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Treating the Healthcare Workforce Crisis: A Prescription for a Health Informatics Curriculum

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Abstract

A serious need exists for information systems workers who have an understanding of the healthcare environment. Traditional information systems degree programs do not adequately prepare students to enter the healthcare environment. In this paper, we propose a curriculum for a baccalaureate health informatics degree that combines the technical and business training of a traditional information systems degree with a strong foundation in healthcare courses to create a graduate that is able to function proficiently in a modern healthcare organization.

Keywords: health informatics, curriculum, information systems

1. INTRODUCTION

Today, there is a pressing need for workers that are both skilled in the use and management of information systems as well as knowledgeable about the field of healthcare. Driven, in part, by changes in government reimbursement policies and the accompanying incentives, interest has been growing among healthcare providers in implementing electronic health records (EHR) systems in their organizations. In addition, some organizations are reexamining their legacy health information systems and realizing that they are insufficient for the needs of a modern healthcare organization. This onslaught of interest in EHR's and health information systems

in general has created a shortage of personnel that are skilled in both information systems and knowledgeable about the healthcare environment (Wager, 2009).

While changes in health information technology (HIT) and the workforce that support and use that technology have traditionally been co-evolutionary, the impact of these recent events has caused a massive increase in the usage of HIT that has not yet been met by a corresponding growth in the HIT workforce. Traditional university training programs that require a student to choose between being a technologist or a healthcare practitioner are inadequate since, as Hersh (2010) notes "a well-trained HIT professional should have knowledge not only of information technology, but also of healthcare, business and management, and other disciplines."

In order to meet this need for a skilled health informatics workforce and to increase enrollment in information systems programs that have previously only trained graduates to enter traditional manufacturing and service organizations, it is necessary to create a new degree program that blends the elements of a traditional information systems curriculum with the healthcare environment training that will be needed to work in a hospital or other healthcare organization. Such a proposal should also take into account the dearth of resources available for new programs in most universities today.

Our goal then is to create a multidisciplinary degree program that prepares graduates to assume new roles in the development and management of information technology resources in healthcare organizations and does not require an influx of funding for expenses such as hiring large numbers of new instructors or building new facilities. To do this, we must structure a curriculum that leverages existing programs and resources while adequately preparing students for a career working with information technology in the healthcare environment. This paper details our proposal for such a program.

2. BACKGROUND

To understand the needs of modern healthcare organizations, it is necessary to understand how the industry arrived at its current point in terms of the industry itself, the legislative environment, and the health information technology workforce. We will discuss events in each of these environments that have led to this pressing need for a skilled health information technology workforce.

Organizational Environment

Despite the rising cost of healthcare, many hospitals and other providers do not generally have surplus funds for large-scale technology investments. One of the reasons for this is that federal law requires hospitals that participate in Medicare to provide emergency treatment to patients regardless of their ability to pay. These hospitals must often write-off the cost of treating patients who cannot pay. Not surprisingly, facilities that serve communities with a large indigent population often run significant operating deficits. In addition, reductions in reimbursement rates by both Medicaid/Medicare and insurance companies have impacted providers' bottom lines significantly (O'Reiley, 2010). With the limited funds that these organizations do have available, most providers invest in information systems that will increase revenue.

Since the advent of information technology in healthcare organizations, technology use has been driven, in part, by government reimbursement policies. In the 1960's and 1970's, government reimbursement was cost-based, meaning that providers were paid based on what they spent. This encouraged the adoption of computer-based billing systems to reduce errors in billing and increase the speed with which patients and the government were billed (Wager, 2009).

This changed in the 1980's when the government introduced a payment policy based on diagnosis-related groups (DRG). Under this system, every ailment is assigned a specific code. Every code is reimbursed at a predetermined amount. Technology was introduced to improve the accuracy of DRG coding so that providers were able to bill for every ailment that a patient might have. Practice management systems were also introduced that helped office staff manage their offices more efficiently in order to treat more patients (Wager, 2009).

