

# EU\*US eHealth Work Project H2020-SC1-HCO13-2016

*Mapping Skills and Competencies; Providing Access to Knowledge, Tools and Platforms; and Strengthening, Disseminating and Exploiting Success Outcomes for a Skilled Transatlantic eHealth Workforce*

## **Case Study: Training the Health IT Workforce at Indiana University**

Indiana University School of Informatics and  
Computing, Indianapolis, Indiana, United States

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**TITLE:** Training the Health IT Workforce at Indiana University**AUTHOR**

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**ORGANIZATION**

Indiana University (IU) School of Informatics and Computing (SOIC) is located in Indianapolis, Indiana, a city that is a significant hub for innovation in the life sciences and a national model for healthcare in the digital age. Indianapolis is one of the 'Most Wired' healthcare markets in the nation, home to five major technology-ready networks of hospitals and physician practices. Further, Indianapolis is home to the largest health information exchange (HIE) in the U.S. These community resources provide access to patient data with research possibilities that are truly unprecedented. Our community is also home to a health informatics accelerator, which works with entrepreneurs to take their innovative ideas to the market.

The Health Informatics (HI) program at SOIC provides students access to a unique combination of faculty as well as organizational and community resources to enhance learning and research. Faculty are engaged in cutting-edge research on the next generation of health information technology (IT) systems, applications of health analytics and development of technologies to support patients wherever they may need access to HI. Furthermore, the SOIC collaborates with many world-class partners including: IU Schools of Medicine and Nursing, The Regenstrief Institute (with its internationally-recognized research in health services and biomedical informatics), The Richard L. Roudebush VA Medical Center and its Center for Health Information and Communication as well as its human-computer interaction laboratory.

**BACKGROUND**

The American Recovery and Reinvestment Act, signed into law February 17, 2009, included an estimated spending of \$167 billion over ten years for programs supporting efforts to improve health care and modernize its infrastructure. The provisions of the Act are specifically designed to provide the necessary assistance and technical support to providers, enable coordination within and among states, establish connectivity to the public health community and assure the workforce is properly trained and equipped to be meaningful users of electronic health records (EHRs) and health IT.

A recent exploration of health IT job postings revealed a lack of alignment between and within the competencies and skills required by HI related jobs and those presented as outcomes of HI curricula. The American Medical Informatics Association (AMIA) Accreditation Committee (AAC), in collaboration with the Commission on Accreditation for Health Informatics and Information Management (CAHIIM), has been reframing and redefining through an iterative process the standards for graduate education in health informatics [1]. The resulting revisions set forth 10 foundational domains, each with accompanying knowledge, skills and attitudes necessary to succeed as HI professionals in an ever-changing job market. Yet only 24.2% of the proposed competencies for HI graduate education match the demands of the job market.

**STATUS/CURRENT DEVELOPMENTS**

Based on those findings, we propose a training program addressing the workforce needs of qualified health IT workers over the next several years while aligning existing educational programs to create flexible training modalities and new modules that cover the fundamental domain as outlined by the AMIA-CAHIIM collaboration.

It is through re-alignment that we propose to accomplish the following objectives: 1) establish flexible training programs from existing course curricula to prepare a skilled workforce in health IT and Meaningful Use; 2) provide flexible delivery of the curriculum ranging from classroom to on-the job training, from real to virtual meeting times; and 3) generate updated HI curricula through scaffolding competencies.

This proposed training program is not yet funded and is still in the development process.

**ACTIVITIES/MEASURES**

We proposed a module-based flexible workforce training program for perspective HI students. After reviewing our own curriculum, the CAHIIM standards, the International Medical Informatics Association (IMIA) and the Healthcare Information and Management Systems Society (HIMSS) objectives and the job market demands, we proposed to redesign the program content around 21 one-credit modules as reported in Table 1. Most content of the core modules already exists in the current curriculum, only a few need to be developed. The remaining nine credits in the program can be used for specialization tracks within HI. The potential mapping between the course modules and the different tracks are illustrated in Figure 1.

