ORIGINAL RESEARCH

Towards an epistemological understanding of healthcare informatics: Academic backgrounds of the faculty

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ABSTRACT

Healthcare informatics is a relatively new field to academia and is multi-disciplinary by nature. Although the field of health informatics encompasses several disciplines and subject areas that are familiar and long standing, the field itself is still in a formative state that allows many disciplines to contribute to the field through teaching and curriculum development in a way that may not be possible in more established educational programs. The purpose of this pilot study was to start to define the cross-disciplinary nature of a Healthcare Informatics faculty. Researchers in the field agree that the discipline includes a full spectrum of courses, but the diversity of faculty backgrounds remains vague. In this pilot study, one trend was apparent in the academic backgrounds of the Healthcare Informatics faculty; Computer Science was the most common academic background of the faculty (10 PhD's, 8 Graduate and 6 Undergraduate Degrees). Interestingly, four faculty members earned a PhD in Health Informatics and no faculty member had earned a graduate/undergraduate degree in Healthcare informatics. The faculty members of the ten universities investigated in this pilot study indicated 45 unique Doctoral disciplines. By any measure, that would be considered inter-disciplinary.

Key Words: Healthcare informatics, Faculty skills, Cross-discipline curriculum

1. INTRODUCTION

Healthcare Informatics is a relatively new field to academia and is multi-disciplinary by nature.[1] Although the field of health informatics encompasses several disciplines and subject areas that are familiar and long standing, the field itself is still in a formative state that allows many disciplines to contribute to the field through teaching and curriculum development in a way that may not be possible in more established educational programs.[2] While academic medical informatics programs are established at few medical institutions in the United States, increasing numbers of schools are considering this field of study and many traditional departments are seeking and attracting individuals with medical informatics skills.[3] There is not a common consensus on what defines those skills. The logical extension and question is; with a new inter-disciplinary field, what are the academic backgrounds of the faculty teaching this new area? Bakken[4] stated that informatics competencies are an essential building block for an evidence-based nursing practice. However, Bakken does not address how those skills should be obtained.

1.1 Literature review

Despite the increasing mandate for use of health Information Technology (IT) systems in organizations, we do not have comprehensive knowledge of the backgrounds, train-

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ing, and skills of those who work within the field. There is an absence of information about those who have clinical/technology backgrounds and work in Healthcare Information Technology (HIT) settings. The importance of this workforce, however, is increasingly acknowledged by leaders in HIT. Dr. David Brailer, Director of the Office of the National Coordinator for HIT (ONCHIT) has stated "We have a huge manpower crisis coming down the road" in the implementation of HIT systems. Drs. Charles Safran and Don Detmer, of the American Medical Informatics Association (AMIA), have called for at least one physician and nurse each at all 6,000 hospitals in the United States to be trained in medical informatics and guide HIT implementation in their local settings.[5]

Medical information systems will continue to evolve with or without staff trained specifically in health care informatics. Some of the very talented and innovative people who are now leaders in health care IT come from very different backgrounds, but lack any formal education in medical informatics. One incentive is a financial package that recognizes that health care informatics staff could use their skills in other industries in which pay levels are higher.[6]

A 2003 study addressed the specific issue of who is teaching technology to healthcare professions. A nursing model has been used in this discussion, as the current research does not have an adequate healthcare model. The nursing model found that faculty, who were rated at the "novice" or "advanced beginner" in information technology content and use of information technology tools, are teaching information literacy skills. The southeastern central and Pacific regions of the United States projected the greatest need for information technology-prepared nurses. Using Benner's (1984) novice to expert framework, only 2 programs rated their nursing faculty as experts in teaching and using information technology. Most nursing programs rated their faculty at the advanced beginner level. Significantly, 18% of programs reported their faculty as novices. Twenty-nine percent of nursing programs reported their faculty members were at the competent level. However, 46% of programs reported either no future plans or no knowledge of any plans to offer information technology education or training in their region.[7]

The boundaries of healthcare informatics are not well defined. Are individuals who work in information technology departments of medical centers medical informaticians? Are librarians informaticians? There is no common informatics curriculum, nor any common job that anyone with training in the field could define.[8]

Research has found the right mix between research/training and service requirements may be challenging. The goal is to attract faculty who understand informatics as science, not just as means to reach pragmatic ends (*e.g.*, find a job). Possibly joint appointments for faculty from other units or primary appointments only for informaticians may be a future option.[9]

One of the benefits of an education in healthcare informatics is the opportunity to interact with professionals from diverse backgrounds, thereby gaining an appreciation for the varied perspectives, vocabularies and values of each domain. This can be a critical factor in arriving at a solution to a problem. One example of divergent vocabularies emerged in a course in which one of the students commented, "I suddenly recognized the challenges inherent in health informatics when I realized that 'HIT' refers to 'health information technology', not 'hemolytic idiopathic thrombocytopenia'". Programs administered across many academic departments bring diverse perspectives together to determine course content, admissions standards, curriculum and degree requirements.[10]