In the 1990's, the government introduced a resource-based relative value scale for physician reimbursement. This policy encouraged physicians to provide patient education as well as treatment and reduced reimbursement rates

for specialists. Technology was used to provide information to patients on their specific ailments so that they could better participate in their own treatment (Wager, 2009).

Until the start of the 21st century, there was not widespread adoption of health information systems that focused on patient care. Often the cost of such systems made them impractical for providers. This changed when the government introduced a number of pay for performance reimbursement programs in the 2000's. Pay for performance systems reward positive outcomes while penalizing mistakes such as errors in medication administration, surgical procedures, and other preventable mistakes that contribute to poor patient outcomes. Because of this, the healthcare industry has seen an increase in the adoption of new technologies focused on improving patient care and reducing human error (e.g. automated medication dispensing, bar-coding of patients and records, and computerized physician order entry) (Wager, 2009).

Despite the availability of these new technologies, many providers have still not had the economic resources to update their organization's information systems. With the passage of the Health Information Technology for Economic and Clinical Health (HITECH) Act in 2009, healthcare providers now have some economic support for the adoption of EHR systems (CMS, 2011). The vendors of these systems promise a significant reduction in preventable errors and a proactive approach to patient care as well as many other benefits.

Legislative Environment

Healthcare as an industry has routinely lagged behind other industries in their implementations of new technology. In order to remedy this situation, the United States Government has enacted the HITECH Act as part of the American Recovery and Reinvestment Act of 2009. The HITECH Act provides incentives for Medicaid and Medicare providers that implement an EHR system and meet a set of meaningful use rules established by the government by 2015. Medicare providers that that do not meet these targets will be penalized in their reimbursements by the government. There is currently no penalty for Medicaid providers (Lynn, 2011).

In many ways, the passage of the HITECH Act of 2009 is considered an update to another piece of important legislation that had a substantial impact on healthcare organizations' information systems: the Health Insurance Portability and Accountability Act (HIPAA). HIPAA, passed in 1996, was a wide-ranging bill that addressed more than just health insurance. It provided non-technology-specific requirements that healthcare organizations must follow in order to protect the privacy and security of the patient records within their care (HHS, 1996a and 1996b).

Because of HIPAA, the information systems (IS) staff of healthcare organizations had to take on the job of security experts in order to protect patient information. In addition, the generic wording of many of the provisions in HIPAA caused healthcare organizations to apply the most conservative interpretation of this new law or risk the substantial penalties that it prescribed. Unfortunately, healthcare organizations bore the cost of these changes because no additional funding was provided by the government (Levin-Epstein, 2001).

The HITECH Act provides clarification of many of the privacy and security provisions contained in HIPAA. In addition, it provides financial incentives for Medicaid and Medicare providers that implement an EHR system and meet a set of meaningful use rules established by the government by 2015. To further encourage adoption of EHR systems, the law states that Medicare providers that do not have EHR systems in place by 2015 that meet the meaningful use requirements will be penalized in their reimbursements by the government (Lynn, 2011).

In addition to the financial incentives available directly to providers by the HITECH Act, the Office of the National Coordinator for Health Information Technology (ONC) has created the HIT Workforce Development Program. This program provides funding to community colleges and universities to develop training programs to provide a skilled health information technology workforce through the use of certificate and masters programs. These programs cater to existing IS and healthcare workers and are generally not available for students without a degree and a minimum level of experience (ONC, 2010).

Healthcare Workforce Environment

The traditional roles of healthcare providers are changing. Budget constraints have caused many responsibilities to be moved from high cost workers (e.g. physicians) to lower cost

workers (e.g. nurses and CNA's). Today's healthcare workers have to know about more than just care delivery, they must also be skilled in the technology used to provide that care (Gleckman, 2011).

There are a number of factors that drive the need for healthcare organizations to develop a more skilled HIT workforce. These factors include a desire to reduce mistakes in patient care through the use of technology, government sanctions for privacy and security breaches, and anecdotal reports of increases in mortality after some HIT implementations (Hersh, 2010).

