



Open House

Biomedical Informatics Graduate Program
October 5, 2019

Department of Medical Informatics & Clinical Epidemiology
School of Medicine
Oregon Health & Science University
Portland, OR, USA

Agenda

- Welcome
- Overview of program and field
- Admissions and Career Services
- Breakout sessions
 - Bioinformatics & Computational Biomedicine (Laderas)
 - Health & Clinical Informatics (Hersh)





Biomedical Informatics

Overview of Program and Field

William Hersh, MD
Professor and Chair
Department of Medical Informatics & Clinical Epidemiology
School of Medicine
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Portland, OR, USA

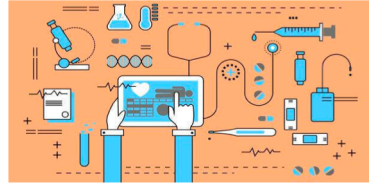
What is biomedical informatics?

- The field concerned with the optimal use of information, often aided by technology, to improve individual health, healthcare, public health, and biomedical research
 - <https://dmice.ohsu.edu/hersh/whatis/>
- More about data and information than technology



Bright picture for biomedical informatics in 21st century

- Value of electronic health record (EHR) for improving the quality and safety of healthcare
- Data science, machine learning, and artificial intelligence to maintain health and improve diagnosis and treatment of disease
- Use of personal health record (PHR), wearables, and other personal information for engaging people in their health and healthcare
- Precision medicine to bring “omics” to health and healthcare

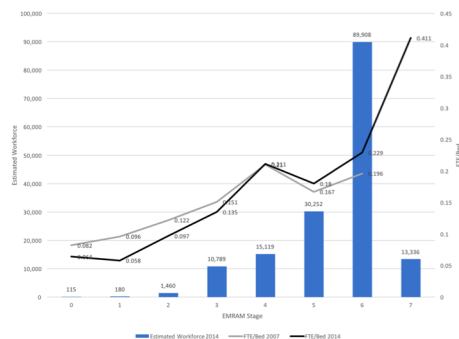


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Many career opportunities

- Recent analysis of healthcare IT workforce shows estimated growth of 19,852-153,114 FTE as EHR adoption increases (Hersh, 2018)
 - <https://doi.org/10.1093/jamiaopen/ooy029>
- Largest amount of opportunity in healthcare but plenty in research, industry, government, etc.



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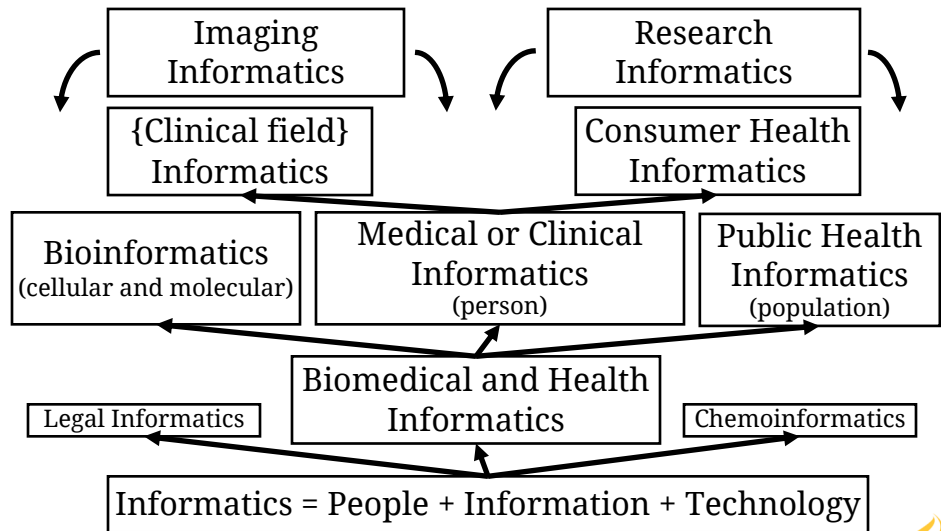
Emerging and declining jobs in Global Health & Healthcare

WORLD ECONOMIC FORUM
Insight Report
The Future of Jobs Report 2018
Centre for the New Economy and Society

Workforce in 2018 and 2022



Many areas of biomedical informatics



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
 - Cynthia Morris, PhD - Vice Chair for Education and Training
 - Joan Ash, PhD - Vice Chair for Faculty Development
 - Shannon McWeeney, PhD, Head, Division of Bioinformatics & Computational Biology
 - David Dorr, MD, MS - Vice Chair for Clinical Informatics
 - Heidi Nelson, MD, MPH - Vice Chair for Clinical Epidemiology



