PHARMACY INFORMATICS CERTIFICATE PROGRAM
CURRICULUM DEVELOPMENT

By

Joseph Fazio, R.Ph., MHA

CAPSTONE PROJECT

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Certificate of Approval

This is to certify that the Master's thesis of

Joseph Fazio

has been approved

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Judith R. Logan, MD, MS

Capstone Advisor

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Abstract

In the United States today, there are several factors influencing the expansion of medical informatics and health information technology (HIT). The Pharmacy Manpower Project forecasted a 100,000 pharmacist shortfall by 2020 due primarily to an aging population, Medicare Part-D and the increasing educational requirements for pharmacists. What the study did not consider is the impact that HIT could have to improve the efficiency of the medication use process and to decrease the need for pharmacists.

To achieve the goal of gaining medication distribution efficiencies though HIT implementation, a qualified workforce of informatics pharmacists must be developed. This paper proposes the creation of a pharmacy informatics certificate program which will educate pharmacists to enter the workforce and lead the safe and effective proliferation of pharmacy informatics and technology in the medication use process.

Based on core clinical and pharmacy informatics knowledge and skill standards suggested by the International Medical Informatics Association (IMIA) and the American Society for Health-System Pharmacists (ASHP), this curriculum contains 6 core courses and a selection of 6 elective courses of which students would select 2. This program would introduce competent informatics pharmacists to the workforce by focusing the post-graduate curriculum core content on the fundamentals of pharmacy informatics, clinical decision-making, medication-use process and leadership development.

Introduction

In the United States today, there are several factors influencing the expansion of medical informatics and health information technology (HIT). Reacting to fundamental business drivers for fiscal stability, some health care organizations are independently adopting HIT to improve cost of care through better resource efficiency, error reduction and information and reimbursement management. Others are adopting HIT secondary to national and local policy drivers. These technologies, which include the electronic health record (EHR), computerized order entry (CPOE), and robotics, have had a low adoption rate. In 2010, only 25 percent of physician offices and 15 percent of hospitals were using EHRs.[1] To expand the broad adoption of HIT, one challenge is to recruit and retain a qualified informatics workforce that can plan, implement and maintain the new information systems.

What is true of primary physicians and nurses is also true of pharmacists: that an overall shortage exists and can be predicted to only get worse as a result of aging of the population and expanded coverage under the Patient Protection and Affordable Care Act of 2010. The Pharmacy Manpower Project [2] forecasted a pharmacist shortage over 10 years ago due primarily to an aging population, Medicare Part-D and the increasing educational requirements for pharmacists (i.e. BS to PharmD). Their projections were that prescription volume would see an increase from 3 billion to 7.2 billion by 2020. That paper projected that even if pharmacist productivity increased three-fold in both outpatient and inpatient settings, there would still be a 100,000 pharmacist shortfall. What the study did not consider,

however, is the impact that HIT could have to improve the efficiency of the medication use process and to decrease the need for pharmacists.

To achieve the goal of gaining medication distribution efficiencies though HIT implementation, a qualified workforce of informatics pharmacists must be developed. It is not known how many informatics pharmacists will be needed. Workforce analysis studies have focused on the numbers needed in clinical informatics and nursing informatics without proper attention to pharmacy informatics.

The pharmacist best understands the level of HIT and sophistication in the medication use process (Figure 1.). The process begins with physician ordering and involves the pharmacist in many steps, from verification of orders to dispensing,

