

# HIMSS Physician Community



transforming health through information and technology™



## New to Medical Informatics Resource Guide

Thought  
Leadership

Member  
Value

### Purpose

To help HIMSS in its continuing efforts to enable the physician community to profoundly influence the transformation of healthcare through information and technology.

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- Clinical Informatics Highways – On Ramps
- Roles and Responsibilities of Clinical Informaticists and Their Colleagues
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## ➤ Introduction to Clinical Informatics

Clinical informatics is the practice of applying information science to the delivery of health care. Clinical Informaticists seek to improve interactions between people and information systems used in hospitals, ambulatory clinics, and other healthcare delivery areas.

The field of clinical informatics considers data collection, verification, analytics and presentation, using sources including electronic health records (EHRs), picture archiving and communication systems (PACS), and laboratory information systems. Informaticists work in collaboration with healthcare providers, hospital administrators, and information technology (IT) professionals, assisting with strategic planning and the implementation of healthcare applications. They apply their varied expertise in the fields of organizational management, physician relations, and information technology. The American Board of Medical Specialties began certifying clinical informaticists in 2014. The board certifies that a physician has the knowledge and experience to be an effective liaison in a healthcare organization. Clinical Informatics is evolving; physician informaticists will continue to serve a critical role in assuring that information technology contributes toward restoring and establishing health.

We offer this resource guide to assist clinicians interested in learning more about this rewarding field. The purpose of this guide is to create a living document, periodically updated, that provides information and links regarding paths, roles, responsibilities and lessons learned. We hope clinicians new to informatics, those interested in formal training, and experienced clinical informaticists will find something of value in these pages.

## ➤ Clinical Informatics Highway – On Ramps

Clinical informatics touches every area of healthcare. Becoming acquainted with and gaining skills in clinical informatics can begin at any stage of one's career. There is a need for clinical informaticists with backgrounds ranging from non-providers with technical backgrounds to providers with medical expertise. Below are some suggestions for entering the field.

### **Universities – A place to learn about informatics**

Individual courses and bachelor's degree programs are available at many schools. The college years provide a time to focus on basic information, such as definitions of components of informatics and technical aspects. Additional considerations:

- Clinical work, experience with EHR and other vendors, and leadership preparation come later in one's career
- Internships in real life may be available (e.g., exposure to database management/administration and network security may be feasible)
- Internships at medical centers may be difficult to obtain because of regulatory restrictions on access to private health information

## **Bachelor's Degree Programs**

Many universities offer Bachelor of Science (BS) degree in biomedical informatics. While not a prerequisite for entering clinical Informatics, earning this degree provides a thorough technical grounding in the field. Or instead of pursuing a degree, a student may wish to take individual courses of the types listed below.

The curriculum for a BS in biomedical informatics may include:

- Introduction courses
  - Bioinformatics
  - General biology
  - Public health
  
- Mathematics and data courses
  - Discrete mathematical structures
  - Statistics
  
- Computer programming courses
  
- Other courses that may be of interest
  - User interface design
  - Networks
  - Data science
  - Information theory (not necessarily programming)
  - Systems analysis
  - Change management
  - Project management

For example, [see Arizona State Temple University's curriculum:](#)

## **Master's Degree Programs**

Some universities offer a Master of Science (MS) in health informatics or a similar degree. While also not required for physicians entering the field, a master's degree has the potential of conferring competitive advantage to those who are able to follow up with a track record of administrative accomplishments.

- Master-level courses are available at some universities
  - OHSU (Oregon Health and Science University) offers biomedical informatics education programs that award degrees according to a combination of onsite and online training
    - <http://www.ohsu.edu/xd/education/schools/school-of-medicine/departments/clinical-departments/dmice/educational-programs/>
  - [University of Illinois offers a similar program](#)

## **Medical schools**

Medical schools offer lectures and occasionally courses on clinical informatics. Medical schools are starting to require every student to have a multi-year mentored research project. A good approach for becoming acquainted with clinical informatics as a field is to work on research that relies upon data extracted from the EHR, laboratory results, and other sources.