*Table 1. HI Module and competency mapping*

**Legend:** light background (intro modules) to dark background (advanced modules)

#	Module Title	Module Description	Competencies From AAC-CAHIIM
M1	HI theories and methods	An introduction to the theories [Technology Acceptance Model (TAM), Diffusion of innovation, Attention Network Test (ANT)] and methods (ethnography, randomized controlled trials (RCT), case studies) that are used in HI. Introduce sub-domains of HI like public health, human factors, social informatics, clinical informatics	Systems thinking and theory; History of HI; Evidence-based systems
M2	Database theory and database design for health	Inform the design of HI applications from user-data by storing and manipulating large amounts of data in a relational database	Principles of Health Information Systems (HIS) data storage design, including patient-centered
M3	Data retrieval, processing and stats in healthcare	Programming in Python and analyzing health care data with statistical methods like regression, Probability Mass Function (PMF), Cumulative Distribution Function (CDF). Using open data sources, data mining and munging	Programming language(s) (such as Standard Query Language (SQL), Python)
M4	Statistical methods for healthcare data	Introduction of statistical techniques, statistical analytical tools and packages; the applications of statistical analysis of healthcare data, clinical data and imaging data.	Principles of data representation;

M5	Analytics on health data	Analytics skills to select, prepare, analyze, interpret, evaluate and present clinical and operational data for the purposes of improving outcomes (quality, effectiveness, efficiency, safety)	Knowledge discovery; Virtual network applications and storage
M6	Measuring health system performance	Measuring health system performance, existing quality/performance measurement frameworks [Healthcare Effectiveness Data and Information Set (HEDIS)], Analytics maturity model (DELTA), comparing healthcare delivery, attributes of high performing healthcare systems and the IT infrastructure and human capital needed to leverage analytics for health improvement	Quality assessment; HIS assessment methods & tools;
M7	Project management fundamentals	Introduces standard project management concepts and capabilities, in the context of innovative and creative knowledge-work projects involving computers	Project planning and management; Policies and protocols
M8	Project management tools and frameworks	Familiarize and train informatics students in project management (PM) tools, methodologies and best practices employed by highly successful project teams. Students will apply industry standard project management in a framework of productive team dynamics, consumer frame of reference and organizational change	Strategic planning; Change management; Personnel management, negotiation, communication skills, business ethics, leadership and governance
M9	Scientific and Clinical Data Management	Concepts to be introduced include the relational database and semantic data modeling, data collection methods, data integration methods, clinical ontology standards	Management of information systems including life cycle analysis, system design, planning methods and tools
M10	EHR systems background and design	Students analyze the design of existing EHR systems through the example of an open-source platform, OpenMRS. They also evaluate their legal, ethical and regulatory implications of Health Insurance Portability and Accountability Act (HIPAA), Meaningful Use, Health Information Technology for Economic and Clinical Health Act (HITECH), Stark law, antitrust law	Patient rights and associated regulations; Privacy and confidentiality; Assessment of commercial vendor products and software
M11	EHR systems development & implementation	Identify the range of clinical decision support (CDS) tools within the EHR; determine which tool is appropriate for specific situations; analyze how to develop and implement CDS tools to adhere to meaningful use criteria. Describe the processes of developing or selecting an EHR system, preparing and supporting clinicians for system implementation and evaluating system effectiveness	Clinical data and clinical process modeling; Technical security applications and issues; Systems testing and evaluation
M12	Healthcare and Clinical Applications	Introduction of the techniques for knowledge discovery over qualitative and quantitative heterogeneous data in nursing and healthcare and their application in clinical decision-making.	
M13	Data mining and natural language processing in health care	Introduce big data analytics to healthcare and clinical practice from the massive medical text records, and develop tools of clinical decision support and risk management.	Knowledge discovery (such as text and data mining); Natural language processing;

