Orientation

Biomedical Informatics Graduate Program

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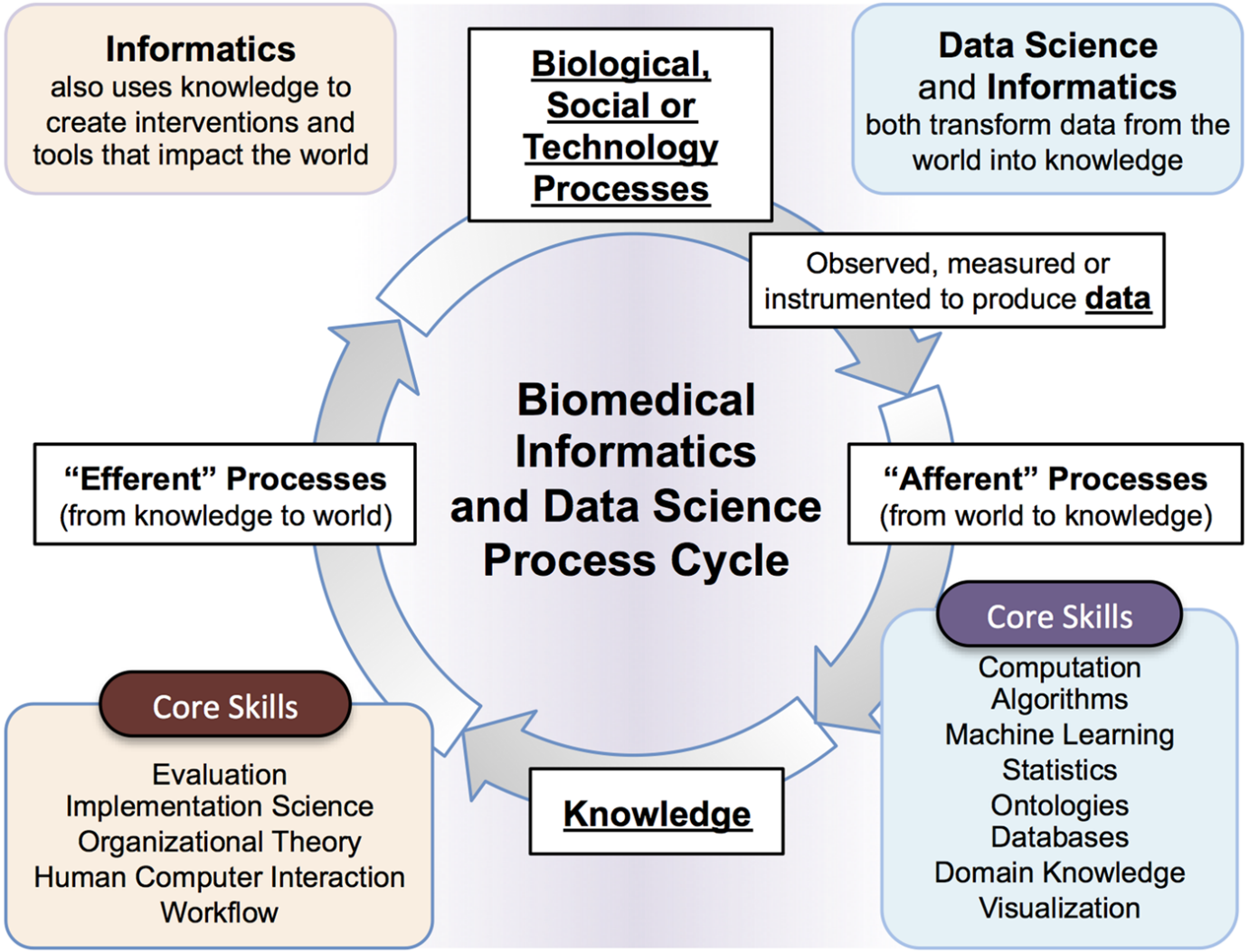
Health & Clinical Informatics (HCIN) major

- Primary goal of HCIN major is to educate the future developers and managers of health care information systems
- Individuals with a variety of backgrounds are provided a strong technical grounding in clinical informatics, health and medicine, computer science, and research methods so that they may assume positions that require a thorough understanding of both information technology and the health care environment