Figure 1. Medication Use Processes Adapted from ASHCP Pharmacy Informatics Webinar[3]
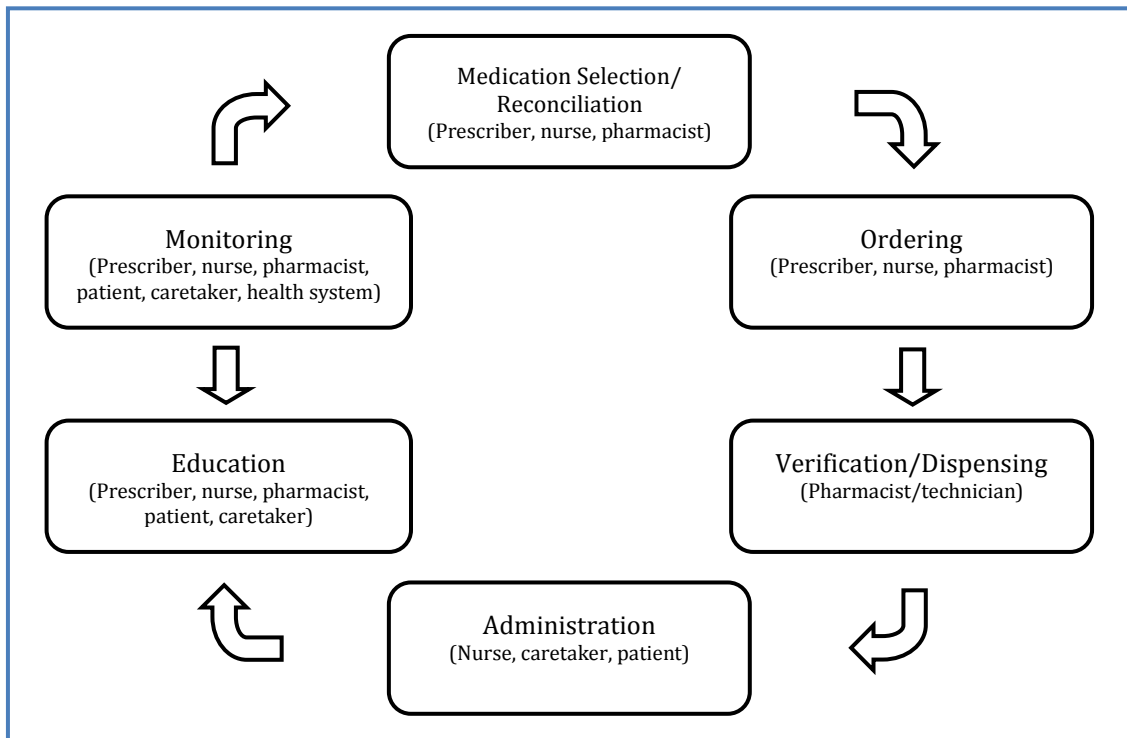
who understands workflow, clinical information and information technology supporting the medication-use process is in the best position to be involved in the distribution, education and monitoring, circling back to medication reconciliation which allows correct orders to be written. It should be recognized that a pharmacist design, implementation and maintenance of the information systems that can lead to needed efficiencies.

This paper will propose the creation of a pharmacy informatics education program which can solve current and future workforce needs by training pharmacists to be informaticians. The vision of this program is to help meet both of those needs specific to medication management through education of pharmacists by:

- Establishing industry-recognized standards for pharmacy informatics education outside the post-graduate residency system.
- Relieving workforce shortages by expanding education access to pharmacists wishing to qualify as certified informatics pharmacists.
- Introducing qualified informatics pharmacists into the workforce to lead the safe and effective proliferation of pharmacy informatics and technology in the medication use process.

Background

Pharmacy Informatics has been defined as "the scientific field that utilizes a systems approach to medication-related data and information, including its acquisition, storage, analysis, and dissemination, in the delivery of optimal medication-related patient care and health outcomes." [4] Informatics pharmacists are pharmacists whose practice is devoted to the development, implementation and management of the health information technology systems. [5]

Much like a physician does in medical informatics, an informatics pharmacist adds perspective with training in both pharmacy practice and informatics. The informatics pharmacist uses their practice experience to evaluate the medication-use process and assess technology and system functioning with their informatics training. To help codify the work of an informatics pharmacist, the American Society for Health-System Pharmacists (ASHP) has grouped their responsibilities into four main categories: [6]

- Participation: Participate in all aspects of informatics that support the medication-use process
- Leadership: Provide leadership that focuses on informatics to enable safe medication use
- Education: Educate at the local and national levels to prepare pharmacists for informatics in practice
- Research: Conduct research evaluating various technical, workflow, outcomes and other related considerations

The diversity of these responsibilities requires exceptionally trained pharmacists. ASHP has compiled a list of recommended knowledge and skill domains, that must be mastered by the pharmacist while preparing to function as competent informaticians: [7]

- Knowledge and understanding of pharmacy practice
- Knowledge and understanding of automation
- Understanding of basic software and database design
- Ability to follow program logic
- Familiarity with basic data management tools
- Familiarity with the automation devices currently available
- Familiarity with informatics standards and initiatives
- Risk analysis skills
- Project management skills
- Change-management skills
- Analytical skills
- Communications skills
- Acquisition/request for proposal (RFP) skills

In 2006, a task force was established under the auspices of IMIA's Working Group on Health and Medical Informatics Education "to consider and undertake any necessary work to update the IMIA Recommendations on Education in Health and Medical Informatics" [8]. The Working Group recommended learning outcomes, knowledge and skill levels classified into three domain areas:

Table 1. IMIA Recommended Domains and Advanced BMHI Learning Outcomes [8]

