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DEVELOPMENT AND ASSESSMENT OF A PROGRAM IN CLINICAL AND HEALTHCARE INFORMATICS

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Abstract:

The objectives of this paper are to report on the development of a program in Clinical and Healthcare Informatics and to assess its impact in terms of   (1) the importance of each of the competencies for successful job performance; and (2) the effectiveness of the program in enabling participants to achieve these competencies. The results will be of value in the design and implementation of similar programs for clinical and healthcare professionals because the competencies that are most relevant to successful job performance may become the building blocks for future program development.

Keywords: healthcare informatics

I.   BACKGROUND AND RATIONALE

Information technology is a strategic necessity for designing and implementing electronic medical records (EMR) and other health information systems that are part of the integrated healthcare information technology infrastructure (Mantzana, 2007). The successful adoption of health information technology (HIT) will depend on the knowledge of health care professionals who use these applications to deliver quality healthcare. This knowledge includes an understanding of the processes supported by the health IT infrastructure. The challenge of educating clinicians and health care professionals in health informatics is great. At present, these clinicians and health care professionals use information systems to do their jobs on a day-to-day basis.

"Because we are serious about transforming our system of health care to be safe, efficient, timely, patient-centered, equitable, and effective, we must invest not only in technology, but also in the education and training of individuals to ensure our workforce is poised to meet this challenge. One of the factors most important to the success of health care information technology projects is the engagement and participation of clinicians. There must be a cadre of health care professionals (physicians, nurses, and others) who have knowledge and skills beyond their clinical training. Virtually every hospital, clinic, physician office, or other health care provider organization will in some way utilize information technology solutions in the coming years and will need health care professionals versed in informatics to assist with the implementation, use, and success of these systems (Detmer, 2009)."

The success of information-based healthcare initiatives, including the EMR, clinical decision support systems (CDSS), and telemedicine are all contingent upon the ability of healthcare professionals to use information systems effectively.

The potential size of the health care community to be educated in health informatics is vast. The impact will be translated into the successful adoption and use of health information systems and the improvement of the quality and effectiveness of healthcare delivery. There is evidence from a number of research studies dealing with the implementation of EMR, computerized physician order entry (CPOE) systems, CDSS, and telemedicine that well-trained health care professionals need an understanding of the use of these information systems for successful implementation (Baron, 2005; El-Kareh, 2008; Metzger, 2003; Miller, 2003; Wilcox, 2008; Yeow, 2008; Zandieh, 2008).

To date, the size of this workforce has not been quantified well. A study using the HIMSS Analytics Database reported that there are approximately 108,390 information technology (IT) professionals in health care in the United States (Hersh & Wright, 2008) and that 40,784 additional IT professionals will be needed to support successful adoption of EMR systems. Prior studies by Gartner Research found that there was one IT staff member per 56 non-IT employees, similar to an assessment of the HIT workforce in England (Gabler, 2003; Eardley, 2006). An additional study of the HIT workforce forecast a need in the next five years for 7,600 HIT professionals to implement EMRs for the 400,000 practicing physicians who do not have them and 28,600 additional IT professionals for the 4,000 hospitals who do not have EMRs (Nationwide Health Information Network Workforce Study, 2007).

A well-trained workforce is essential for successful HIT implementation. Health care professionals play a number of roles that are critical to the success of HIT. In addition to using health information systems in their jobs, clinicians are often called upon to serve on systems acquisition teams, to provide training to their peers, and to evaluate the effectiveness of information systems. The above-mentioned research on the need for HIT professionals does not include the number of clinicians and health care professionals who use information technology in their day-to-day roles as nursing professionals, medical technologists, lab technologists, medical records specialists, medical office assistants, and other individuals in administrative roles using health information systems. These roles are all critical to the effective implementation of HIT.

II.   THE PROGRAM: CLINICAL AND HEALTHCARE INFORMATICS

The Clinical and Health Informatics Program was developed based upon a needs assessment by a team of health care professionals in nursing, medical information, and information technology. A series of information sessions were delivered to obtain further input from clinicians and health care professionals. The overall objective of the program is to provide an overview of information systems and state-of-the-art information technology in the health care and clinical domain.