HIT is quickly evolving and the workforce that supports and uses that technology is struggling to keep up. As mentioned in the last section, grant funded community college and university programs are available, but most aim to retrofit current experienced workers though the use of certificate and master's degree programs. This is important for bringing the current HIT workforce up to speed with new technology, but additional programs are necessary to train new workers that the healthcare industry will certainly need in the coming years.

3. HEALTH INFORMATICS CURRICULUM

Traditionally, students training for a career in healthcare rarely received training in the use or management of information systems. Similarly, those training for a career in information systems rarely received training in healthcare despite receiving some instruction on how traditional manufacturing or service organizations operate. In order to provide students with an education that equips them to work with HIT resources in the many different areas available in the healthcare field, it is necessary to build a curriculum that includes courses from a number of different traditional healthcare specialties as well as information systems. The program outcomes and objectives are listed in Table 7 (Appendix C). In the following sections, we discuss the main course areas in our proposed curriculum.

Pre-professional Area

The pre-professional area consists of required and elective courses to be completed in the student's freshman or sophomore year. These courses could be taken at a two-year institution as part of a 2+2 agreement between a state's community colleges and universities. These courses are intended to be foundational courses pre-requisite to the upper-division courses in the major. The list of courses in this area is reproduced in Table 1.

Table 1: Pre-Professional, Pre-Major, and Electives

Courses	Credit Hours
BMD 210 Infectious Disease in Health Care Environments	3
CIS 150 Introduction to Computer Applications	3
BUS 245 or STA 210 Statistics I or equivalent	3
BUS 255 or other advanced statistics or equivalent	3
CA 275 Small Group Communication	3
ACC 211 Principles of Accounting I	3
MGT 300 Management Theory and Practice	3
	------ **21**

The course BMD 210 provides an introduction to the fundamental concepts of host-parasite relationships involved in infectious diseases. This course is foundational material for more advanced health sciences courses in the clinical environment, for example, in understanding biostatistics and epidemiology. CIS 150 provides a broad-based introduction to the use of computers to enhance personal productivity. This course is foundational material for the advanced information systems courses. The courses BUS 245 or STA 210 provide a survey of statistical techniques used to support managerial decision-making and problem solving. This course is essential preparatory material for biostatistics and epidemiology in the clinical environment courses. This course should be followed by an advanced statistics course or quantitative methods designed to prepare the student for understanding the design of experiments and advanced data analysis techniques. The ability to work effectively in groups is a critical skill for the HIT professional. CA 275 covers the theory and practice of leading and participating in groups. Most major EMR systems are enterprise-wide or ERP systems. A working knowledge of accounting principles and terminology (ACC 211) is important for organizations with accounts receivable modules and DRG coding. Finally, EMR systems exist in the context of organizational structures, practices, and behavior. Effective leadership and change management require an understanding of the interaction of material and human resources in social/business systems. This material is covered in the MGT 300 class.

Clinical Environment
At our university we are fortunate to have Colleges of Allied Health and Nursing. These programs provide breadth-first introductory knowledge particular to their disciplines. We have selected courses from these sets because they provide a portfolio of experiences necessary for our health informatics professionals to possess. Although these "first" courses are not advanced; when taken as a set, they provide a richness in vocabulary and related methods. Both of these provide valuable insight into the needs of health care professionals. Without being conversant in the health care language, it would be difficult to learn, implement, and train users on EHR systems. The courses consist of those specified in Table 2, and in the detailed course descriptions (Appendix B, Table 7).

Table 2: Clinical Environment

Courses	Credit Hours
NU 311 Clinical Nursing Skills	4
NU 325 Health Assessment	4
HSC 343 Clinical Pharmacology	3
RAD 101 Principles of Radiographic Exposure	4
OT 201 Introduction to Occupational Therapy	3
CRC 330 Cardio-respiratory Care Assessment Skills	4
	22

Students who have completed BMD 114 and 115 will have acquired credible knowledge of human physiology and anatomy. These courses replace traditional courses in biology and chemistry for students whose primary interests will be in the health care arena. BMD 210 provides all students with knowledge of infectious disease, and limited introduction to patho-physiology. This course replaces the need for a microbiology course because of its broader and more general scope. While there are many other courses that might have been considered in these three pre-professional areas, these selected courses provide the focus needed for our health informatics degree program, as well as prerequisite knowledge for our clinical environment courses.