1	**Biomedical and Health Informatics Core Knowledge and Skills**
1.6	Characteristics, functionalities and examples of information systems in health care (e.g. clinical information systems, primary care information systems, etc.)
1.8	Management of information systems in health care (health information management, strategic and tactic information management, IT governance, IT service management, legal and regulatory issues)
1.11	Appropriate documentation and health data management principles including ability to use health and medical coding systems, construction of health and medical coding systems
1.12	Structure, design and analysis principles of the health record including notions of data quality, minimum data sets, architecture and general applications of the electronic patient record/electronic health record
2	**Medicine, Health and Biosciences, Health System Organization**
2.4	Organization of health institutions and of the overall health system, inter-organizational aspects, shared care
3	**Informatics/Computer Science, Mathematics, Biometry (continued)**
3.1	Basic informatics terminology like data, information, knowledge, hardware, software, computer, networks, information systems, information systems management
3.2	Ability to use personal computers, text processing and spread sheet software, easy-to-use database management systems
3.3	Ability to communicate electronically, including electronic data exchange, with other health care professionals, internet/intranet use
3.4	Methods of practical informatics/computer science, especially on programming languages, software engineering, data structures, database management systems, information and system modeling tools, information systems theory and practice, knowledge engineering, (concept) representation and acquisition, software architectures
3.8	Handling of the information system life cycle: analysis, requirement specification, implementation and/or selection of information systems, risk management, user training

3.9	Methods of project management and change management (i.e. project planning, resource management, team management, conflict management, collaboration and motivation, change theories, change strategies)
3.12	Methods for decision support and their application to patient management, acquisition, representation and engineering of medical knowledge; construction and use of clinical pathways and guidelines

- Biomedical and Health Informatics (BMHI) core knowledge and skills

- Medicine, health and biosciences, health system organization,

- Informatics/computer science, mathematics, biometry,

Learning outcomes listed in Table 1 are those that had a knowledge and skill level for BMHI professionals as "+++ = advanced." Advanced learning outcomes provided were the most relevant to the pharmacy informatics curriculum.

Both the IMIA and ASHP are leaders in promoting health informatics proliferation. Additionally, their core knowledge and skill standards are remarkably similar, which demonstrates the natural alignment of clinical informatics and pharmacy informatics with only the specialty of the training being different. The pharmacy informatics program being proposed takes advantage of these similarities; based on an amalgam of learning objectives from the two professional organizations, four core content categories have been defined.

The four core content categories are:

- Fundamentals of pharmacy informatics

- Clinical decision-making and medication-use process improvement

- Pharmacy information systems

- Leading and managing change

Curriculum Summary and Student Learning Objectives

Relevant learning outcomes from ASHP and IMIA were adapted for this program. The program's seven student learning objectives (Table 2) address the knowledge and skills needed to be a successful informatics pharmacist. The objectives provide a quality benchmark against which each graduate will be measured. Additionally, the learning outcomes are a reflection of the four core content categories: pharmacy informatics fundamentals, clinical decision support and medication-use process, pharmacy information systems and leadership.

Table 2. Student Learning Objectives

	At the end of <u>*Pharmacy Informatics Certificate*</u> *program the graduate will be able to:*
SLO 1.	Demonstrate an understanding of how the application of pharmacy informatics principles, standards, and best practices improves the medication use process safety, quality and efficiency. (COMPREHENSION)
SLO 2.	Select appropriate patient-specific, medication-specific, and evidence-based pharmacotherapy information required to support effective medication-related decision support systems. (APPLICATION)
SLO 3.	Explain how standard interface messaging, standard medical vocabularies and clinically validated data produce an accurate and reimbursable medication use process. (COMPREHENSION)
SLO 4.	Describe the various functions among the applications, technologies and automation systems found within a pharmacy operation's medication use process. (KNOWLEDGE)
SLO 5.	Demonstrate a working knowledge of the project life cycle for a significant pharmacy information technology or automation implementation. (COMPREHENSION)
SLO 6.	Describe the attributes of a pharmacy informatics leader. (KNOWLEDGE)
SLO 7.	Design and fully execute a pharmacy informatics-related project. (SYNTHESIS)

This curriculum for a Certificate in Pharmacy Informatics is modeled after and uses courses from the Certificate in Biomedical Informatics at Oregon Health & Science University (OHSU), taught in the Department of Medical Informatics and Clinical Epidemiology. Where possible, courses are selected (with and without minor modifications as noted) from that curriculum.

Each OHSU course content, context and learning objectives were reviewed. The goal of the review was to determine if any of the existing courses offered by OHSU were appropriate to include in the curriculum. If a course's learning objectives were not aligned with the program's student learning objectives (SLOs), it was considered not appropriate for inclusion. More than one course was felt to be appropriate but with minor modifications.