As the internet has removed geographic barriers, this issue is not solely a concern in the United States. Although not the focus of this research, the issue appears to be a global question. In Slovakia, the curriculum content and the quality of education varied among providers and programs. In one research study, the total number of faculty members representing Slovakia was about 40, with different qualifications for academic degrees and professional preparation. The opportunities for further career development and training of students after graduation were not clearly defined. Additionally, the criteria for program self-assessment are not academically sufficient.[11]

1.2 Research purpose and questions

The purpose of this pilot study was to start to define the cross-disciplinary nature of a Healthcare Informatics faculty. Researchers in the field agree that the discipline includes a full spectrum of courses, but the diversity of faculty backgrounds remains vague. Consequently, this study addresses fundamental questions:

- What are the academic backgrounds of Healthcare Informatics faculty?
- Do the disciplines mirror the inter-disciplinary nature if the Healthcare Informatics field itself?

2. METHODOLOGY

For this study, a content analysis of Healthcare Informatics graduate/doctorate degree professors was conducted, using a representative sample of universities. The design goal was to construct a sample frame corresponding to the population (Universities/Colleges).[12] A web search was conducted to obtain the academic backgrounds of healthcare informatics professors.

Content analysis requires two processes: definition of the content characteristics (basic content elements) being examined and application of rules for identifying and recording these characteristics. An objective coding scheme must be applied to the courses.[13] For this pilot study, a Web search was conducted to obtain the following data elements:

- Name of Professor
- Teaching At
- Title
- Doctoral Degree Area
- Doctorate Granted at
- Masters Subject
- Masters Granted at
- Bachelors Subject
- Bachelors Granted at
- Notes

One design issue is how well the sample frame corresponds to the population a researcher wants to describe. Searching for healthcare informatics professors web pages potentially has limitations in identifying all relevant academic backgrounds.[14] Extensive browsing and keyword searching of program web pages was conducted to verify and update faculty details. Healthcare Informatics curriculums may lean towards a more business or medical viewpoint. As such, a limit of thirteen professors per university was set to ensure one university would not skew the results.

Is this a true picture? By using a reprehensive sample, the goal was that the information derived from the sample and the conclusions reflected the same conditions that exist in University settings as a whole.[15] Specifically excluded from the sample was "for-profit universities", defined as colleges that are owned and operated by businesses and are ultimately accountable by law for the returns they produce for shareholders.[16] The sample selected for this pilot study (January 2014) will be universities have a Graduate and/or Doctoral program and meet one of the following criteria:

- Traditional/On the ground
- Public or Private institution
- Large School

Table 1 shows the working definitions used for this study.

3. FINDINGS

For this pilot study, 65 faculty members from 10 universities were analyzed. The ten universities selected and the number of faculty included in this pilot study are shown in Table 2.

Table 1. Working definitions of universities

Term	Definition
Large university	Large Universities have more than 15,000 students. [17] "Large university" means a university that produces more than 150,000 student credit hours per academic year. Although a more detailed criteria, credit hours is not readily available. [18]
Small university	Small Universities have fewer than 5,000 students. [17] "Small university" means a university that produces 150,000 or fewer student credit hours per academic year. [18] Although a more detailed criterion, credit hours are not readily available.
Private University	The term "private" simply means that the university's funding comes from tuition, investments and private donors, not from taxpayers. [19]
Public University	The term "public" indicates that the university's funding comes partly from state taxpayers. [19]

Table 2. List of universities selected for pilot study

University	Category	Count of Professors
Cornell University Weill Cornell Medical College	Private	6
Indiana University	Public	13
Marshall University	Public	5
The University of Michigan	Public	7
University of Kansas	Public	2
University of Minnesota	Public	8
University of Missouri	Public	5
University of North Carolina at Charlotte	Public	8
University of Texas	Public	5
University of Washington	Public	6
Grand Total		**65**

This pilot study looked to investigate two fundamental questions:

- What are the academic backgrounds of Healthcare Informatics faculty?
- Do the disciplines mirror the inter-disciplinary nature if the Healthcare Informatics field itself?

The academic backgrounds of the faculty in this pilot study is fairly diverse. Table 3 shows the areas in which the PhD's have been granted.