Emerging aspects of HCIN

- Focus shifting from implementing to optimizing HCIN systems
- Applied data science – from "deep divers" to implementers of machine learning, artificial intelligence, etc.
  - Currently revising (rebalancing) curriculum based on information from workforce analysis and Career Development Specialist
- Professional certification
  - For physicians, subspecialty of clinical informatics
  - Advanced Health Informatics Certification forthcoming from AMIA for others

Where does data science fit into informatics? (Payne, 2018)



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Impact of COVID-19

- Many impacts on DMICE research and educational operations – though less than on many other departments
- Opportunities for informatics to contribute, e.g.,
  - Importance of data to guide diagnosis and treatment
    - OHSU a leader in National COVID Cohort Collaborative (N3C) – https://covid.cd2h.org/
  - Rapid deployment of telehealth

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

Curriculum – organized by domains, each of which have specified courses

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

Other programs

- Fellowships
  - Predoctoral and postdoctoral funding from National Library of Medicine and National Institutes of Health institutes since 1992
  - Clinical informatics fellowship for physician board-certification since 2015
- 10x10 ("ten by ten")
  - Continuing education course in clinical informatics
  - Adaptation of on-line introductory course (BMI 510), with option to pursue further study at OHSU
  - Over 2700 have completed course since 2005, with about 10-15% going on to additional graduate study

AMIA 10x10 Health Informatics Online

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Mapping out course of study

- Work with your Mentor and Diane Doctor to plan your individual course of study
  - Student Resources webpage has the program major requirements and forms by degree
  - Class Information webpage has information for courses taking place during the academic year

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Informatics is not a spectator sport

- Many possible “on the ground” activities available, even by virtual means
  - Faculty research projects
  - Experiences in operational settings, including within OHSU Health system
- Can be done as internship or practicum experiences, possibly evolving into more

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AMIA informatics practice workforce analysis

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

(Silverman, 2019; Gadd, 2020)

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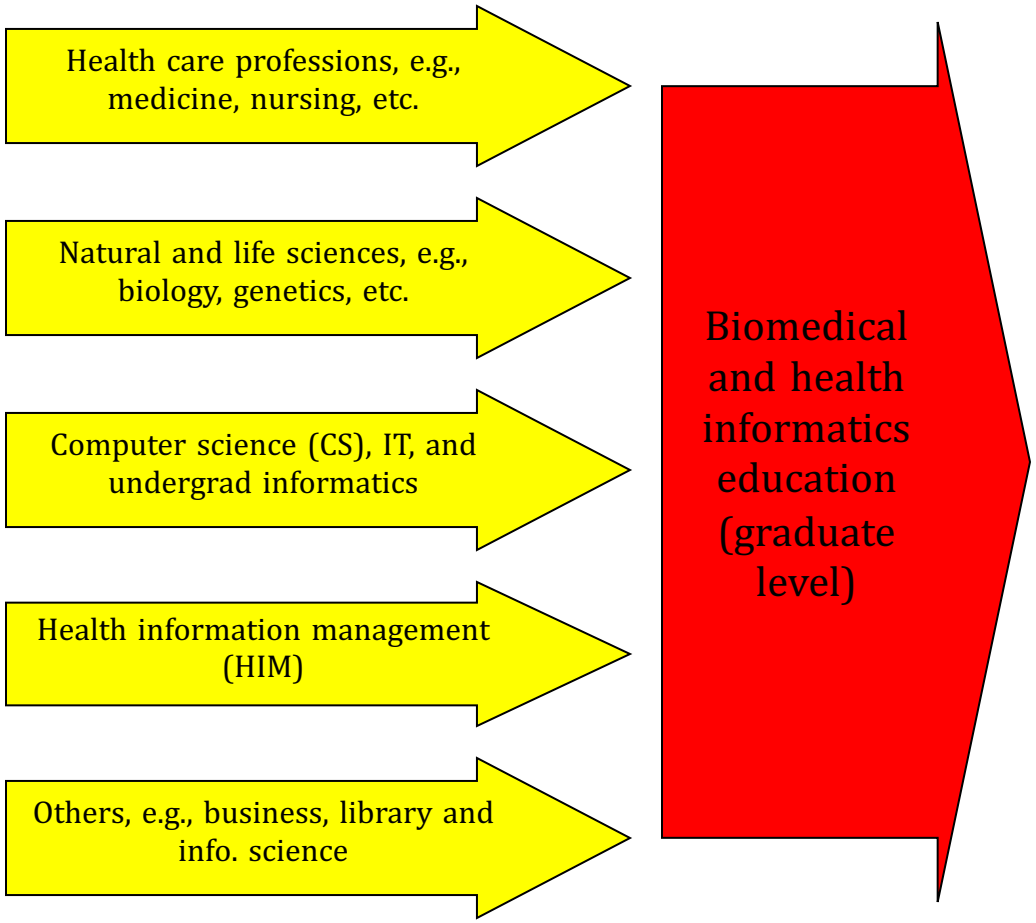
Domains of applied health informatics practice (Gadd, 2020)