Because nursing cuts across all biomedical disciplines, NU 311 and NU 325 will be broadly applicable to patient and care definitions, records, issues, and procedures. Drug usage implies the need to define pharmacologic principles including classes of active compounds, routes of administration, drug interaction and safety, drug ordering, and potential errors and their prevention. Radiographic imaging is an enormous field requiring knowledge of radiation, physics, procedures, and images processing. In addition, other forms of imaging involving ultrasound and new scanners provide important diagnostic and even therapeutic modalities. Finally, occupational therapy, physical therapy and cardio-respiratory care are among the most important care and restoration responsibilities in biomedical care. Knowing the vocabulary as well as procedures within these disciplines will give our graduates the ability to engage intelligently in conversations, while also enabling them to be effective in their information systems related mission.

Information Systems Area
The Information Systems area courses are designed to prepare the student to leverage information technology to improve the performance of people in organizations, add business value, and help individuals, groups, and organizations achieve their goals. The list of courses in this area is reproduced in Table 3.

Table 3: Information Systems Area

Courses	Credit Hours
ISC 245 Information Systems in Organizations	3
ISC 272 Systems Architecture	3
CIS 321 Data Communications and Networking	3
CIS 324 Database Design, Development, and Management	3
ISC 360 Information Systems Analysis and Design (W)	3
ISC 462 Information Systems Strategy and Policy	3
	18

The course ISC 245 provides a breadth-first view of information systems from an organizational perspective. This course prepares the HIT professional to view an EHR system as an information system and as part of a larger organizational context. The courses ISC 272, CIS 321, and CIS 324 provide depth in the areas of operating systems, networking, and database. These courses give the healthcare professional the knowledge needed to communicate effectively with an IS staff or with software vendors and to make technology recommendations. The course ISC 360 is a traditional systems analysis and design course.

The (W) indicates it is a writing course in the curriculum, meaning the course includes significant writing assignments. This course provides the student with the foundational knowledge needed for conducting and managing lifecycle activities. Finally, the course ISC 462 provides the top management, strategic perspective for aligning competitive strategy with information systems. This course provides foundational material for aligning healthcare objectives such as improved outcomes, reduced cost, and reduced errors with EHR functionality.

Health Informatics Area

The health informatics courses are designed to apply the student's knowledge and experience of information systems and the clinical environment to the domain of healthcare systems and information technology. A major focus of the health informatics area is hands-on, applied experiences. Because of the cross disciplinary nature of this area, it was necessary to create five new courses. The capstone internship course was already in place in our traditional information systems degree program. The list of courses is reproduced in Table 4.

Table 4: Health Informatics Area

Courses	Credit Hours
ISC 300 Health Informatics Clinical Environment	3
ISC 410 Health Informatics	3
ISC 450 Health Sys Analysis and Design	3
ISC 455 Health Decision Support Sys	3
ISC 475 Information Systems Project Management	3
CIS 496 Computer and Information Sciences Internship	3
	18

The course ISC 300 provides an overview of concepts, terms, organization, and processes associated with patient care and clinical environments as they pertain to health informatics. The patient journey, how a person accesses, moves within, and exits the system both as inpatient and outpatient to obtain care is examined. This course provides hands-on experiences through the use of a real fully functionally electronic medical records system.

ISC 410 provides an overview of the concepts, terms, tools, and architectures associated with health informatics as applied to healthcare delivery. Topics include: electronic record systems, computerized physician order entry, health system standards, terminologies, workflow modeling, security and privacy of clinical data, clinical reporting, and the impact of information technology use on the quality and efficiency of health care delivery and outcomes.