Courses that were considered appropriate or appropriate with modification were mapped to each of the seven SLOs. A gap analysis was performed to identify which SLOs, if any, were not properly supported by the curriculum. It was determined that pharmacy informatics concepts, principles and methods were underrepresented in the available OHSU course offerings. Table 3 lists the suggested six required courses and six elective courses (of which students would choose 2). Among the six required courses, three new courses are proposed, two existing OHSU courses are acceptable with minor modifications, and one was included with no changes. Elective courses were selected based on their overall contribution to supporting the SLO without the need for pharmacy-related content or context. Table 4 illustrates the relationship between the selected courses and the SLOs they support.

Table 3. Course Name, Type and Credit Hours

Pharmacy Informatics Certificate Track		
Required Courses		
Course Description	**Course Type**	**Credit Hours**
Introduction to Biomedical and Health Informatics	M	3
Building Core Competencies in Pharmacy Informatics	N	3
Pharmacy Quality and Evaluation Methods	N	3
Business of Pharmacy Informatics	M	3
Project Management	U	3
Pharmacy Informatics Practicum	N	3
Suggested Elective Courses (choose 6 credits)		
Course Description	**Course Type**	**Credit Hours**
Ethical, Legal, and Social Issues in Biomedical Informatics	U	3
Organizational Behavior and Management in Informatics	U	3
Design and Evaluation in Health Informatics	U	3
Clinical Classification Systems and Applied Reimbursement Methodologies	U	2
Standards and Interoperability in Healthcare	U	3
Foundations of Databases	U	3

N = New Course; **M** = Modified from Existing Course; **U** = Unchanged Existing Course

Table 4. Student Learning Objectives and Curriculum Alignment

Student Learning Outcomes	Required Courses						Elective Courses					
	Introduction to Biomedical Informatics	Pharmacy Informatics	Pharmacy Quality & Evaluation	Business of Pharmacy Informatics	Project Management	Practicum	Ethical, Legal, and Social Issues	Standards and Interoperability in Healthcare	Organizational Behavior & Management	Fundamentals of Databases	Design and Evaluation in Healthcare	Clinical Classification & Reimbursement
SLO 1.	X	X	X	X		X	X	X				
SLO 2.	X	X	X	X		X	X				X	
SLO 3.	X	X	X	X			X			X		X
SLO 4.		X		X						X		
SLO 5.		X			X	X	X	X				
SLO 6.		X	X		X	X	X	X				X
SLO 7.				X	X	X	X		X			

The courses selected, modified or created can be grouped by their alignment with the four core content categories.

Fundamentals of pharmacy informatics

This category focuses on the informatics pharmacist gaining a clear understanding of the overall impact that information technology, automation and information management can have on pharmacy operations and the medication-use process. This includes its impact on safety, quality and privacy.

Courses that support learning in this core category are:

- *Introduction to Biomedical Informatics*

- *Pharmacy Informatics*

- *Pharmacy Quality and Evaluation Methods*

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- *Design and Evaluation in Health Informatics*

- *Ethical, Legal, and Social Issues in Biomedical Informatics*

Clinical decision-making and medication-use process improvement

This category focuses on technology and information management that involves medication-related clinical concepts and the medication-use process. Students are introduced to computerized provider order entry, clinical decision support systems, automated medication preparation and distribution, administration technologies and monitoring analysis.

Courses that support learning in this core category are:

- *Introduction to Biomedical Informatics*

- *Pharmacy Informatics*

- *Pharmacy Quality and Evaluation Methods*

Pharmacy information systems

This category focuses on developing an understanding how implementing new data or software can affect the functionality of an application or device. Included in this are telecommunication and health information standards, system interoperability, vocabularies and coding for charting and billing.

Courses that support learning in this core category are:

- *Pharmacy Informatics*

- *Clinical Classification Systems and Applied Reimbursement Methodologies*

- *Standards and Interoperability in Healthcare*

- *Fundamentals of Databases*

Leading and managing change in pharmacy practice

This category focuses on how to successfully implement change and recognize and plan for the angst those personnel will experience as they transition to a new technology or workflow. Dr. William Hersh [9] suggests when implementing new systems in an organization the project leader should budget 90% of their time on managing stakeholders and 10% on the technology.