MEDICAL INFORMATICS
& CLINICAL EPIDEMIOLOGY

DMICE is a national leader

- No official rankings, but OHSU informatics program is
 - 1 of 16 programs to have a National Library of Medicine NIH Training Grant for PhD and postdoctoral students
 - 1 of 9 programs funded under the Office of the National Coordinator Health IT Workforce Development Program
 - 1 of 8 programs funded by the NIH Fogarty Center Informatics Training for Global Health Program in collaboration with Hospital Italiano de Buenos Aires
 - 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 also highly successful, especially in areas of evidence-based medicine and comparative effectiveness research



Rooted in Techlandia

<https://joom.ag/YYCe/p18>



TECHLANDIA
A Guide to the Oregon and Southwest Washington Tech Industry

POWER PAIRINGS
INSPIRING & DRIVING CHANGE IN THE REGIONAL TECH COMMUNITY

STATE OF SECURITY
Oregon on the front lines of cybersecurity innovation

VANTECH
Pioneering solutions for the future of technology

HIVEMIND
Offering wisdom to tech job seekers



BIOMEDICAL & HEALTH INFORMATICS

The Intersection of Health & Computing

The field that oversees, integrates, and evaluates data and technologies is called **biomedical and health informatics**. It focuses on putting to work data and information for the benefit of human health and the understanding and treatment of disease.

The last decade has seen substantial adoption of electronic health records by healthcare delivery systems. This has led to use of data to improve healthcare delivery and facilitate biomedical research. There has also been an explosion of data from other sources, from the genome and other biologic sources to individuals tracking health through web applications, mobile devices, and wearables. On top of all this, advances in machine learning and related areas are leading to new insights from data and starting to impact individual health and healthcare.

There are about three dozen academic programs devoted to informatics around the U.S., mostly in academic health science centers. One of the most prominent in the country is right here in the Willamette Forest at Oregon Health & Science University (OHSU). Situated in the Department of Medical Informatics & Clinical Epidemiology (DMICE) in the School of Medicine.

DMICE is also an international leader in informatics education. Its **Biomedical Informatics Graduate Program** is one of the oldest and largest in the field. Over two decades of operation, it has evolved not only its curriculum but also its mode of delivery. The program features two majors:

Health & Clinical Informatics (HCIN) - the original program, focusing on informatics and applied data analysis in health, healthcare, public health, and clinical research settings

Bioinformatics & Computational Neuroscience (BCN) - focused on molecular and deep analytics applied across omics, imaging, clinical medicine, and public health.

This graduate level program, leading to Master of Science and PhD degrees, attracts students from a variety of backgrounds, from healthcare to life sciences to information technology, computer science, and increasingly data science. Since its inception the Biomedical Informatics Graduate Program has awarded 631 degrees and certificates to 746 people, most of whom have gone on to successful careers with healthcare organizations, companies, academia, government, and research institutions.

DMICE also offers continuing education (CEU) credit for various audiences, including 1000 "non by type". In partnership with the American Medical Informatics Association (AMIA) and annual updates to those already established in the field. There has also been increasing demand for DMICE to teach informatics to students in other fields of study, including medical students, nursing students, and biomedical PhD students.

Informatics is a field and career for the 21st century. There are a wide variety of jobs for people with diverse backgrounds, interests, and talents, all of whom can serve the health of society through effective use of information and associated technologies applied to health.

EXPERTISE

Like many successful academic departments, DMICE has a diverse portfolio of research expertise and funded research. Some of the areas of expertise include the following, applied in biomedicine and health:

- Data Science
- Machine Learning
- Informatics Biomedical Research
- Data Quality
- Natural Language Processing
- Image Analysis
- Bioinformatics
- Workflow Analysis

OREGON HEALTH & SCIENCE UNIVERSITY ACADEMIC PROGRAMS ARE KNOWN AROUND THE WORLD FOR INNOVATION & LEADERSHIP IN RESEARCH & EDUCATION

FUNDING

Most of the department's \$13 million in annual research funding comes from agencies of the federal government, including the **National Library of Medicine**, part of the **National Institutes of Health**, and the **Agency for Healthcare Research and Quality**. Increasing amounts of funding come from industry, including software companies, device manufacturers, and pharmaceutical companies. In addition, DMICE participates in local initiatives such as the **Oregon Enterprise Blockchain Venture Studio** and the **Portland Innovation Quadrant**.



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Other relevant DMICE happenings

- Many research opportunities
 - DMICE receives ~\$10 million in grant funding annually
 - Grants funded through NIH (including NLM), AHRQ, ONC, NSF, State of Oregon, companies, and professional societies
- Academia-industry partnerships
 - Research and educational instances of Epic EHR
 - Collaborative research with Alnylam, IMO, and others
 - Participant in Oregon Blockchain Incubator
- Revision of curriculum to enhance data science/analytics
 - Curriculum funding projects from NIH and ONC



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Collaboration with others

OHSU to pioneer digital health
innovation for the benefit of
patients nationwide

© October 03, 2017 Portland, Oregon

Downloads

OHSU has been awarded two grants totaling \$62 million from the National Center for Advancing Translational Sciences, part of the National Institutes of Health, to support the use of health data, algorithms and information systems to bridge basic science and clinical research.