ISC 450 involves a thorough examination of the analysis and design of healthcare information systems from the informatics specialist's view. This course covers the entire life cycle of a system using an established systems development methodology including workflow analysis. At each step in the development life cycle, both the methodologies used and the documentation required will be examined. Students produce artifacts and deliverables for each stage of the life cycle. Unlike in a basic systems analysis course, ISC 450 students grapple with enterprise projects conducted within the environment of biomedicine and health care.

ISC 455 focuses on the design and management of electronic medical record systems and clinical decision support systems. A review of database concepts is provided. Course content related to electronic medical record systems includes architectural components, technical design issues, and management; and, content related to clinical decision support systems includes decision support roles, extracting useful information from data, and legal and regulatory restrictions. Laboratory assignments will provide students with opportunities to interact with these systems.

ISC 475 examines the principles and techniques of project management from an information technology perspective. Topics included are: project planning, scheduling, resource allocation, and project management software tools. There is a specific focus on management of software projects, integrating the principles of information systems/needs analysis, software engineering, risk management, and change management. Both the technical and behavioral aspects of project management are covered.

The CIS 496 internship provides the student with a capstone, culminating experience in a particular clinical or systems vendor setting. An emphasis is placed on the application of information technologies to improve healthcare outcomes and the reduction of costs and errors. Students work on supervised projects with faculty guidance. Educational objectives focus on

the application of the theories, processes, methodologies, techniques, and technologies learned in the program.

4. DISCUSSION

In order to successfully attract and matriculate students, it is necessary to structure the proposed program to address the needs and interests of prospective students. There are many constituencies who must be considered in an implementation of the program including underrepresented groups (e.g. women), transfer students, and traditional four-year students.

Women in Science, Technology, Engineering, and Mathematics

Traditionally, women have been underrepresented in the fields of science, technology, engineering, and mathematics (STEM). A recent report (St. Rose, Hill, and Corbette, 2010) notes that women were much less likely than men to enter the fields of physics, engineering, and computer science. The study also found that over half of the degrees awarded in STEM were in the biological sciences.

Although the reasons behind the low number of women graduates in technology fields are open to debate, we do believe that creating a program that combines the biological sciences with environment appropriate technology training will attract a greater number of women students than traditional information systems programs.

Four-Year Degree Plan

Implementation of a curriculum eventually requires a degree plan by which students can graduate in a timely fashion. The four-year degree plan provided below in Table 5 (Appendix A) represents the proposed implementation at the author's university. The degree program is divided into lower and upper division course work. Lower division coursework is intended for the freshman and sophomore years. Upper division coursework is for the junior and senior years. Lower division course work focuses on general education requirements and pre-professional, pre-major courses, and supporting electives. Upper division coursework is comprised of information systems, health informatics, and clinical classes and as such represents the multi-disciplinary component of the degree program.

As feeder schools for universities, the two-year college system provides an opportunity for increased enrollments in computing. A major advantage of dividing coursework into lower and upper division is it facilitates 2+2 matriculation agreements with the two-year colleges. Because all lower division courses are 200-level or lower courses, these courses can be offered by junior and community colleges as an associate degree. A student with an associate degree (two years) can complete the baccalaureate degree in health informatics in two additional years.

The flow of the upper division courses in Table 5 should not be considered a pre-requisite structure. In our view, pre-requisites in the upper division should be kept to a minimum. Overly linear course sequences make it much more difficult for students to matriculate in two years. The course sequence of upper division courses should be considered guidance to academic advisors. The only "hard" pre-requisites are ISC 300 and ISC 410 as pre-requisites to ISC 450 and ISC 455. Both ISC 300 and 410 are introductory courses that should precede the more advanced health informatics courses. The remainder of courses are more-or-less independent of each other. The upper division courses are multidisciplinary and as such sample from a wide range of discipline specific "first courses". The overall aim of the course sequence is to provide an even balance of computing and clinical courses per semester. It is recommended that the internship, as a culminating capstone experience, be taken the student's last semester.