## Residencies

- Arizona State University's graduate degree in biomedical informatics. <https://chs.asu.edu/bmi>
- American Medical Informatics Association (AMIA) 10x10 course
- Stanford University, Vanderbilt University, and the University of Utah have informatics as part of their residency programs
- Accessing information and apps/software
- Usability vs. expectations vs. reality
- Residents moonlight during “go live” as a super user or during a big upgrade
  - Create a super-user program
- Involve residents in committee structures
- Use informatics for quality
- American Board of Medical Specialties (ABMS) residents and fellows engage in quality improvement projects for maintenance of certification (MOC)

## Clinical Informatics Fellowship Programs

Entry practice/academia – recommended steps:

- Get experience with vendors/industry (using EHRs in mock practice)
- Consider health IT certificate through the American Association for Physician Leadership course
- AMIA references clinical informatics training programs

## ➤ Roles and Responsibilities of Clinical Informaticists and Their Colleagues

Clinical Informaticists play roles of technical domain experts and liaisons between providers, administrators, IT leadership and staff, and others. No matter what the specific role, informaticists have common responsibilities, including interpreting technical terms for those needing orientation and as a basis for mutual planning. Being knowledgeable about related leadership roles is an important asset for successful clinical informaticists. We list below some functions of chief medical information officers and related roles.

### Clinical Informatics leadership roles

#### Chief medical information officer (CMIO)/Chief health information officer (CHIO)

These officers serve as liaisons with medical staff and executive management in regard to health IT planning and implementation and associated issues, such as:

- Working with physicians and other providers to design, implement and upgrade health IT systems
- Assisting with content development for use in EHRs
- Providing input on policies that affect the use of the EHR
- Order set creation and review, including-electronically reported quality measures and how to capture current workflows
- Evaluating current systems and proposing modifications
- Monitoring systems for adverse events and mitigation efforts
- Addressing quality and patient safety issues
- Evaluating usability and proposing improvements/modifications to workflows
- Assisting with IT strategies/strategic planning; serving as a liaison within the IT governance process

- Government reporting
  - Providing policy recommendations
  - Developing and enforcing standards of operation
  - Making recommendations and examining data on government issues

**Chief research informatics officer** (in some organizations, Director, Research Informatics)

- Suggesting strategic objectives/tactical approaches
- Recommending resources (staff, software, etc.)
- Coordinating data extraction with Institutional Research Board (IRB) approval and grant submission
  - Providing identified and non-identified data (from EHR and other sources) to investigators
- Participating in external advocacy groups
  - e.g., ONC Content Standards Workgroup, helping to advance medical informatics in government

**Chief innovation officer.** The functionality of the Chief Innovation Officer can easily fall under the CMIO role, with the “I” standing for information and/or innovation).

- Evaluate and recommend new technology to the organization
- A Chief Innovation Officer’s Actual Responsibilities

**Vendor CMIO**

- Evaluating usability and proposing improvements/modifications to workflows
- Serving as a liaison between the knowledge of medicine and informatics
- Following government issues and responding to them
- Writing copy for presentations on informatics
- Serving as a liaison to users of the vendor system; assisting with training and Go Lives
- Setting up implementation; managing project implementations
- Performing management responsibilities

**Vendor Consultant** (Physician; related to vendor CMIO role)

- Making onsite visits to clients
- Optimizing vendor system to meet the needs of clients

**Medical App Developer**

**Practicing Physician/Super User**

- Selecting and implementing EHRs
- Making recommendations on modifications or usability fixes in EHRs
- Serving in the role of a physician champion
- Serving as a super user
 

Working as a physician builder on an EHR system to enhance user interface with tools/programming. Some EHRs have an established training program for this work.

**Related Leadership Roles**

**Chief Information Officer**

- Performing administrative/budget responsibilities

- Maintaining infrastructure of the organization
- Contributing to the governance of IT
- Aligning IT strategies to organizational strategies
- Making executive decisions on IT projects and capital planning
- Executing compliance with external entities
- Maintaining privacy and security standards

#### **Chief Medical Officer**

- Directing medical staff issues/human relations
- Evaluating how informatics can help resolve issues in health IT
- Evolutionary role, which may overlap CMIO role

#### **Chief Technology Officer**

- Similar to innovation officer

#### **Chief Quality Officer**

### ➤ **Clinical Informatics - Knowledge Domains**

Clinical informaticists need expertise in or at least an acquaintance with the basics of a number of related areas of knowledge. Dwelling in two worlds, IT and clinical medicine, clinical informaticists need to speak the language of both. As such, they are experts in communicating and creating a bridge between these domains. We list some of the knowledge domains:

- Standard nomenclature
- HIMSS Dictionary (purchase at the HIMSS Bookstore)
- Finance
- Hospital/Acute care
- Implementation strategy
- IT infrastructure
- Organizational governance - Including data governance
- Communication skills and tools
- Project management: Project Management Institute
- Specialty
- Standards
- CPHIMS certification
- AMIA reference site

### ➤ **Careers in Clinical Informatics**

The field of clinical informatics continues to evolve, and with it, the types of careers. Having a successful career relies on achieving a solid base of training and experience, as well as guidance from mentors.