M14	Systems thinking and usability of HIT	Usability Evaluation homework, Clinical Decision Support System (CDSS) Implementation. Clinical Guidelines and Clinical Workflow discussion assignment. Human factors and Computer-Supported Cooperative Work (CSCW) literature on healthcare is discussed and understood.	Human-computer interface; Cognitive support
M15	Decision support and decision making using HIT	Decision Rules and Engines, Ontologies and Data Models. Knowledge management, use of info buttons and decision making in relationship to EHR systems and Computerized Physician Order Entry (CPOE) systems.	Medical decision-making: principles, design, implementation;
M16	Basics of data interoperability	Understand the challenges of interoperability such as technical, syntactic and semantic. Define the challenges of interoperability and assess the needs for interoperability.	Electronic data exchange;
M17	Data standards and terminology	Theory for data standards and development. Assignments ask students to apply that theory to explore successful standards.	Development of healthcare terminologies, vocabularies and ontologies
M18	Epidemiology using clinical repositories	Analyze the distribution of disease and health outcomes in relevant populations of interest (e.g., general population, health system members, patient subgroups) as well as geographic regions and represent data on Maps (Geographic Information System (GIS) tools)	Epidemiology (public health or clinical)
M19	HIE business models and governance models	Students will examine the strategic, organizational, legal, technical and socio-political aspects of HIE initiatives in the United States and abroad. Students will further review the evidence on the impact of HIE services on health care quality, safety, efficiency and cost	Business continuity and disaster recovery; Policy development and documentation; Finance and budgeting and cost-benefit analysis for information systems
M20	HIE value, ethics and technology	Privacy, Security, Confidentiality and Transparency. Infrastructure, Architecture and Data Types. Identity and Location Resolution: Core Technologies for HIE	Health Information technology: systems architecture, database design, data warehousing
M21	Biomedical simulations and personalized medicine	Consumer HI course in which we learn about how technologies are used to deliver healthcare to the public. Includes topics related to the complexities of low, medium and high throughput applications in Technology Management (TM) and powerful solutions to TM data management problems by employing various informatics frameworks	Biomedical Sciences (such as medical terminology, anatomy, physiology, pathophysiology); Personalized medicine