The structure of the degree plan described here is not intended to suggest upper division courses must be cohort based or that students must first complete the lower division courses before applying for admission to the health informatics degree program. Clearly this can be done, but it is not implied by the lower/upper division of coursework. We are implementing a lower/upper division separation at our university to facilitate 2+2 agreements with two-year colleges and to enable pre-nursing and pre-allied health majors to switch to the health informatics degree program in their sophomore or junior year.

The degree plan presented here assumes no summer classes and a goal of graduating in four years. Assuming the absence of a cohort system, any plan must be adapted to the actual circumstances of each student. Summer course offerings allow students to take lighter course

loads in the fall and spring semesters and "catch up" if they are switching from other majors.

Finally, general electives could be implemented as required courses. Our goal in including three electives is to make the degree program flexible. Health informatics as a discipline is broad and varied. We submit that allowing students to customize part of their education results in a better prepared workforce because students are empowered to choose a direction that best aligns with their career goals and aspirations. For example, a student could choose to take business courses in order to pursue a managerial-focused career such as the Chief Information Officer of a hospital or perhaps a student plans to specialize in a particular clinical environment such as occupational therapy. At our university, the articulation of this direction is a shared responsibility of the student and academic advisor.

5. CONCLUSIONS

Our proposed curriculum addresses the needs of the healthcare industry by providing a workforce that is skilled in the use of information technology as well as having an in-depth knowledge of the healthcare environment. It stands apart from many other university and community college programs such as those funded by HIT Workforce Development Program because our aim is to train new HIT professionals instead of retraining existing professionals.

We have designed this proposed curriculum both to meet the needs of industry and to leverage resources that are already available at our university. Because of budgetary concerns, the authors realize that it is advantageous to create a curriculum that does not require a large number of new classes. In addition, we believe that it is likely that the addition of this program to an existing information systems program will increase the number of female students enrolled in the computing disciplines.

By selecting courses offered by a number of different programs, we have created a multidisciplinary curriculum that we believe will provide students with a versatile skill set that will allow them to function in a wide range of healthcare settings. To provide the student with real world experience in which to practice their skills, we have specified a senior year internship as the program's capstone experience.

We submit that this program offers students, healthcare providers, and universities a practical and academically valid option for meeting the diverse needs of all stakeholders.

Epilogue

Based on feedback from reviewers, ISECON conference discussions, and the author's colleagues in the College of Nursing and College of Allied Health Professions between the time of acceptance and publication of this manuscript, the specific course list in Table 2 (Clinical Environment) is being revaluated. Our original intent in formulating this list of clinical courses was to select from "first courses" in each of the subject areas most relevant to the role of the health informatics professional. However, most of these first courses are gateway courses designed to filter out students newly accepted into the program. Further, rather than breadth-first courses designed to provide an overview of the field, these courses are very detailed and in-depth and require hands-on demonstration of skill mastery. Our current plan is to develop a collection of three to four new Biomedical Sciences courses designed to provide a breadth-first overview of each of the content areas possibly combining two areas into a single course.

6. REFERENCES

Centers for Medicare and Medicaid Services (CMS) (2011) The Official Web Site for the Medicare and Medicaid Electronic Health Records (EHR) Incentive Programs. Retrieved July 10, 2011 from http://www.cms.gov/ehrincentiveprograms/

Gleckman, H. (2011). Atmosphere Unsettled around Workforce Trends. *Health Progress*. Retrieved July 10, 2011 from http://www.chausa.org/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=4294968927

Hersh, W. (2010). The Health Information Technology Workforce: Estimations of Demands and a Framework for Requirements. *Applied Clinical Informatics*. Retrieved July 10, 2011 from http://skynet.ohsu.edu/~hersh/aci-10-workforce.pdf

Levin-Epstein, M. (2001). HIPAA Privacy Rules Create Uncertainty, Compliance Woes. *Managed Care Magazine*. Retrieved July 10,

2011 from http://www.managedcaremag.com/archives/0102/0102.hipaa.html

Lynn (2011). Meaningful Use Mondays – Medicare vs. Medicaid Penalties and Other Differences. Retrieved July 10, 2011 from http://www.emrandhipaa.com/lynn/2011/01/17/meaningful-use-mondays-medicare-vs-medicaid-penalties-and-other-differences/