Courses that support learning in this core category are:

- *Business of Informatics*

- *Project Management*

- *Organizational Behavior and Management in Informatics*

Curriculum - Required Courses

INTRODUCTION TO BIOMEDICAL & HEALTH INFORMATICS

Credits: 3.0

Prerequisite: None

Course Description[1]

This course provides a broad survey introduction to biomedical and health informatics, the field concerned with the acquisition, use, and storage of information in healthcare, biomedical research, and public health. Students focus on the underlying themes of biomedical and health informatics, including the proper use of information technology in health-related settings. The course also covers the main applications of information technology in health and biomedicine, including electronic health records, personal health records, medication use process, information retrieval, genomics, imaging, and telemedicine. The viewpoints of information technology from medicine, computer science, nursing, pharmacy, public health, patients/consumers are considered.

The course provides up-to-date details on current events in the field, including the "meaningful use" of electronic health records specified by the Health Information Technology for Economic and Clinical Health (HITECH) Act of the American Recovery and Reinvestment Act (ARRA, also known as the economic stimulus package)

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[1] This course is modified from the OHSU BMI course. Modifications in the course description are underlined and suggested modifications in content are shown in the course outline.

Learning Objectives

At the end of this course, the student will be able to:

- Describe the fundamental attributes of medical informatics and its role in delivering health care.

- List the external forces influencing the development and implementation of medical informatics in US healthcare facilities.

- Explain how medical informatics can reduce medical errors.

- Demonstrate an understanding of the importance of bioinformatics in genomic research.

Course Outline

Week	Topics	Additional topics for Pharmacy Informatics
1	**Overview of Field and Problems Motivating It** What is Biomedical and Health Informatics? A Discipline Whose Time Has Come Problems in Healthcare Motivating Biomedical and Health Informatics Who Does Biomedical and Health Informatics? Seminal Documents and Reports Resources for Field - Organizations, Information, Education	
2	**Biomedical Computing** Types of Computers Data Storage in Computers Computer Hardware and Software Computer Networks Software Engineering	

3	**Electronic and Personal Health Records (EHR, PHR)** Clinical Data History and Perspective of the Health (Medical) Record Definitions and Key Attributes of the Electronic Health Record (EHR) Benefits and Challenges of the EHR EHR Examples Personal Health Records Nursing Informatics	Achieving ancillary application integration through the EHR enterprise system: CPOE with Pharmacy and Lab systems (Epic Willow and Beaker) Introduction to Pharmacy Informatics
4	**Standards and Interoperability; Privacy, Confidentiality, and Security** Standards: Basic Concepts Identifier and Transaction Standards Message Exchange Standards Terminology Standards Natural Language Processing of Clinical Text Privacy, Confidentiality, and Security: Basic Concepts HIPAA Privacy and Security Regulations	RXNORM National Council for Prescription Drug Programs (NCPDP) standards group defining EDI claims adjudication and e-Prescribing CPOE and e-Prescribing, Lab results as structured data
5	**Meaningful Use of the EHR** Patient Safety and Medical Errors Healthcare Quality Clinical Decision Support: Approaches and Historical Perspectives Reminders and Alerts Computerized Provider Order Entry (CPOE) Health Information Exchange HITECH, ARRA, and Achieving Meaningful Use	Medication Errors Drug-Drug Interaction, Therapeutic duplication, Drug Allergy, Dose range, pregnancy/geriatric/pediatric dosing precautions Drug build (NDC Master) order sets, therapy plans, User interface

6	**EHR Implementation and Evaluation** Clinical Workflow Analysis and Redesign System Selection and Implementation Usage of the EHR Clinical Outcomes of the EHR Cost-Benefit of the EHR Clinical Research Informatics Public Health Informatics	Integration of Lab, Pharmacy, OR (Surgery/Anesthesia), Oncology, Transplant systems.
7	**Evidence-Based Medicine and Medical Decision Making** Definitions and Application of EBM Interventions Diagnosis Harm and Prognosis Summarizing Evidence Putting Evidence into Practice Limitations of EBM	
8	**Information Retrieval and Digital Libraries** Information Retrieval Knowledge-based Information Content Indexing Retrieval Evaluation Digital Libraries	
9	**Imaging Informatics and Telemedicine** Imaging in Health Care Modalities of Imaging Digital Imaging Telemedicine: Definitions, Uses, and Barriers Efficacy of Telemedicine Patient-Clinician Communications	

10	**Translational Bioinformatics and Personalized Medicine** Bioinformatics - The Big Picture Overview of Basic Molecular Biology Important Biotechnologies Driving Bioinformatics From Clinical Genetics and Genomics to Personalized Medicine Bioinformatics Information Resources Translational Bioinformatics Challenges and Opportunities	Pharmacogenomics

PHARMACY INFORMATICS

Credits: 3.0

Prerequisite: None

Course Description

This course builds core competencies in pharmacy informatics. The competencies discussed in this course are intended to provide the student with a foundation of knowledge and understanding of the connection between the medication use process and informatics. This course is not intended to be an exhaustive discussion of all pharmacy informatics fundamentals, but an introduction to, and the beginning of an exploration of pharmacy informatics.