The newly awarded grant provides OHSU with \$25 million over five years to establish and lead the new National Center for Data to Health, or CD2H, which aims to foster collaboration across more than 50 premier medical research institutions within the prestigious Clinical and Translational Science Awards, or CTSA, network.

research.

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Related

Translational research
institute at OHSU
receives \$37 million



Other relevant OHSU happenings

- OHSU MD curriculum revision – DMICE playing major role in adding clinical informatics
 - Also notable national leadership role through AMA Consortium for advancing medical education
- Oregon Clinical and Translational Research Institute (OCTRI) – core funding (including informatics)
- Knight Cancer Institute – funded with \$1B in philanthropy from Phil Knight and others
- OHSU 2025 strategic planning
 - Initiative of new President, investing in future



OHSU Biomedical Informatics Graduate Program

- <http://www.ohsu.edu/informatics/>
- 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 faculty and leadership

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

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Program majors (formerly 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 methods and deep analytics applied across omics, imaging, clinical medicine, and public health

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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 Major	PhD	MS thesis	MS non- thesis	Grad Cert
HCIN	On- campus	On- campus	On- campus On-line	On- campus On-line
BCB	On- campus	On- campus	On- campus	

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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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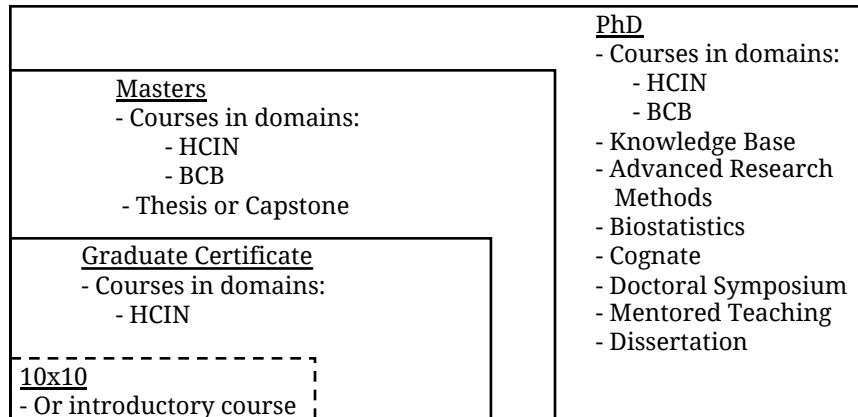
Curriculum – organized by domains, each of which have courses

High-Level Competency	Domain Names for HCIN Major	Domain Names for BCB Major
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

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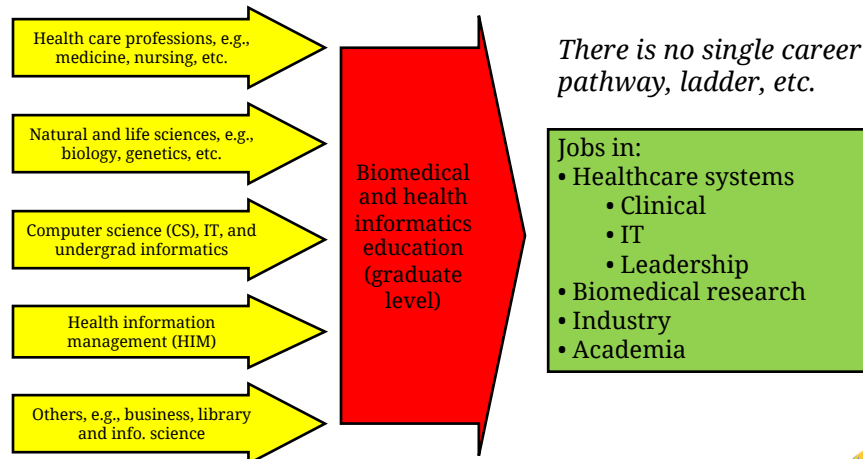
Building block approach



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Informatics career pathways have diverse inputs and outputs



