics (HCIN)	On-campus	On-campus	On-campus	On-campus
			On-line	On-line
Bioinformatics & Computational Biomedicine (BCB)	On-campus	On-campus	On-campus	N/A

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Curriculum

- Curriculum in each major for degree programs (master's and PhD) organized into domains, each of which may have courses that are
 - Required
 - Individual competency (“k of n”)
 - Elective
- Core curriculum of degree programs is knowledge base plus additional courses
 - MS thesis = knowledge base + thesis
 - MS non-thesis = knowledge base + capstone (can be internship)
 - PhD = knowledge base + additional advanced work, including dissertation

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“Building block” approach

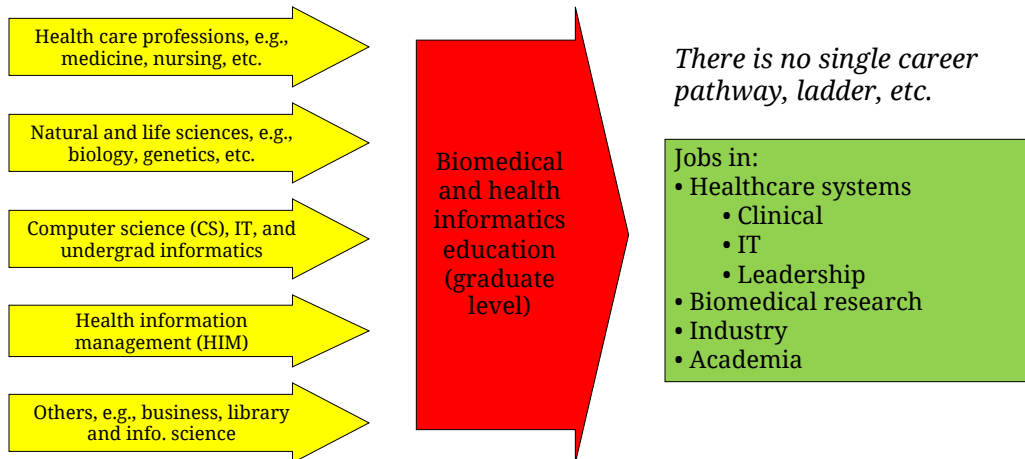
<p><u>Master of Science</u></p> <ul style="list-style-type: none"> - Knowledge Base: <ul style="list-style-type: none"> - Health & Clinical Informatics - Bioinformatics & Computational Biomedicine - Thesis or Capstone/Internship <p><u>Graduate Certificate</u></p> <ul style="list-style-type: none"> - Biomedical Informatics - Organization and management <p><u>10x10</u></p>	<p><u>PhD</u></p> <ul style="list-style-type: none"> - Knowledge Base - Advanced Research Methods - Biostatistics - Cognate - Advanced Topics - Doctoral Symposium - Mentored Teaching - Dissertation
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Informatics career pathways have diverse inputs and outputs



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A growing understanding of the work of informatics professionals

Health Informatics

Domains	Task statements	KS statements
Domain 1. Foundational Knowledge and Skills	NA	31
Domain 2. Enhancing Health Decision-making, Processes, and Outcomes	11	21
Domain 3. Health Information Systems	26	36
Domain 4. Data Governance, Management, and Analytics	17	28
Domain 5. Leadership, Professionalism, Strategy, and Transformation	20	28
Total	74	144

Clinical Informatics Subspecialty (CIS)

Domains	Task statements	KS statements
Domain 1. Foundational Knowledge and Skills	NA	26
Domain 2. Improving Care Delivery and Outcomes	7	28
Domain 3. Enterprise Information Systems	16	33
Domain 4. Data Governance and Analytics	10	27
Domain 5. Leadership and Professionalism	9	28
Total	42	142

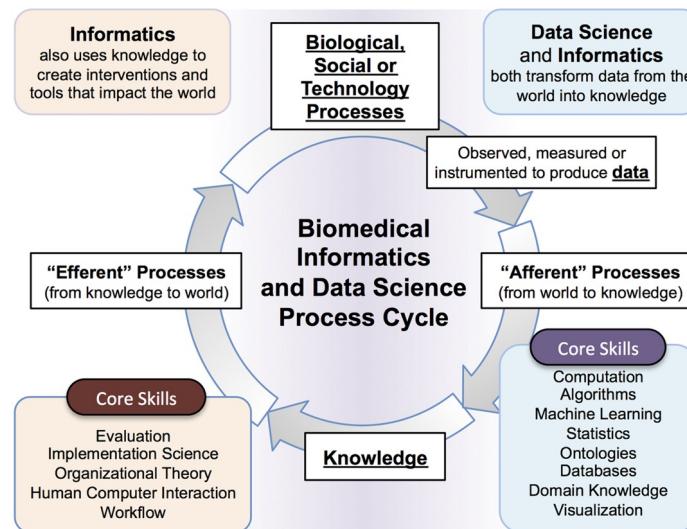
- From 4 (Gardner, 2009) to 5 domains (Silverman, 2019; Gadd, 2020)

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Where does data science fit in? (Payne, JAMIA Open, 2018)



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Key challenges ahead for BMHI

- Improving usability of systems in clinical care, especially EHR
- Integrating omics and other sources of data
- Learning from data while protecting privacy and security
- Integrating new AI into healthcare practice and research while minimizing bias
- Achieving the goals of personalized/precision medicine



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DMICE online

- DMICE seminars
 - YouTube
 - <https://www.youtube.com/c/OHSUInformatics/>
- Web and blog
 - Web
 - <http://www.ohsu.edu/informatics>
 - Blog
 - <http://www.ohsu.edu/blogs/health-data/>
- Social media
 - Twitter
 - [@OHSUInformatics](https://twitter.com/OHSUInformatics)
 - LinkedIn
 - <https://www.linkedin.com/groups/962257/>
 - Facebook
 - <https://www.facebook.com/ohsu.informatics>

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Thank you!

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