- Domain 1: Foundational Knowledge
  - Fundamental knowledge and skills that provide health informaticians with a common vocabulary, basic knowledge across all health informatics domains, and understanding of the environment in which they function.
- Domain 2: Enhancing Health Decision-making, Processes, and Outcomes
  - Support and enhance decision-making by clinicians, patients, and public health professionals; analyze existing health processes and identify ways that health data and health information systems (HIS) can enable improved outcomes; evaluate the impact of HIS on practice; pursue discovery and innovation in HIS and informatics practice.
- Domain 3: Health Information Systems
  - Plan, develop or acquire, implement, maintain, and evaluate health information systems that are integrated with existing information technology systems across the continuum of care including clinical, consumer, and public health domains, while addressing security, privacy, and safety considerations.
- Domain 4: Data Governance, Management, and Analytics
  - Establish and maintain data governance structures, policies, and processes. Acquire and manage health-related data to ensure their quality and meaning across settings and to utilize them for analysis that supports individual and population health and drives innovation.
- Domain 5: Leadership, Professionalism, Strategy, and Transformation
  - Build support and create alignment for informatics best practices; lead health informatics initiatives and innovation through collaboration and stakeholder engagement across organizations and systems.

Clinical informatics subspecialty practice (Silverman, 2019)

- Domain 1: Fundamental Knowledge and Skills
  - Fundamental knowledge and skills which provide clinical informaticians with a common vocabulary, basic knowledge across all Clinical Informatics domains, and understanding of the environment in which they function.
- Domain 2: Improving Care Delivery and Outcomes
  - Develop, implement, evaluate, monitor, and maintain clinical decision support; analyze existing health processes and identify ways that health data and health information systems can enable improved outcomes; support innovation in the health system through informatics tools and processes.
- Domain 3: Enterprise Information Systems
  - Develop and deploy health information systems that are integrated with existing information technology systems across the continuum of care, including clinical, consumer, and public health domains. Develop, curate, and maintain institutional knowledge repositories while addressing security, privacy, and safety considerations.
- Domain 4: Data Governance and Data Analytics
  - Establish and maintain data governance structures, policies, and processes. Incorporate information from emerging data sources; acquire, manage, and analyze health-related data; ensure data quality and meaning across settings; and derive insights to optimize clinical and business decision making.
- Domain 5: Leadership and Professionalism
  - Build support and create alignment for informatics best practices; lead health informatics initiatives and innovation through collaboration and stakeholder engagement across organizations and systems.

HCIN career pathways have diverse inputs and outputs



There is no single career pathway, ladder, etc.

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

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Some job titles and employers

- Product manager
- Data analyst
- Informatics researcher
- Consultant
- Project manager
- Terminology engineer
- Software engineer
- Chief medical informatics officer
- Information systems manager
- Bioinformatician
- Database administrator/architect
- Faculty

- OHSU
- Providence Health System
- Kaiser-Permanente
- OCHIN
- Impact Advisors
- Health Share of Oregon CCO
- Epic
- Cerner
- Intel
- Sutter Health
- National Library of Medicine
- Harvard Medical School
- University of Virginia

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Thank You!

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