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Training Leaders in Health Informatics

Susan H. Fenton, Angela Ross, Debora Simmons

The University of Texas School of Biomedical Informatics, Houston Texas, USA

Abstract

Despite the widespread adoption of electronic health records (EHRs) in the U.S. over the past decade, significant improvements, especially in patient safety, have yet to be realized. This finding, along with health informatics workforce data and an identified gap in the offerings of an educational program, led to a proposed professional doctorate in health informatics. Developed via stakeholder focus groups, the program was approved by the public university system, the state-level educational authority, and the regional accreditation body, with final approval in July 2018. Unique features of the program include a prolonged practice project demonstrating a return on investment, as well as online and face-to-face delivery components. This program aims to develop evidence-based professionals who improve the health of people and populations through the application of health informatics. Applications and interest in the first class are high.

Keywords:
Education, Health Informatics

Introduction

In 2004, President George W. Bush outlined a plan to ensure that most Americans would have electronic health records within the next 10 years. The President believed that better health information technology was essential to his vision of a health care system that puts the needs and the values of the patient first and gives patients the information they need to make clinical and economic decisions – in consultation with dedicated health care professionals [1].

President Barack Obama continued to support President Bush's mandate during his administration, including incentives for implementing electronic health records (EHRs) in the American Recovery and Reinvestment Act [2]. As a result of this, the health informatics industry has flourished with the need for an educated informatics workforce[3]. This workforce is needed to assess, design, implement and evaluate the electronic health record (EHR) and patient care technologies, as well as effectively utilize the data generated; all with the goal of preventing medical errors and providing the information needed to improve human health.

As of 2017, 96% of all U.S. Non-federal Acute Care Hospitals have adopted a certified EHR [4]. Documented benefits of EHRs include enhanced patient care; real-time, multi-user access to the patient record; alerts for medication errors and critical lab values, among others[5]. However, in spite of these benefits of the introduction and widespread use of EHRs in hospitals, medical errors are perceived to have increased and are estimated to be the nation's third leading cause of death[6]. These medical errors also include unanticipated and undesirable consequences from implementing an EHR. In 2016, Johns Hopkins researchers examined four separate studies that analyzed medical death rate data from 2000 to 2008. Then, using hospital admission rates from 2013, they extrapolated that based on a total of 35,416,020 hospitalizations, 251,454 deaths stemmed from a medical error, which the researchers say now translates to 9.5 percent of all deaths each year in the U.S[6]. In March 2019, Fortune magazine published "*Death by 1,000 Clicks"* describing multiple failures of EHRs, with even those who led the national U.S. effort stating EHRs "have not fulfilled their potential."[7]

The health care industry is in need of transformational change in the education required for executive-level health informaticists who practice at the most advanced levels. The 2019 Health Information Management Systems Society (HIMSS) Leadership and Workforce Survey found that 84% of all respondents reported to be in a management role, with 47% associating themselves with an "Executive Management" position[8]. The health informatics executives are an integral part of the health care team, providing the foundational technology infrastructure to support efficient, effective care. The recommendation that health informatics executives practicing at the highest levels should receive doctoral level preparation emerges from multiple factors evident by the expansion of scientific knowledge in health informatics and growing concerns regarding patient safety, the continued need for improved patient outcomes, and quality care delivery.

The 2019 Health Information Management Systems Society (HIMSS) U.S. Leadership and Workforce Survey ranked the following priority needs concerning quality care delivery and health informatics/health IT in health care organizations:

- Cybersecurity, Privacy, and Security
- Improving Quality Outcomes Through Health IT
- Clinical Informatics and Clinician Engagement
- Culture of Care and Care Coordination
- Process Improvement, Workflow, Change Management
- User Experience, Usability and User-Centered Design
- Data Science/Analytics/Clinical and Business Intelligence
- Leadership, Governance, Strategic Planning
- Safe Info and Tech Practices for Patient Care
- HIE, Interoperability, Data Integration and Standards[8]

It is worthwhile noting that leadership and user experience are new to the top 10 in 2019. The health informatics workforce data indicates there is an increased demand for health informatics in several health care delivery models. In 2017, HIMSS noted that efforts to advance clinical IT in non-Hospital Provider environments (ambulatory and long term Post-Acute care facilities) can be challenging when there is no educated, trained, and designated health IT workforce [9]. Both the 2018 and 2019 reports concluded that the influence of executive management health IT professionals continues to expand in organizations[8,10].