Learning Objectives:

At the end of this course, the student will be able to:

- Describe the pharmacy informatics technologies used at each stage of the medication use process.
- Explain how pharmacy informatics can improve medication safety.
- Demonstrate an understanding of the importance of data communication standards and network security.
- Assess the future of pharmacy informatics' role in health care technology development and use.

Course Outline

Week	Topics
Unit 1	**Foundations of Pharmacy Informatics**
1	Informatics and the Medication Use Process
2	Health Information Technology Adoption
3	Telecommunication and Health Information Exchange Fundamentals
Unit 2	**Informatics Role in the Medication Use Process**
4	Assessment and Ordering Computerized Provider Order Entry (CPOE) Electronic Prescribing (e-Prescribing) Clinical Decision Support (CDS) Systems at Prescribing
5	Order Verification by the Pharmacist Pharmacy Information Management System Evidence-Based Medicine, Clinical Tools and Evaluation of the Evidence Clinical Decision Support Systems in Pharmacy Practice
6	Medication Dispensing and Distribution Automation of Hospital Pharmacy Operations Automation of Ambulatory Pharmacy Operations Automation of Retail Pharmacy Operations
7	Integrated Electronic Systems for Medication Verification, Administration and Documentation Enterprise Electronic Health Record Documenting Medication Administration – BCMA, Smart Pumps
8	Medication Related Monitoring and Outcomes Measurement Clinical Surveillance Systems Documenting Clinical Interventions Data Mining, Analysis and Reporting for Quality Improvement
Unit 3	**Informatics and Business Services**
9	Pharmaceutical Supply Chain Charge Master Maintenance Coding Standards Billing Compliance
10	**Summary**

PHARMACY QUALITY AND EVALUATION METHODS

Credits: 3.0

Prerequisite: Pharmacy Informatics, Introduction to Medical Informatics

Course Description

This course covers the issues of establishing quality measures, techniques for measuring and how to improve the quality of pharmacy care. The course begins with a general overview of endorsed quality measures and their authoring organization in the United States, followed by techniques for measuring and reporting quality metrics. Students will be expected to apply these techniques in practical settings. We'll finish the course with a discussion regarding how to use quality data to make quality improvement work.

Learning Objectives

At the end of this course, the student will be able to:

- Discuss nationally endorsed quality measures and their impact on pharmacy and health care performance.
- Discuss key aspects of data validity, collection, analysis and reporting.
- Describe the process needed to implement team-based, quality improvement initiatives within the context of their daily activities.

Course Outline

Week	Topics
Unit1	**Introduction to Quality Improvement**
1	Status of quality improvement and reporting in the US health care system
2	Historical review of quality initiatives to improve patient safety
3	Pharmacy-centric quality initiatives and national quality organizations
Unit 2	**Measuring Quality**
4	Measurement theory and practice
5	Data types and collection methods
6	Analysis and reporting
Unit 3	**Changing Practice**
7	Strategies for implementing quality measures and continuous improvement
8	Application of quality improvement to pharmacy practice
9	Legal and regulatory issues in healthcare quality
10	**Summary**

BUSINESS OF INFORMATICS[2]

Credits: 3.0

Prerequisite: Introduction to Biomedical Informatics

Course Description

This course is designed to provide the informatics student an overview of the business practices related to information technology. It augments the study of the science of health information with an exposure to the practices whereby a health care organization sets IT goals and objectives, designs and implements IT solutions, manages the IT function and organization, and develops IT capital and operating budgets.

Health care organizations by their very nature are information dependent—from clinical decision making to operational and business planning. These organizations are investing significant dollars, and increasingly high percentages of available capital, into modern information systems. The success of these projects hinges upon solid business practices, including strategic planning, system life cycle, requirements development, vendor negotiation and selection and project management. These skills are too often learned through the "school of hard knocks."

This course will present current "best practices" of the business of health and, more specifically, pharmacy informatics, drawn from industry journals and business analysis consultants. Lectures will augment these readings with real life experience.

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[2] This course is modified from the OHSU BMI course. Suggested modifications in content are shown in the course outline.

Learning Objectives

At the end of this course, the student will be able to:

- Describe a systematic, organized approach to <u>pharmacy</u> information technology solutions—from high-level strategic planning to the tactical system development life cycle.

- Analyze the information technology marketplace, including vendor history, product offerings and financial evaluation.

- List common business issues and tools, such as requirements development, the request for proposal, and vendor selection, negotiation, and contracting.