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Other programs

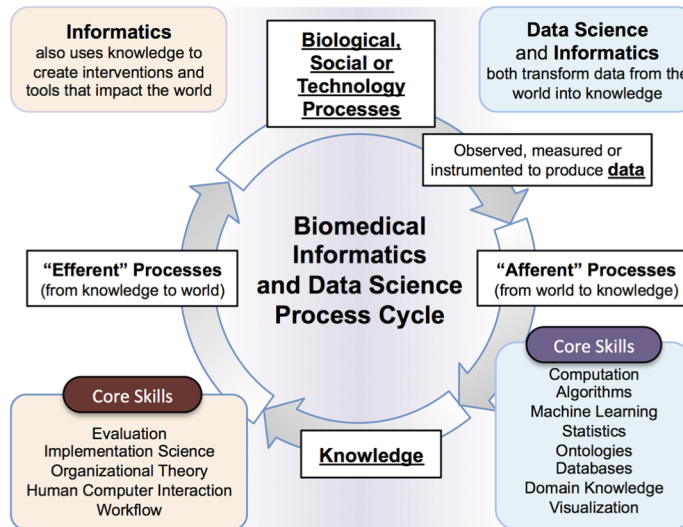
- Fellowships
 - Predoctoral and postdoctoral funding from National Library of Medicine and National Institutes of Health institutes since 1992
 - Clinical informatics fellowship for physician board-certification started in 2015
- 10x10 ("ten by ten")
 - Continuing education course in clinical informatics
 - Adaptation of on-line introductory course (BMI 510), with option to pursue further study at OHSU
 - Nearly 2500 have completed course since 2005, with about 10-15% going on to additional graduate study



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



OHSU informatics program provides value

- For tuition and fees comparable to other programs, get
 - Cutting-edge curriculum based on solid foundation
 - Faculty who are international leaders in research and practice
 - Internship/practicum experience
 - Career development and advising
 - Connections to industry and others



Alumni – 831 degrees and certificates awarded to 753 people



International students from (among others):
Singapore, Thailand, Argentina, Egypt, Israel,
Saudi Arabia, Zimbabwe, China, and more

Degree	Total	BCB	HCIN
Graduate Certificate	455	0	455
Master's (any)	348	46	302
PHD	28	9	19
Total	831	55	776



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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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Current enrollment

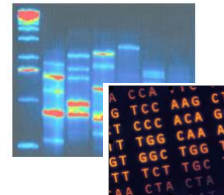
Degree/ Certificate	Major	BCB	HCIN	Total
PhD		12	5	17
MS Thesis		16	3	19
MS Non-Thesis		1	34	35
Graduate Certificate		N/A	24	24
Total		29	66	95

(Does not include late registrants or those on Leave of Absence)

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DMICE online



- DMICE seminars
 - YouTube: <https://www.youtube.com/channel/UCCekPERb6i3xXEDQxwlCeIA>
- Web and blog
 - Web: <http://www.ohsu.edu/informatics>
 - Blog: <http://www.ohsu.edu/blogs/health-data/>
- Social media
 - Facebook: <https://www.facebook.com/ohsu.informatics>
 - Twitter: [@OHSUInformatics](https://twitter.com/OHSUInformatics)

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Thank You!

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Health & Clinical Informatics Major

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Health & Clinical Informatics major

- Primary goal of clinical informatics 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

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Health & Clinical Informatics major

- Required courses in
 - Biomedical informatics
 - Healthcare
 - Computer science
 - Organization and management sciences
 - Evaluation
- Additional work depending on program
 - Capstone (MS non-thesis)
 - Thesis (MS thesis)
 - Advanced courses and dissertation (PhD)

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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

(Silverman, 2019; Gadd, forthcoming)

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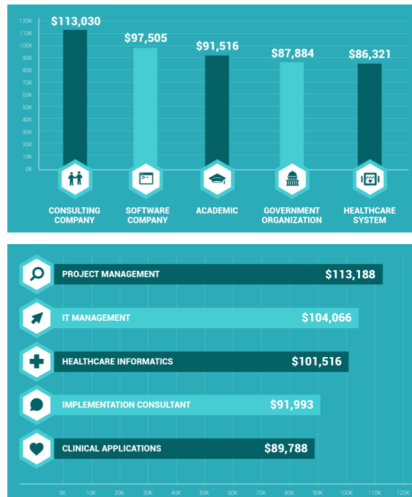
Applied health informatics professionals (Gadd, forthcoming)

- Develop, implement, manage and evaluate health information systems
- Manage and analyze data to support decisions related to individual health, population health, and organizational performance
- Strategize, innovate, and envision advancements in health information systems and data analytics
- Lead organizational changes in technology, practice, and culture required for implementation of the envisioned advancements
- Strengthen the practice of health informatics and the health informatics workforce through mentoring, research on best practices, participation in standards development, and/or participation in policy development for advancement of health information systems, health data analytics, and the health informatics workforce

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Plenty of high-paying jobs in clinical informatics



Source:
HealthITJobs.com

Even higher for some:

- Data analytics
- Physicians
- High-end leadership