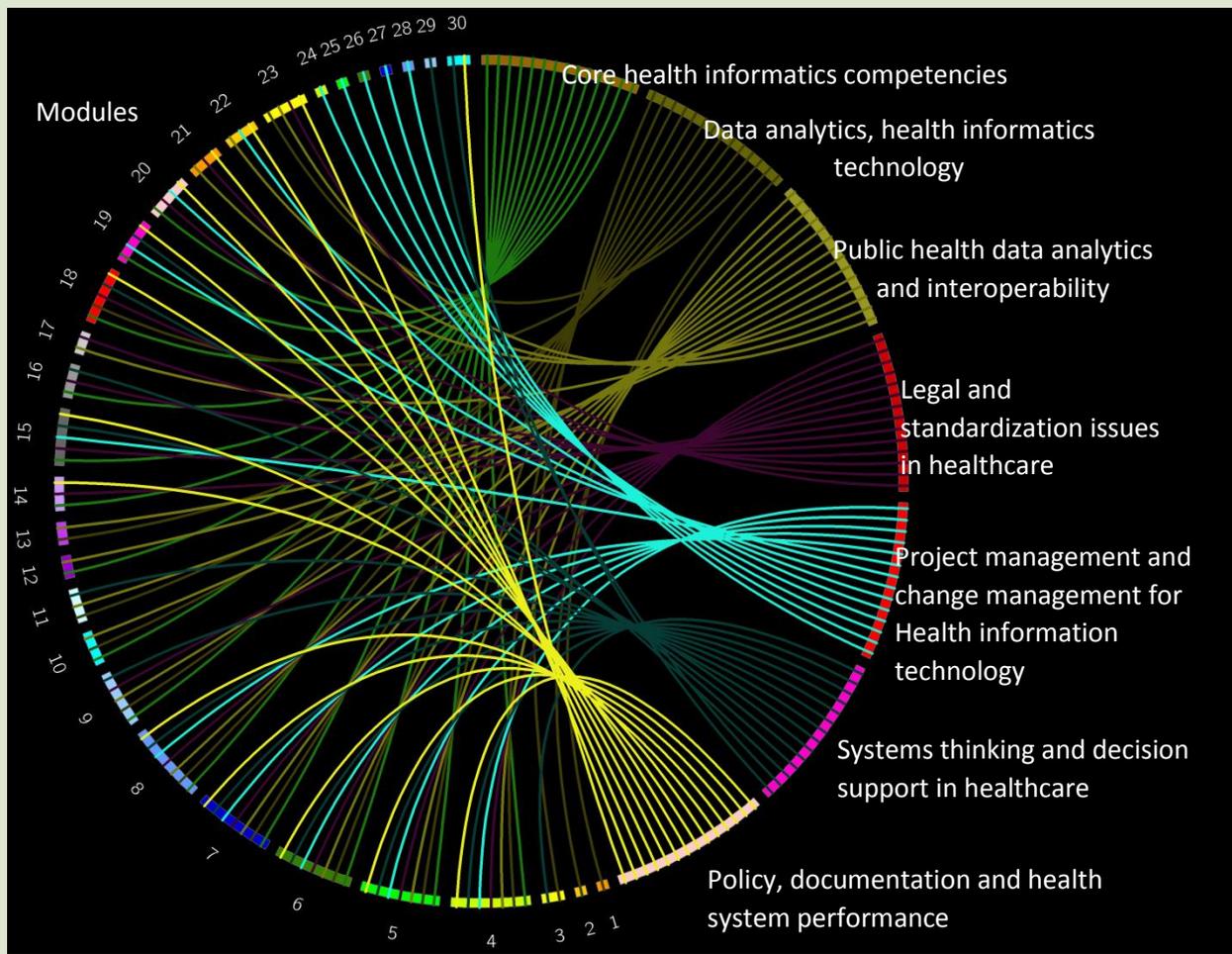


Figure 1 Modules in relation to a degree/track map

*Suggested change: Modules in relation to proposed tracks within the degree*

The targeted trainees:

The basic principle of this proposed training program is to make it available for anyone who needs the training in HI. The curriculum is designed for potential trainees with diverse backgrounds, various education levels and mixed skill sets. Each trainee is required to take the 21 core modules: the core is complemented with elective courses offering more in depth knowledge and skills in a specific practice area of HI such as clinical informatics, privacy and security, data analytics, etc. A specialization track is then chosen based on career goals and educational background.

The course content is competency-driven and modules will be organized in a scaffolding method, which means that students’ progress through the modules order from intro/basic knowledge and skills to advanced knowledge and skills. This approach is proposed to assure that each trainee meets the set program goals upon graduation.

The potential trainees can be:

- **Students from Health Professional programs:** Indiana University-Purdue University Indianapolis (IUPUI) is widely known as the Indiana University system’s “Life and health Science Campus” since we have several Schools and Departments (IU Medical School, IU Dental School, IU Nursing School,

School of Science, IU School of Public Health, etc.) that offer degree programs related to biomedical sciences. Students from these programs are interested and will benefit from added health IT training to enrich their own education and career paths.

- **Professional Health Care Staff Members:** this include staff members in organizations such as Accountable Care Organizations (ACOs), Patient Centered Medical Homes (PCMHs), urban and rural solo practices, community health centers, state HIEs, private and public health care institutions, etc.
- **Health Care Providers:** physicians, nurses and other healthcare professionals who desire training in clinical informatics.
- **Anyone interested in HI Training:** Students who come from other majors and disciplines and wish to enter the healthcare IT field. These range from those who have studied natural sciences as undergraduates to those who have a computer science or engineering undergraduate background.