The United States has implemented the position of the Chief Medical Informatics Officer (CMIO), as well as the Chief Nursing Informatics Officer (CNIO), in its largest healthcare organizations. For the CMIO, the American Board of Medical Specialties administers the clinical informatics subspecialty exam for physicians[11]. Likewise, the American Nurses Credentialing Center administers an informatics nursing certification, the RN-BC[12]. In the UK, it appears that the position of Chief Clinical Information Officer (CCIO) is emerging[13]. The nursing certification content outline does not include management or leadership skills. The US subspecialty exam includes one item related to leadership needed for fostering change and managing large-scale information projects. The UK CCIO role is proposed as a leadership role with a clinical focus. While there is no doubt of the need for these clinical leadership roles in health informatics, they often do not include the techinical or management background needed for the chief information officer (CIO) or chief technology officer (CTO). In addition, while these clinical roles are essential in care delivery organizations, they may not be found in pharmaceutical or insurance or other health information technology organizations. The advent of digital health in the US and around the world will only expand the types and numbers of organizations engaging in the health informatics field. Effective informatics leaders are needed in all of them.

Therefore, **it is critical that the executive-level health informatics professional is educated and prepared to manage complex organizations across the continuum of care and throughout the healthcare industry**.

In addition to the available workforce data, the University of Texas School of Biomedical Informatics (SBMI) identified a gap in their current educational offerings after multiple applications for the doctor of philosophy degree from industry professionals who could not articulate a research area for their studies. These applicants felt the need to continue their education to a terminal degree, as is the case for the MD, PharmD, DNP, and DPT. However, historically, the only terminal degree option in the informatics field has been the PhD. With all of these issues in mind, a group of applied informatics faculty proposed the development of a practice doctorate, or professional degree, in health informatics (DHI).

Methods

The first step in the development of the DHI was approval of the concept at a faculty retreat. Following this, the task of developing the proposal was assigned to the Associate Dean for Academic Affairs, with assistance of the applied faculty and staff members. The process for public institutions in Texas necessitates several steps with the format of the proposal proscribed in regulation.

Development of the proposal began with submission of a letter of intent to develop a new degree program to the university and The University of Texas System administration. This was followed by the convening of focus groups of Texas Medical Center and other SBMI stakeholders. These stakeholders are persons who mentor SBMI master's degree students for capstone projects or have employed SBMI graduates or are SBMI alumni. Focus groups were held in early 2017 to ascertain whether the proposed program was needed, as well as determine topics that were deemed most important for health informatics executives and managers. Eleven (11) people either participated in the focus groups or were interviewed individually if the focus group meetings were not convenient. The titles of those participating are as follows:

- One Executive Officer with a nursing background from the U.S. Defense Health Agency
- Three Directors of Information Technology, Information Technology Development, and Information Systems Operations from large systems in the Texas Medical Center, respectively.
- One Vice President of Clinical Informatics for a large integrated health care system.
- One Division Director of Clinical Informatics for a multi-state health care delivery system
- One Vice President of Applied Clinical Informatics and Chief Nursing Informatics Officer from a tertiary care system.
- One Executive Director of Clinical Quality Informatics for a multi-hospital system
- One Director of Nursing Operations
- One Informatics Manager with a public health system.
- One Associate Chief Medical Informatics Officer

Once the focus group results were analyzed, development of the proposal began. The format required includes evidence related to Job Market Need; Existing Programs; Student Demand; Student Recruitment; Enrollment Projections; Accreditation; Admission Standards; Program Degree Requirements; Curriculum; Candidacy/Dissertation Requirements; Use of Distance Technologies; Program Evaluation Plans; Faculty Availability and Teaching Load; Student Financial Aid; Library and Other Teaching Resources; Support Staff; potential Proposal Evaluators; and a 5-year Financial Plan.

Results

Focus Group Results

The focus groups and persons interviewed individually were very supportive of the need for and subsequent development of a doctorate in health informatics (DHI). Selected comments include:

"There needs to be an understanding of analytics and linking that back to scientific inquiry to better collaborate with research Ph.D. students & make things workable for the end user. It is important to work in an evidence based space so we can continue to inform the community and fill the gap in this doctorate; fill the gap so people are trained appropriate in practical application."

"Terminal degree completion for specific specialties is important. Practice prepared topics can make the research information usable in the field and can provide real-time solutions."