Aspects to consider:

#### **What to look for in a role/job – attention to the individual**

- What are the general categories you would like?
  - Deciding what is the best fit for you
- Understanding your skills and weaknesses

- Board certification in clinical informatics
  - Administered by the American Board of Preventive Medicine to any physician with ABMS certification for all specialties other than pathologists, who sit for the same examination, administered by the American Board of Pathology
  - Until 2023, physicians meeting certain criteria can sit for the examination
  - After 2023, physicians must have completed a fellowship in clinical informatics

### **Where to look for jobs – sites/resources**

- Online job boards
  - AMIA, HIMSS, AMDIS, LinkedIn
- Recruiters
- Specific companies that you are familiar with
- Search by locale
- Networking at conferences and meetings

### **Employment contracts (CMIOs, other positions). The art of negotiation**

- Should you involve a lawyer? If so, how should this be done? Should you or the lawyer negotiate details?
- It is your responsibility to know the details of a contract
- Nothing is written in stone
- What are key details?

### **Contracts for CMIOs**

In general, this list is continuously growing and changing and includes:

- Medical professionals, defined as clinical informaticists
- Physician, physician assistant, nurse, pharmacy, lab, research informatics
- Non-medical IT – defined as IT professionals who are not medically trained but who are involved in the medical field

### **When considering a career in clinical informatics, understanding Job requirements is a key:**

- Knowledge of specific EHR
- Quality assurance
- Meaningful Use
- Licensure Certificate, Master's or Ph.D. in clinical informatics, or headed in that direction
- Management
- Other

### **Job profiles**

- Academic (research, teaching)
- Clinical (CMIO, assistant CMIO, clinical specialists)
  - Hospital
  - Ambulatory
- Commercial (unique field; a vendor related to healthcare)
- Start up (subclass of commercial; nonpaying role)
- Specialty focus
  - Medical specialty
  - Population health
  - Public health

- Research
- Analytics (non-medical IT)
- Quality

### Miscellaneous

- Networking
- Managing your involvement in professional societies
- Setting professional goals
- Moving from a clinical job to a non-clinical job

## ➤ Research within Clinical Informatics

Clinical informatics is accelerating clinical research by the ability to use efficient tools to provide investigators with data extracted from the EHR and other sources. In addition to performing single investigator projects, clinical informaticians can become involved in multi-center studies depending upon participation from organizations within research data networks. Future growth in this area will include linking precision medicine initiatives to clinical phenotypic data. Population health studies analyzing data from large public health databases will provide researchers with new opportunities when clinical informaticians provide the necessary links to data.

### 1. Research Informatics - Infrastructure Needs

- a. Glossary of terms
  - i. Glossary of terms – HIMSS dictionary of health IT terms, acronyms and organizations  
<http://www.ebooks.himss.org/product/himss-dictionary-healthcare-information-technology-terms-acronyms-organizations51050>
  - ii. AMIA glossary of acronyms and terms commonly used in informatics  
<https://www.amia.org/glossary>
- b. Resources – part of organization’s budget
  - i. Servers
  - ii. Staff
    1. Systems reporting specialists: extract data from sources (e.g. EMRs) and upload to targets (e.g. personal databases; multicenter collaborative registries, databases)
    2. Database administrators oversee access to and structure of databases
  - iii. Applications
    1. EMRs (Cerner, Epic, etc.)
    2. Analytic tools (statistical, e.g. SAS)
    3. Data visualization (e.g. Microsoft Power BI)
- c. Participation in planning
  - i. Strategic –
    1. Align with medical practice and organizational planning
    2. Account for links with others, e.g. medical schools, multi-center research consortia
    3. Vision statement; Roadmap document (where are we, where do we want to be in 1 year, 5 years?)
  - ii. Specific research projects: align resources with researchers’ needs by using project management tools and staff
- d. Participation in data governance



- i. Make sure access to data by researchers comply with IRB, HIPAA and other requirements (e.g. data use agreements must be signed by a medical school or private practices when researchers use private practice data, even if de-identified)