- Describe information technology management issues, such as organizational structure and budget development.

Course Outline

Week	Topics	Suggested Additional Lecture Topics
1	Introduction and Overview Environmental Factors in the Business of Health Care IT	
2	Strategic Planning for Health Care IT	Medication Use Process and its Role in Health Care Information Technology
3	System Development Life Cycle Needs Assessment/Requirements Analysis	
4	Return on Investment Setting Project Priorities	
5	Health Care IT Vendor Marketplace Student Projects: Vendor Analysis	
6	Vendor Selection Selecting a Health Care Application Request for Proposal	Assess medication-Use technology

7	Vendor Selection (Part 2) Evaluation, Negotiation, Contracting Project Management	
8	Project Implementation Support Issues	
9	IT Organization Outsourcing/Consultants	Pharmacy Informatics and IT organizational relationship
10	IT Financial Management Final Projects	Pharmacy Informatics Financial Management

PROJECT MANAGEMENT[3]

Credits: 3.0

Prerequisite: None

Course Description

This course focuses on the role project management and project managers have in directing pharmacy informatics and information technology initiatives in a health care setting. Students will learn the fundamental theories, processes and tools for managing pharmacy technology implementations in a complex healthcare environment.

Learning Objectives

At the end of this course, the student will be able to:

- Discuss an approach to managing projects that includes both the technical and sociocultural aspects of project management.

- Describe the tools and methods used for defining, planning, budgeting, scheduling, staffing, controlling and documenting projects.

- Apply project management tools and methods to case studies and other assignments.

- Understand and apply Organizational Behavior principles and successful implementation of current management practices, especially in health care.

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[3] This course is part of the current biomedical informatics curriculum and requires no modification.

- Apply Organizational Behavior concepts at the organization, group and individual level to improve project management effectiveness and project success.

Course Outline

Week	Topics
1	Introduction Project Life Cycle and Organization
2	Project Management Process for a Project
3	Project Integration Management
4	Project Scope, Time and Resource Management
5	Human Resource and Communications Management
6	Quality and Risk Management
7	Introduction to Organizational Behavior
8	Leadership, Communication and Motivation
9	Managing Change and Conflict
10	Summary

PHARMACY INFORMATICS PRACTICUM

Credits: 3.0

Prerequisite: All required courses

Course Description

The pharmacy informatics practicum is a 10-week core experience at a participating hospital or health-system pharmacy or outpatient pharmacy. The practicum experience will be precepted by the institution's informatics pharmacy preceptor, faculty members or affiliate faculty members. The practicum will provide students an opportunity to function as an informatics pharmacist both independently and with other healthcare providers with the purpose of developing and demonstrating achievement of the program's learning objectives.

Learning Objectives

At the end of this course, the student will be able to:

- Demonstrate an understanding of the organization's medication-use system and its vulnerabilities to adverse drug events (ADEs).
- Identify opportunities for improvement in the organization's medication-use system by comparing the medication-use system to relevant best practices.
- Design and implement pilot interventions to change problematic or potentially problematic aspects of the medication-use system with the objective of improving quality.
- Determine the presence of any of medication therapy problems in a patient's current medication therapy

- Initiate, design, implement, and write up a practice-related project that reflects the application of project management skills

- Explain security and patient protections such as access control, data security, data encryption, HIPAA privacy regulations, as well as ethical and legal issues related to the use of information technology in pharmacy practice.

- Exercise skill in basic use of databases and data analysis software.

- Successfully make decisions using electronic data and information from internal information databases, external online databases, and the Internet.

Experiential Learning Objectives

Practicum students will be expected to actively participate in all aspects of the site's pharmacy informatics program and support the medication-use process technologies. The participation must be collaborative and comprehensive across the entire healthcare organization. The student's experience will begin with a system overview as well as a review of ongoing application design, development, implementation and maintenance. The student will also be involved in the development and implementation of standards for medication-related vocabularies and terminologies to ensure safety and optimize deployment of clinical decision support-related activities.

Curriculum – Elective Courses[4]

ETHICAL, LEGAL, AND SOCIAL ISSUES IN BIOMEDICAL INFORMATICS

Credits: 2.0-3.0

Content: The goal of this course is to introduce and sensitize students to the ethical, legal, and social issues arising in the use of information systems and other computer-based tools in the delivery of health care. Topics will include the protection of confidentiality and privacy in an electronic environment; ethical implications associated with consumer-oriented Web sites, the use of telemedicine and decision support tools in diagnosis and treatment; the implications of electronic communication and effects on the physician-patient relationship; as well as legal and regulatory requirements for biomedical informatics systems, including patent law and FDA regulations. The approach will be case-based, requiring students to apply ethical frameworks and principles in the analyses of actual situations and case studies. This course meets the ethics requirement for medical informatics students in the School of Medicine Graduate Program.