"Practice based trends/evidence are important. Students should be driving things back to the researchers – feeding things back to Ph.D. researchers to identify trends and help validate their work."

"We are looking for someone with the ability to think strategically and be forward thinking to look at the impact of regulatory requirements. How can we leverage or utilize technology that addresses new needs that are coming in the future?"

"The number one skill needed is change management experience as we implement new systems. You need to be able to change a culture in an organization."

"While there is a discussion of workflow, formality and discipline, the structure is not there. How do you structure a proper workflow that is then communicated across the organization – it is just not there. Discipline is lacking. When you look at staff and come to see how they have become an "Informatician", background is lacking."

"Many informaticians are heavily focused on implementation and do not look back at the practice of it to do an evaluation or look for evidence-based practice."

The final proposal document with all required attachments totaled 62 pages.

The proposal was approved by The UT Board of Regents in August 2017. From there, it was submitted to the Texas Higher Education Coordinating Board (THECB). The THECB required a desk review of the proposal and later conducted a site visit with three external reviewers. Final approval was obtained in July 2018.

Program Development

The professional doctorate in health informatics is a degree sorely needed for the current and future success of health care across the globe. In the U.S., a master's degree extends what is learned at the bachelor's degree, but does not provide the depth of a doctoral degree. Many informatics professionals, currently holding master's in informatics degrees and working in health care organizations wish to continue their training. However, they do not wish to conduct the research necessary for a PhD. The only knowns professional doctorate in health informatics and the requirements are described herein.

The objectives of the program are to:

- Implement evidence-based practice to improve human health.
- Assume leadership positions throughout the healthcare industry having integrated health informatics with organizational leadership and ethics.
- Design, implement and evaluate health information technology quality improvement projects in health care systems.
- Synthesize health informatics and patient care technologies to effect improvements in health care delivery and patient safety.
- Employ effective communication and collaboration skills to identify and implement best practices in health care delivery.

Admission Standards

The admission standards include:

- Bachelor's degree with documented executive/management health care experience
- Master's degree preferred
- Personal statement that includes short and long-term goals after completion of the practice doctorate program
- Proposed area of interest for the translational practice project
- *Letter of Support from the health care organization willing to facilitate the translational practice project*
- Resume or curriculum vitae
- Three letters of recommendation from supervisors (two letters should be from supervisors), colleague etc.
- Interview with the SBMI Application, Progression, and Graduation Committee (APG) (by invitation upon review of application)
- Cumulative GPA of 3.0 or higher

The maximum number of students admitted to the first cohort will be thirty (30), with no set minimum. That is, if only 15 applicants are qualified for the program, only 15 students will be accepted into the first cohort.

Curriculum

The student learning objectives for the practice doctorate in health informatics are as follows:

1. The student will design and implement a project plan to address an operational health informatics problem.
2. The student will apply the appropriate scholarly foundations and evidence-based practices when designing and implementing the project.
3. The student demonstrates broad knowledge in the field of health informatics and advanced knowledge in a sub-discipline, such as privacy and security, data analytics, revenue cycle management, or other specified, in conjunction with the advisory committee.
4. The student will present and disseminate his/her project and the evaluation using strong verbal and written communication skills.

The curriculum is found in Table 1.

Table 1 - Curriculum

Course #	Course Title	Semester Credit Hours
Year 1 – Fall		
BMI 5300	Introduction to Biomedical Informatics	3
BMI 6324	Health Information Technology Policy	3
Year 1 – Spring		
BMI 6328	Healthcare Delivery in an EHR-enabled Environment	3
BMI 6311	Advanced Decision Analysis	3
Year 1 - Summer		
BMI 7350	Scholarly Foundations of Advanced Health Informatics Practice	3
Year 2 – Fall		
BMI 6305	Social Dynamics and Health Information	3

Course #	Course Title	Semester Credit Hours
BMI 6316	Change Management in Health Informatics	3
BMI 7170	Project Advisement	1
Year 2 - Spring		
BMI 7360	Advanced Project Management	3
BMI 7351	Evidence-Based Health Informatics Practice	3
BMI 7170	Project Advisement	1
Year 2 - Summer		
BMI 7361	Vendor Relations and Contract Negotiation	3
BMI 7170	Project Advisement	1
QUALIFYING EXAMINATION		
Year 3 – Until Graduation		
BMI 7070	Fellowship in Health Informatics	6
BMI 9950	Project Evaluation and Writing	6

The courses beginning with 6000 are electives in the master's and PhD degree programs. Those beginning with 7000 are unique to the DHI program. BMI 5300 is a leveling course required for all students new to SBMI. The selection of the additional courses was influenced and guided by the focus group feedback. As can be seen from the course titles, the program curriculum is focused on developing the skills needed for informatics managers and executives to implement evidence-based health informatics practices and technologies to improve care delivery and outcomes.