## 2. How can a Clinical Informaticist be Involved in Research?

- a. Vignettes
- b. Hypothetical research questions
  - i. New knowledge obtained from quality improvement (QI) projects
    - 1. QI itself is not research – it is the process of decreasing unexplained variance; QI research is the discovery of new knowledge when QI projects are carried out (e.g. discovering that diabetics are less prone to hypertension when a QI project improves level of compliance)
      - a. QI research follows specific publication guidelines:  
<http://www.squire-statement.org>
  - ii. Big Data research: use of streaming data from ICU monitors to develop algorithms to predict when patients are at risk of cardiac arrest
  - iii. Ergonomics/Usability/Workflow design studies
  - iv. Clinical decision support research
- c. Challenges of research in clinical informatics
  - i. Needs good time management, given other responsibilities (esp. clinical care)
    - 1. Research in clinical informatics is a team sport
      - a. Full-time researchers
      - b. Statisticians
      - c. IT staff (e.g. providing network, server support)
    - 2. Best to look for synergies (“biggest bang for the buck”) – how can research projects also generate useful information for hospital operations, and vice versa?
  - ii. Research questions are necessary at the start of a project
    - 1. Hypothesis generating projects characterize a group of patients, looking for distinguishing characteristics that may lead to a question
      - a. e.g. preliminary data shows that non-compliant diabetics who have metabolic syndrome appear to have higher incidence of hypertension, by an initial scatter plot:
        - i. y-axis: blood pressure
        - ii. x-axis: non-compliant diabetics, divided into 2 groups
          - 1. Metabolic syndrome
          - 2. Those without metabolic syndrome
    - 2. Hypothesis testing projects formally compare two populations to each other, using statistical methods, including power calculations
      - a. e.g. formally compare large groups in above example to test for significant differences
- d. Grant opportunities in informatics
  - i. AHRQ, RSNA, specialty societies
- e. Mentoring
  - i. By HIMSS
  - ii. Universities with strong informatics research/curriculum
    - 1. Vanderbilt University
    - 2. University of Utah

3. Stanford University
4. Duke University

### 3. How do patients benefit from research informatics?

- a. Benefit from research findings from above section
- b. Increasing input of structured data from patients will improve health
  - i. Patient Reported Outcome Measurement Information System (<http://www.nihpromis.org/about/overview>)

## ➤ Resources

### Books and Websites

- 1) Biomedical Informatics, 4th Ed., 2014. Edward H. Shortliffe, James J. Cimino, Ed. ISBN 978-1-4471-4473-1
- 2) Health Informatics. Practical Guide for Healthcare and Information Technology Professionals, 6th ed., 2014. Robert E. Hoyt, Ed., Ann Yoshihashi, Assoc. Ed. ISBN 978-1-304-79110-8
- 3) Practitioner's Guide to Health Informatics, 2015. Mark L. Braunstein. ISBN 978-3-319-17661-1
- 4) Project Management for Healthcare Informatics, 2007. Susan M. Houston, Lisa A. Bove. ISBN 978-0-387-73682-2
- 5) The Handbook of Continuing Professional Development for the Health IT Professional, 2017, Ed. Joann W. Klinedinst. ISBN 978-1-1387-2090-9
- 6) Gartner Research
- 7) Clinical Decision Support
  - Jerome Osheroff
    - Improving Outcomes of Clinical Decision Support
    - Improving Medication Use & Outcomes of Clinical Decision Support
  - Raymond Gensinger
    - Analytics in Healthcare: An Introduction
  - AHRQ
- 8) EHR selection, use, implementation/adoption
  - HIMSS EHR Readiness Assessment Toolkit
  - EHR Vendor Selection: the 5 Step Guide
- 9) Bob Hoyt Public Resources (including videos and links)
- 10) Bill Hersh: Informatics Professor Blog
- 11) Don Berwick The Conversation Project

## ➤ Employment

### Job opportunity websites

- [HIMSS Job Mine](#)
- [AMIA Career Center](#)
- [American Association for Physician Leadership](#)

### Journals/Curriculum

- 1) Journals
  - [JAMIA](#)
  - [Health Affairs](#)
- 2) [Partners in E Curriculum](#)
- 3) [TIGER curriculum](#)
- 4) [Clinical informatics fellowship programs](#)
- 5) Professional organizations
  - [HIMSS](#)
  - [IMIA](#)
  - [AMIA](#)
  - [AMDIS](#)
  - [AHRQ](#)
  - [ACP](#)
  - [Institute for Healthcare Improvement](#)
  - [AHIMA](#)

### Project Management Resources

- 1) Project management
  - [Project Management Institute](#)
  - Look at [Project Management SIG @ HIMSS](#) for tool kit
  - [Project Management for Healthcare Information Technology 1<sup>st</sup> Edition](#)

### Get Involved

- 1) [HIMSS Professional Communities](#)
- 2) [HIMSS Special Interest Groups](#)

### **About HIMSS**

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