Office of the National Coordinator for Health Information Technology (ONC) (2010). Get the Facts about Health Workforce Development Program. Retrieved July 10, 2011 from http://healthit.hhs.gov/portal/server.pt/community/health_it_workforce_development_program:_facts_at_a_glance/1432/home/17051

O'Reiley, T., (2010). Hospitals lose $133.1 million. *Las Vegas Review Journal*. Retrieved July 10, 2011 from http://www.lvrj.com/news/clark-county-hospitals-posts-loss-of--133_1-million--worst-year-ever-91952714.html

St. Rose , A., Hill, C., Corbette, C. (2010). Why So Few? Women in Science, Technology, Engineering and Mathematics. *American Association of University Women*. Retrieved July 10, 2011 from http://www.aauw.org/learn/research/whysofew.cfm.

US Department of Health and Human Services (HHS) (1996a). Summary of the HIPAA Privacy Rule. Retrieved July 10, 2011 from http://www.hhs.gov/ocr/privacy/hipaa/understanding/summary/index.html

US Department of Health and Human Services (HHS) (1996b). Summary of the HIPAA Security Rule. Retrieved July 10, 2011 from http://www.hhs.gov/ocr/privacy/hipaa/understanding/srsummary.html

US Department of Health and Human Services (HHS) (2009). HITECH Act Enforcement Interim Final Rule. Retrieved July 10, 2011 from http://www.hhs.gov/ocr/privacy/hipaa/administrative/enforcementrule/hitechenforcementifr.html

Wager, K. A., Lee, F. W., and Glaser, J. P., (2009). Health Care Information Systems: A Practical Approach to Heath Care Management. Jossey-Bass, San Francisco.

Appendix A

Table 5. Health Informatics Four-Year Degree Plan

Fall 1	Credits
BMD 114 Human Anatomy and Physiology I	4
EH 101 Comp I	3
Social Sci elective	3
CA 110 Public Speaking	3
CIS 150 Intro to Computer Apps	3
	16

Spring 1	Credits
BMD 115 Human Anatomy and Physiology II	4
EH 102 Comp II	3
History	3
MA 112 or higher	3
Humanities elective	3
	16

Fall 2	Credits
Statistics I	3
Literature	3
BMD 210 Infectious Disease in Health Care Environments	3
Social science elective	3
ACC 211 Principles of Accounting I	3
	15

Spring 2	Credits
CA 275 Small Group Communication	3
PSY 120 General Psychology	3
Advanced Stats or quantitative methods	3
Art Drama	3
MGT 300 Management Theory and Practice	3
	15

Fall 3	Credits
ISC 300 Health Informatics Clinical Environment	3
ISC 245 Information Systems in Organizations	3
HSC 343 Clinical Pharmacology	3
NU 311 Clinical Nursing Skills	4
General elective	3
	16

Spring 3	Credits
ISC 410 Health Informatics	3
ISC 272 Systems Architecture	3
CIS 324 Database Design, Development, and Management	3
NU 325 Health Assessment	4
CRC 330 Cardio-respiratory Care Assessment Skills	4
	17

Fall 4	Credits
ISC 455 Health Decision Support Sys	3
ISC 360 Information Systems Analysis and Design (W)	3
ISC 462 Information Systems Strategy and Policy	3
RAD 101 Principles of Radiographic Exposure	4
OT 201 Introduction to Occupational Therapy	3
General elective	3
	19

Spring 4	Credits
ISC 450 Health Sys Analysis and Design	3
CIS 496 Internship	3
CIS 321 Data Communications and Networking	3
ISC 475 Information Systems Project Management	3
General elective	3
	15

Total 129 Hours

Appendix B

Table 6: Courses Establishing a Health Informatics Pre-Professional and Clinical Environment