The competencies, which are the basis for designing the program in Clinical and Healthcare Informatics, are:

Competencies:
- Achieve an in-depth understanding of the design, selection, testing, and implementation of information systems in a health care organization.
- Understand and demonstrate the ability to apply information management concepts and applications to support data retrieval and decision support in research, consultation, and administration.
- Be familiar with state-of-the-art computer hardware, software, database systems, data communications, disaster recovery, and data security.
- Understand the tools, methodologies, and technologies supporting the uses of information technology in health care services.
- Achieve an understanding of the human factors surrounding the use of information systems.
- Understand project management best practices.

Pedagogical Methods:
The pedagogical methods include lectures, textbook reading assignments, instructor-led discussions, Web-based instructional materials, and team-based activities that require communications, problem-solving, discussion, feedback, and evaluation. One of these team-based activities, a case-based simulation of a systems acquisition team decision, is an example of a team-based instructional activity.

Content outline: The content outline for the 15-session program in Clinical and Healthcare Informatics is as follows:

Week	Topic
1	Systems Planning for Information Systems - What is a health care information system? - Strategic planning for health care information systems - The users, managers, and systems in health care. - Types of applications in health care. o Operational information systems o Tactical information systems o Decision support systems
2	Database Systems. - Data, information, and knowledge. - Understanding data models. - Understanding relational databases. - Database management system software and the firms providing the software. - An overview of management of a firm's database systems.
3	Database Systems - Query and reporting basics - SQL for the non-IT manager
4	Clinical Decision Support Systems: An Overview - Data warehouses: the software and databases that support data warehousing operations. - Decision support systems (DSS) concepts and objectives. - Unique information requirements for health care professionals
5	Clinical Decision Support Systems: Part 2 (Queries) - Key performance indicators (e.g., cost/service) - Clinical Decision Support Systems - Administrative Decision Support Systems
6	Information Systems Development - System life cycle and the phases of the life cycle methodology - Systems Analysis o Needs assessment. o Conducting a feasibility study. o Tools for data modeling and process modeling. o Process modeling—identifying a process and evaluating process performance. o Defining functional requirements.
7	Systems Design and Implementation - Process re-engineering - Design: Human computer interaction - Design: Inputs and outputs - Design: Files and databases - System Implementation
8	Information Technology Infrastructure - Hardware and Software Distributed Systems. - Distributed system architectures. - Providing 24x7 high availability. - Key industry providers of distributed systems hardware and software. Data Communication Systems. - Computer-based data communications including communications hardware. - Communications software. - Basic network approaches to processing data. - Common communication system carriers.

	- Local networks and intranets. - Network management.

9	High Availability (Business Continuity) and Disaster Recovery Planning
	    - How high availability is achieved.
	    - Disaster recovery issues and responsibilities, including an example
	      disaster recovery plan.
	System Quality Assurance
	    - Information Systems Audit and Control
	    - Enhancements and upgrades
	    - Control objectives

10	"Package" implementation vs. "Custom Development" – project and solution
	selection (Integrated Case, Part 1).
	    - Conducting a feasibility study
	    - System selection task force
	    - RFP Development

11	Project Management
	    - Concepts of project scope, time, and cost
	    - Project management techniques
	    - Tracking project progress

12	Information Systems Security.
	    - Threats of accidents and malfunctions.
	    - Threats of computer crime.
	    - External threats.
	    - Methods for minimizing risk.
	    - Privacy and confidentiality requirements.

13	RFP Case Study and Procurement (Integrated Case, Part II)
	    - Project Presentations
	    - Analysis and Evaluation
	    - Supplier Management/Procurement

14	IT Trends in Health Care (this might be changed)
	    - Electronic Health Records—factors, forces, and issues.
	    - eHealth: the Internet and health care information systems
	    - An eHealth case study
	    - Virtual teams in health care service delivery

15	Information needs and challenges in today's health care environment
	    - Integration of information systems in virtual organizations.
	    - Telecommunications applications in clinical practice.
	    - Future directions in health care informatics.