Prerequisite: None

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[4] All elective courses are currently taught. No changes have been made in the published course descriptions.

STANDARDS AND INTEROPERABILITY IN HEALTHCARE

Credits: 3.0

Content: This course will explore the details of healthcare information technology (HIT) interoperability and standards. The evolution of technology in healthcare, along with the impact on clinical information systems, will be studied. The benefits of integrating healthcare information systems will be investigated, as will the challenges of integrating systems across disparate organizations, healthcare disciplines, and technologies. The value proposition of a standards-based approach to integration will be presented. Students will learn the process of HIT integration projects, and how that parallels the development process of interoperability standards. The course will present an in depth look at standards critical to HIT interoperability – HL7 v2, HL7 v3 RIM, CDA, and SNOMED – and at the use of those standards in national regulations and industry-wide efforts such as IHE. Students will gain experience in navigating through standards documents and tools. Students will utilize the skills and knowledge gained to design a standards-based interoperability project addressing a real-world need.

Prerequisite: None

ORGANIZATIONAL BEHAVIOR AND MANAGEMENT

Credits: 3.0

Content: The most important functions of managers in an organization include understanding and motivating individuals and organizing structural systems within

which they can work in a productive manner. This course will review the concepts, issues and practices of organizational behavior at the individual, group and organizational levels. Students will practice applying these concepts in simulated situations to improve personal effectiveness in groups or organizations. At the individual level, topics will include perception, decision-making, values, attitudes, job satisfaction, and motivation. The group level topics are work teams, communication, leadership, power and politics, conflict and negotiation. Organizational level topics include organizational structure, work design, human resources policies, organizational culture and change. The hybrid version of the course requires some pre-campus reading. See the hybrid course syllabus for details.

Prerequisite: None.

FUNDAMENTALS OF DATABASES

Credits: 3.0

Content: This course is an introduction to databases and database management systems. The main topics covered in this course include database principles, relational databases, database design with Entity-Relationship modeling, the SQL query language, database optimization, and data warehousing. Individual database projects will be completed.

Prerequisite: No prerequisite, but prior completion of BMI 540 suggested.

DESIGN AND EVALUATION IN HEALTH INFORMATICS

Credits: 3.0

Content: This course is one of two core courses in the Evaluative Sciences branch of the curriculum, which also includes PHPM 524 (Introduction to Biostatistics) or an equivalent course. The Evaluative Sciences curriculum was developed to enable students to understand the fundamental aspects of scientific research including statistics, qualitative research methods, epidemiology and health data analysis. At the most fundamental level, this course provides you with a "toolkit" of design and evaluation concepts that will allow you to build your own projects, both in research as well as the clinical informatics realms. This course is intended to provide a high-level overview of the concepts, terminology, and strategies needed to design and evaluate projects in biomedical informatics, including methodologies drawn from software engineering, qualitative research, quantitative research, and business administration.

Prerequisite: PHPM 524 or BSTA 511/611, and working knowledge of Excel or consent of instructor

CLINICAL CLASSIFICATION SYSTEMS AND APPLIED REIMBURSEMENT METHODOLOGIES

Credits: 2.0

Content: This course will address the case studies and applications that focus on the analysis and synthesis of clinical classification system and reimbursement methodologies affecting the role of the Health Information Manager. Students will examine coding compliance and ethical behavior and the effects on revenue issues. Use of software from AHIMA virtual lab is included. Emphasis on ability to process cases in workbook. Group and individual assignments expected.

Prerequisite: Working knowledge of ICD-9 or consent of instructor

Conclusion

An informatics pharmacist has a unique skill set and is more than someone with a passing interest in technology. The informatics pharmacist works at the confluence of medication use, clinical information and technology and must possess an expertise in all. That expertise means that they must also have the ability to critically assess the input, processing and output of clinical information that has a direct impact on a patient's safety and quality of treatment.   The informatics pharmacist must have a strategic understanding of the evolution of technology and how it impacts pharmacy practice with the tactical skills to implement those advances.

An informatics pharmacist must have these abilities and interests if pharmacy practice is to meet future quality, efficiency and workforce demands. This paper proposes, as a solution for these future demands, a formal post-graduate educational certificate program for pharmacists to gain the knowledge and skills in pharmacy informatics. The program will introduce competent informatics pharmacists to the workforce by focusing the post-graduate curriculum core content on the fundamentals of pharmacy informatics, clinical decision-making, medication-use process and leadership development.

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