Pre-Professional Courses Related to Health Informatics Clinical Environment	
Courses	Catalog Description
BMD 114 Human Anatomy and Physiology I	This is the first of a two-course sequence that covers an introduction to basic human anatomy and physiology, including the study of the structure and function of the normal human body. Included is a study of basic principles of chemistry related to human physiology, a study of cells and tissues, metabolism, joints, the integumentary, skeletal, muscular and nervous systems, and the senses.
BMD 115 Human Anatomy and Physiology II	A continuation of BMD 114. Topics include nervous, cardiovascular, lymphatic, immune, respiratory, digestive and urinary systems. Additional topics may include blood, metabolism, immunology and reproduction.
BMD 210 Infectious Disease in Health Care Environments	This course introduces the fundamental concepts of host-parasite relationships involved in infectious diseases. Included are virulence characteristics of microbes and mechanisms of host defenses. Principles of microbial physiology, genetics and antimicrobial therapy are provided as background. Specific infectious diseases of various anatomical systems are emphasized
ACC 211 Principles of Accounting I	The course provides an understanding of ways in which accounting information supports business decision-making. Topics include financial accounting and reporting for assets and liabilities
MGT 300 Management Theory and Practice	Theories of organizational structures, practices, and behavior, and the effective leadership and management of organizations. Emphasis on leadership and developing patterns and strategies of organization management in a dynamic environment as affected by the interaction of material and human resources using the technique of applied social and management sciences.
Health Informatics Clinical Environment	
Courses	Catalog Description
NU 311 Clinical Nursing Skills	The purpose of this course is to provide students the opportunity to acquire basic nursing care skills. The emphasis is on the responsibilities of the professional nurse in ensuring quality and safety. Students are introduced to simulation as an approach to sharpen clinical reasoning and communication skills in a safe environment
NU 325 Health Assessment	The purpose of the course is to provide students the opportunity to acquire basic nursing assessment skills. The emphasis is on the assessment skills of the whole person, including physical, psychological, socio-cultural, and spiritual aspects of persons from all stages of life. Students will learn skills associated with obtaining a health history and performing health assessments across the lifespan.
HSC 343 Clinical Pharmacology	The purpose of the course is to provide the student with the opportunity to acquire information related to the clinical application of drug therapy and the concepts relating to the mechanisms of drug actions, interactions, and adverse reactions, including the immunologic-idiosyncratic-allergic responses. Emphasis is on the current evidence related to pharmacokinetics, dosage, methods of administration, and adverse effects of major classifications of drugs to inform nursing care.
RAD 101 Principles of Radiographic Exposure	A beginning study of the principles involved in image formation including radiographic films, film processing, and exposure factors affecting film quality.
OT 201 Introduction to Occupational Therapy	An introduction to the occupational therapy profession and the scope of occupational therapy practice. Includes self assessment and development strategies to enhance students' readiness for the professional component of the occupational therapy curriculum. Familiarizes students with the functions, policies and services of the University, College and Department and includes an exploration of related allied health professions.
CRC 330 Cardiorespiratory Care Assessment Skills	A presentation of patient assessment skills to prepare for subsequent courses in the curriculum. Modules included are chart review and history, vital signs, physical assessment of the chest, chest radiography, laboratory assessment, bedside pulmonary function testing, electrocardiography, and cardiopulmonary resuscitation. Students are prepared to function in a problem-based learning curriculum.

Appendix C

Table 7. Health Informatics Program Objectives

The program must enable students to attain, by the time of graduation, the ability to perform:
• *Analysis: evaluate process workflows, perform process workflow redesign through user requirements analysis, and participate in implementation of redesigned process workflows* • *Evaluation: assist in vendor and software selection, evaluate technology/software/system alternatives, and assist in network planning and needs assessment* • *Management: manage implementation project plans, act as liaison among healthcare providers, IT staff, and systems vendors, and communicate existing and emerging trends to healthcare providers and IT staff* • *Data management: manage healthcare data and record structures, work with IT staff to ensure documentation/security/privacy requirements for medical records, and analyze and present data for healthcare decision making such as evidence-based practice* • *Assessment: apply a working knowledge of biostatistics and epidemiology to assess healthcare outcomes and risks*