III.   PARTICIPANT PROFILE

The participants in the Clinical and Healthcare Informatics Program represent a cross-section of the health care community. In many cases, healthcare professionals have already taken on roles in designing and implementing health information systems within their functional areas. They can be seen as "super-users" or functional area information specialists. A representative sample of job descriptions includes:

Nursing professional
Lab technical coordinator
Medical lab technician
Project manager
Nursing manager
Home healthcare coordinator
Case management supervisor
Healthcare information systems analyst

Clinical applications specialist
Clinical information systems coordinator
Pharmacy information systems (IS) coordinator
Financial manager
Clinical nurse manager
Trainer
Operating room information systems analyst

IV.   ASSESSMENT OF PROGRAM EFFECTIVENESS

The twenty-five participants in the Spring, 2009 Clinical and Health Informatics program completed an assessment at the conclusion of the program. The assessment included a 1 – 7 Likert scale:
- The extent to which they achieved competencies in clinical and healthcare informatics (7 = to a great extent; 1 = to a limited extent).
- The extent to which they viewed these competencies as being important to job success (7 = very important to job success; 1 = of little importance to job success).

A summary of the assessment data for the competencies which were considered most important to job success is included in Table 1. Appendix A includes the complete assessment results.

Table 1: Competencies in Clinical and Healthcare Informatics

Competencies	Importance	Gained
Understanding future directions health care informatics	5.95	5.42
Knowledge of electronic health records: issues	5.74	5.26
Understanding design implement information systems	5.65	5.35
Knowledge of methods for minimizing info security risk	5.63	5.11
Understanding system quality assurance audit control	5.58	5.10
Understanding information systems security	5.58	5.11
Knowledge of project management: scope and WBS	5.53	5.25
Knowledge of how to query databases	5.50	5.10
Knowledge of basics of IT infrastructure	5.45	5.30
Understanding human factors information sys design	5.40	5.10
Knowledge of basics of data communications systems	5.37	5.00
Knowledge of how to create reports using databases	5.35	5.00
Understanding clinical decision support systems	5.35	4.95
Knowledge of project management: statement of work	5.32	5.15
Knowledge of project risk management	5.32	4.89

As you can see from the table, several themes emerged as important to job success, including: (1) knowledge of electronic health record implementation issues; (2) information systems acquisition; (3) information security and information assurance; (4) database reporting; and (5) project management. All of these are prevalent themes in clinical and healthcare information systems design, implementation, and management. The increasing role of clinical professionals in information systems project management is illustrated through the importance of project management competencies.

A Clinical and Healthcare Informatics Advisory Committee participated in reviewing the results of the assessments and uses these results to provide input into re-designing the competencies for the program.

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Appendix A: Clinical and Healthcare Informatics Competencies

Competencies	Importance	Gained
Understanding future directions health care informatics	5.95	5.42
Knowledge of electronic health records: issues	5.74	5.26
Understanding design implement information systems	5.65	5.35
Knowledge of methods for minimizing info security risk	5.63	5.11
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Knowledge of how to create reports using databases	5.35	5.00
Understanding clinical decision support systems	5.35	4.95
Knowledge of project management: statement of work	5.32	5.15
Knowledge of project risk management	5.32	4.89
Understanding database management systems	5.30	5.10
Understanding disaster recovery planning	5.30	4.80
Understanding strategic planning for health care teams	5.30	5.47
Understanding eHealth: internet and health care	5.26	5.10
Knowledge of applications in healthcare	5.25	4.50
Knowledge of systems development life cycle	5.16	5.05
Ability to work on virtual health care teams	5.16	5.30
Ability to make systems acquisition decisions	5.11	5.68
Understanding administrative decision support systems	4.95	5.00
Understanding how to conduct feasibility study	4.95	5.00
Knowledge of distributed systems architecture	4.83	4.58
Knowledge of software databases for data warehousing	4.80	4.63
Knowledge of tools for data and process modeling	4.60	4.65
Knowledge of systems acquisition, including RFP	4.60	5.60
Understanding process re-engineering	4.56	4.39

ABOUT THE AUTHOR

Mary Sumner is Professor of CMIS and Associate Dean for Executive Education, School of Business, Southern Illinois University Edwardsville. She is the author of eight textbooks and over 50 journal articles. Her teaching and research focus on enterprise systems, project management, IT workforce issues, and global IT teams. She is Co-Conference Chair for the 2010 International Conference on Information Systems in St. Louis.