Table 3. List of doctoral degree disciplines of healthcare informatics professors

PhD Discipline	Count Disciplines
Anthropology	1
Behavioral decision theory	1
Biochemistry	1
Biochemistry & Molecular Biology	1
Biomedical Informatics	1
Biometry	1
Business Administration	1
Chemical Engineering	1
Comparative Literature	1
Computer Engineering and Computer Science	1
Computer Science	10
Computer Science and Engineering	1
D.Phil.	1
Department of Cognitive Science	1
DNP	1
Doctor of Philosophy in Educational Leadership & Policy Analysis	1
DrPH	1
Ed.D	1
Engineering and Public Policy	1
Epidemiology	1
Health behavior and health education	1
Health Finance and Organization	1
Health Informatics	4
Health policy	1
Health services organization and policy	1
Healthcare Strategic Management	1
Information and media studies	1
Information Science	2
Information Technology	1
M.D.	5
Machine learning	1
Machine Learning in Healthcare: Health Informatics	1
Medical Computer Engineering	1
Medical Informatics	1
Medical Information Sciences	1
Methodology and Evaluation Research	1
Not listed	4
Nursing	1
PhD	1
Public health	1
Public policy	1
Robotics	1
Sc.D	1
Statistics	1
Systems Sciences and Electrical Engineering	1
Grand Total	**65**

Table 4 shows the areas in which the Graduate/Master's Degree's have been granted.

Table 4. List of garduate degree disciplines of healthcare informatics professors

Graduate Discipline	Count Disciplines
Anthropology	1
Behavioral decision making and economics	1
Biomedical Engineering	1
Biophysics	1
Chemical Engineering	1
Comparative Literature	1
Computer Engineering	1
Computer Science	8
Computer Science and Engineering	1
Department of Cognitive Science	1
Electrical and Computer Engineering	1
Electrical Engineering	2
Epidemiology	1
Fisheries Genetics	1
General Experimental Psychology	1
Health Administration	1
Health Administration Executive Masters	1
Healthcare Management	1
Information Systems	1
library sciences	1
M.P.H.	3
M.S.	1
Marketing and Management Information Systems	1
Master of Health Administration	1
Mathematics	1
MBA	1
Medical Informatics	2
Mgt./Supr. Health Care Adm	1
MLS	1
MS	1
MSN	1
Not listed	15
Preventive Medicine	1
Public Health	3
Public Policy Analysis	1
Robotics	1
School of Medical Sciences	1
Social work	1
Grand Total	**65**

Table 5 shows the areas where the Undergraduate Degree's have been granted.

In this pilot study, one trend was apparent in the academic backgrounds of the HIT faculty. Computer Science was the most common academic background of the faculty (10 PhD's, 8 Graduate and 6 Undergraduate Degrees). Interestingly, four faculty members earned a PhD in Health Informatics and no faculty member had earned a graduate/undergraduate degree in HIT.

Table 5. List of undergraduate degree disciplines of healthcare informatics professors

Undergraduate Discipline	Count Disciplines
Applied Mathematics	1
Applied Mathematics & Computer Science	1
B.A.	2
B.A.Sc	1
BA	1
Bachelor of Arts in Psychology	1
Biochemistry and Molecular Biology	1
Biology	1
Biology and Computer Science	1
BSN	2
Chemical Engineering	1
Chemistry	1
Computer Science	6
Department of Biological Sciences	1
Divisional Science	1
Economics	1
Economics	1
Electrical Engineering	1
English	2
Fisheries Biology	1
Health and Society	1
History	1
Marketing	1
Mathematics	3
MBBS, (US Equivalent of Doctor of Medicine)	1
Med. Tech/Education	1
Not listed	17
Anthropology/Psychology	1
Nuclear Engineering	1
Pharmacy	1
Philosophy	1
Physics and religious studies	1
Psychology	2
Science	1
Science and math	1
Women's studies	1
Zoology	2
Grand Total	**65**

Do the disciplines mirror the inter-disciplinary nature if the Healthcare Informatics field itself? The faculty members of the ten universities investigated in this pilot study indicated 45 unique PhD disciplines. By any measure, that would be considered inter-disciplinary. Thirty-nine graduate disciplines and thirty-seven undergraduate areas were found to be academic backgrounds of the Healthcare informatics faculty.

4. Discussion

This pilot study has demonstrated that the academic backgrounds of 10 sample universities and the 65 professors selected demonstrate the inter-disciplinary nature of Healthcare Informatics. Virgona (2014)[1] found the course distribution of Healthcare Informatics to follow this inter-disciplinary path (see Table 6).

Table 6. Course distribution of healthcare informatics courses

Disciple	% of Healthcare Informatics course
Business	10%
Health Care	9.1%
Healthcare Informatics	27%
Information Systems	53%

While 53% if the courses in Healthcare Informatics are in the Information Systems discipline, less than 2% of the PhD in this pilot study earned a PhD in Information Systems. In a similar discovery, 10% of Healthcare Informatics curriculum is business related yet there is no evidence of any business background of the Healthcare Informatics faculty.

Despite this disparity, it is not clear or known if this is an issue that needs to be addressed. Future research should investigate if the lack of academic qualifications presents curriculum problems in a relatively new field. Is there a clear definition for Healthcare Informatics faculty or is each institution addressing the multi-disciplinary needs on a case-by-case basis?

Conflicts of Interest Disclosure

The author declares that there is no conflict of interest.

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