In addition, during their course of study, students will identify and seek a certification relevant to their translational practice project.

Translational Practice Project

The proposed practice doctorate will conclude with a project evaluation report to be written upon completion of a translational practice project. The proposed translational practice project requirements will consist of:

- Background and Review of Relevant Literature/Evidence
- Project Overview
- Theoretical Framework/Logic Model
- Purpose Statement/Significance of Project
- Evaluation Design, including Return on Investment
- Implementation/Gather Evidence
- Recommendations
- Future Implications

Program Delivery

The program was designed to be delivered executive-style. Thus, all of the didactic course content will be available online. However, students will be required to travel to Houston, Texas for onsite meetings. These will be held over long weekends, beginning on a Thursday and ending on a Saturday. This will enable cohort building, meetings with advisors, and value-add activities such as guest lectures from leaders in the field of health informatics. First year students will meet 5 times throughout the year, while second through fourth year students will meet on campus once per semester.

Program Evaluation

This program is the first of its kind in the country. As such, there is no accreditor for a practice doctorate in this discipline at this time.

During the first and second cohorts, formative evaluations in the form of student feedback sessions will be conducted. Course evaluations will also be reviewed. Longitudinally, the program will be evaluated as follows:

1. Acceptance rates each year and longitudinally – More applications for the program than available slots will be an indication of the demand for this type of program. Decreasing rates of acceptance as the number of slots available each year increases over the first five years will indicate strong need for the program.
2. Qualitative Assessment at 2 and 4 years – Graduates will be interviewed and surveyed by program faculty at 2 and 4 years after graduation to determine which skills and competencies learned in the program have proven useful and which have not.
3. Aggregate Return on Investment of practicum projects – Demonstrating the cost-effectiveness of the practicum projects demonstrates the benefit the program can provide to the health care industry.

In addition, the state of Texas requires an annual report from all doctoral programs and an external review every 7 years from external reviewers.

Discussion

The DHI has not yet been implemented. However, given the evaluation proposed and the inclusion of a Return on Investment as an essential component of the translational practice project, value is expected to be documented as soon as the first students complete their studies. Whether these savings are expressed in actual dollars saved or adverse patient events prevented or efficiencies in the application of health informatin technology remains to be seen.

Upon approval in the early fall of 2018, the school issued a press release and opened an application on the website. (https://sbmi.uth.edu/news/story.htm?id=61f010ca-127e-4778-ab02-d7925d562f7e) An informational webinar held in early October 2018 had 27 participants from across the U.S. and even overseas.

One of the ways to judge the perceived need for a program such as this is by the expressed interest. By the March 1, 2019 deadline, twenty-nine (29) persons had started applications and thirteen (13) had submitted completed applications for review. As of this submission, applicant interviews were underway to choose the initial cohort.

Conclusions

This is a new terminal degree program aiming to educate health informatics and information technology executives as they seek to become evidence-based professionals who improve the health of people and populations through the application of health informatics. To the knowledge of the authors and sponsoring school, this is the only degree of this type in the world. As such, the program seeks to advance standards of care and models of delivery and health care policy via the implementation of the translational health informatics practice project. This proposed program offer health informatics

executives a unique educational opportunity that is not currently offered anywhere else in the U.S. or the world. The practice doctorate program will serve diverse communities, as executives within the program will represent a variety of health care facilities, companies, and other organizations (such as insurance and pharmaceutical companies) throughout the Texas Medical Center and beyond. The in-depth translational projects will seek to advance quality of care in those facilities and improve health care delivery, while reducing costs, for patients, their families, clinicians and the sponsoring organizations. The level of interest to date suggests that the health care industry is ready for a practice doctorate of health informatics or DHI.

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Address for correspondence

Susan H. Fenton, PhD,
UTHealth School of Biomedical Informatics
7000 Fannin, Suite 690
Houston, Texas 77030
USA
713 500 3591 tel
susan.h.fenton@uth.tmc.edu