## CHANGES

The innovation of this training program compared to the traditional way of training:

- One program, different units (for participating academic units and institutions): This training program unifies the faculty and researchers from different academic units to work under the same umbrella of HI. The program aims at 1) updating the existing instructional material to reflect the changes in health information technology and health care delivery and 2) align the revised instructional material with the foundational domains proposed by AMIA-CAHIIM.
- One program, various (for courses to be offered) competency-driven content tracks: Most of the proposed course modules are already covered in our existing courses, with some related information scaffolding over various courses, even in many different academic units. The proposed course module will realign the previous course contents while integrating the evolving health information technologies and practices in health care delivery. The participating faculty have been at the frontier of both research and curriculum development and they are well suited to realign the educational materials adaptable to reflect the current trends in HI science and practices.
- One training, diverse backgrounds (for perspective program trainees): The proposed training responds to trainees with diverse educational background and various professional training needs. From undergraduate (or even less) to graduate students, from clerical staff to nurses and physicians, from computer rookies to skilled programmers; a trainee can always select a challenging and appealing course module offered in this training program. For example, clerical staff working in an ACO can increase their understanding of the care delivery by selecting an introductory module in value based care, while on the other hand, physicians can select from the more advanced modules in CDS.
- One module, flexible delivery (for course offering approaches): To enhance flexibility and increase participation and to meet the individual's training needs, the training program is designed to adjust to multi-modal delivery approaches. The faculty will be supported by an instructional design expert from the Center for Teaching and Learning at IUPUI to explore content delivery methods ranging from face-to-face, to web-based or blended; from one-to-one, to large classroom setting; on campus, to onsite at the place of work. In addition, the trainees have the flexibility to take only those modules of interest to them. In addition, based on the trainee needs and availability, the same course module can be offered as an intensive "short course", which will be delivered in two days (about eight hours per day, a weeklong training of three hours per day). And, as usual, the course can also be attended as a "regular" one-credit modular course throughout the semester (one hour per week for a module).



- One program, widespread degree options: Trainees can opt to attend course modules for a continuing education (CE) credit, to earn an 18-credit HIT certificate (<http://soic.iupui.edu/biohealth/graduate/>) or a 36-credit master degree. The academic degrees have the option for a supervised project in the field of HI, mentored practicum and/or internships. It also may be noted that each credit taken in the training program can be counted toward an academic degree if desired at any time of the program.
- One skillset, many career options (for training program outcomes): Trainees completing this training program will master health IT skills and develop competencies and knowledge in HI for both academic and professional careers. Complementary to the training modules, the SOIC will also provide specialized seminars and workshops, such as a seminar on exploring career development, and offer assistance in job searches.

## RESULTS

The workforce training program sets the stage for a comprehensive and flexible curriculum adaptable to students of different educational backgrounds and employed on various health care settings, providing them with a program that meets individual training needs. It will also establish a truly multi-modal and innovative platform for the delivery of HI educational activities.

This training program provides a flexible solution, flexible in both content and delivery. No matter how diverse the intended program participants are, our proposed training program will provide a rich, adaptable learning experience for their professional career enhancement. Even academic faculty who need to sharpen their skills and knowledge to train future health care professionals will be able to learn what they need through flexible modular courses.

## OUTLOOK/LESSONS LEARNED

HI, while having been in existence for at least 20 years, is still an emerging transdisciplinary field, yet with tremendous potential and promising future. All these characteristics, as well as the diverse student background, add complexity to HI training. Therefore, the flexibility of a competency-driven content delivery and the accessibility to the defined knowledge, skills and attitudes is the key to a successful HI program. In the future, the curriculum design will continue to focus on improving the flexibility of content delivery and aligning to students' long term career goals.

## References

- [1] Commission on CAHIM and AMIA. AMIA Accreditation Committee : Draft For Public Comment, 2016.