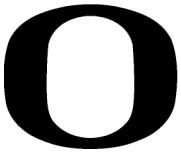

UNIVERSITY OF OREGON
APPLIED INFORMATION MANAGEMENT

Presented to the Interdisciplinary Studies Program:
Applied Information Management and the Graduate School of the University of Oregon
in partial fulfillment of the requirement for the degree of Master of Science

Implementation of Effective Change Management for Successful Integration of Health Information Technology (HIT) Systems in Hospitals

CAPSTONE REPORT

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Implementation of Effective Change Management for Successful Integration of Health Information Technology (HIT) Systems in Hospitals

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Abstract

The purpose of this literature review is to examine change management strategies that Chief Information Officers (CIO) and Chief Medical Informatics Officers (CMIO) need to understand to best implement Health Information Technology (HIT) systems to effectively produce health services in hospitals. Two systems are examined: Electronic Medical Record (EMR) and Computerized Physician Order Entry (CPOE). Leadership is the essential ingredient. Three key methods are identified to combat resistance to change: communication, collaboration, and empowerment.

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Introduction

Purpose

The purpose of this literature review is to examine change management strategies that the Chief Information Officer (CIO) and Chief Medical Informatics Officer (CMIO) need to understand in order to best implement Information and Communication Technology (ICT) systems to effectively produce health services in hospitals. Specific focus is placed on change management strategies related to integration of two pre-selected health information technology (HIT) systems: (1) Electronic Medical Record (EMR) systems and (2) Computerized Physician Order Entry (CPOE) systems. These two systems have been identified as key collaborative components of ICT in hospitals (Paul, Reddy, Abraham, & DeFlitch, 2008). With these HIT systems in place, Tsiknakis and Kouroubali (2009) predict that the CIO and CMIO will see an increase in productivity, costs controlling, and care improvement.

Preliminary review of selected literature chosen for this study demonstrates the potential to build an alignment between change management and HIT systems implementation in hospitals. The assumption is that by doing so, this researcher will be able to address change management strategies the CIO and CMIO can utilize when implementing EMR and CPOE systems (Benham-Hutchins, 2009).

In order to select literature necessary to support building the alignment, the process of literature collection focuses on the following four areas:

- Information pertaining to the need of the CIO and CMIO for change management strategies (Szydlowski & Smith, 2009).

- Information pertaining to selection of EMR and CPOE systems for collaborative work in hospitals (DePhillips, 2007; Hillestad et al., 2005; Tjora & Scambler, 2009).
- Information pertaining to selected key components of change managements, including communication and collaboration among stakeholders (Tsiknakis & Kouroubali, 2009).
- Information pertaining to resistance to change of stakeholders, the primary known barrier that hospital must address to successfully integrate HIT systems (Lorenzi & Riley, 2003; Wagstaff, 2006).

Problem

The power of technology has transformed every industry and line of business in our economy (Craige, 2009). The healthcare industry is under increasing pressure to utilize information technology (IT) in an effort to reduce process inefficiencies, control spiraling healthcare costs, and improve the quality of patient care (Edwards, Moloney, Jacko, & Sainfort, 2008, p. 719). However, according to Szydlowski and Smith (2009), it is very common to see a health organization spend large amounts of money on health information technology (HIT) systems and fail to implement them because of poor change leadership. As noted by Frisse (2009), the benefits of HIT depend on successful systematic implementation, which is the responsibility of the CIO and CMIO. Simply spending more without improving the focus and operation of current initiatives will not guarantee greater societal benefit, improved provider efficiency, or better health outcomes (Frisse, 2009). Frisse proposes that organizational culture, organizational commitment, change management, and skilled personnel are the more important determinants of success.

Significance

Health technology and information systems are defined by Szydlowski and Smith (2009) as technology used within a healthcare organization to facilitate communication, integrate information, document healthcare interventions, perform record keeping, or support the functions of the organization. This technology has demonstrated potential to provide a positive impact on the delivery of healthcare in a number of ways. According to Travers and Downs (2000), information and communication technology (ICT) systems are key components of HIT that improve the way information is collected, stored, retrieved, and processed by clinicians. Many hospitals implement ICT, such as computerized provider order entry (CPOE) and electronic medical records (EMR), with the goal of improving care coordination and reducing medical errors (Benham-Hutchins, 2009).

However, resistance to change is always a crucial challenge to the success of any innovation (Zandieh et al., 2008). As noted by Benham-Hutchins (2009), the influence of new ICT on existing hospitals, including information exchange between hospitals, is most often overlooked or downplayed by IT executives, such as the CIO and CMIO, during the design, selection, and implementation processes. For example, Craige (2009) finds that technology has yet to be adequately implemented within the healthcare field to allow patient information to be shared across multiple health facilities and hospitals. Benham-Hutchins (2009) believes that incorporation of change management strategies, such as participation by stakeholders during the implementation process, is a critical component of effective ICT systems implementation. Bosco (2008) explains that in relation to the example of stakeholder participation, open communication (a key change management strategy) helps vest stakeholders in the process and decreases the resistance and anxiety that often accompanies change.

Audience

The target audience for the proposed study includes individuals who perform duties attributed to the CIO and CMIO of the hospital. According to the Internet & IT Job Descriptions HandiGuide (2009), the CIO is accountable for managing and directing the information and data integrity of the enterprise and its groups, and for all IT functions of the enterprise. Moreover, the CIO is currently seen as a key contributor in formulating strategic goals, and typically reports either to the Chief Operations Officer (COO), or in the case of small or IT-centered organizations, to the Chief Executive Officer (CEO) (*Internet & IT Job Descriptions HandiGuide*, 2009). The CMIO is a physician with expertise in informatics, who plans, implements, and operates EMRs, enterprise PACSs, and other clinical information systems (Versel, 2006). The role of the CMIO is to focus on links between the practice of medicine and the information world (Anonymous, 2008).

This study identifies change management strategies needed for the CIO to successfully implement ICT systems in hospitals. Szydlowski and Smith (2009) state that the CIO must function as a technology leader and be able to demonstrate change management and leadership skills. Jaciute (2009) proposes that as an IT leader, it is necessary for the CIO to understand that early involvement of stakeholders and especially end users into the specification and development stage of any IT system is a key success factor for complex IT projects. The Parliamentary Office of Science and Technology (2003) reports that the main benefits of early involvement of stakeholders are (a) the communication of the right information to the system designers, so that the business case and service design can be built around stakeholders' needs and preferences, and add to the quality of the finished product, and (b) a sense of ownership and commitment for changes to take place.

Limitations

Time frame. The literature collected for this study is published between 1999 and 2009. As Lorenzi and Riley (2004) describes in their study, over the past five years, many organizations have felt the pressure for massive change, and our healthcare systems are now being drawn into this high-stress arena, whether through the formation of multiple hospital system enterprises or by creating an enterprise within its current system (p. 20). In addition, the examination of information sources for this inquiry discloses that healthcare organizations, particularly hospitals, began to utilize information technology effectively to support their operations and increase service quality in the past decade, despite the fact that so many health informatics projects have resulted in limited success (Lorenzi and Riley, 2004). A few articles produced prior to 1999 are used as references for relevant theories and additional knowledge sources pertaining to organizational and project management.

Types of sources. Most of literature deemed appropriate for the study are available online from medical and healthcare informatics journals, for examples, Journal of the American Medical Informatics Association, Social Science & Medicine, International Journal of Medical Informatics, modern healthcare, Health Affairs, and Journal of General Internal Medicine. PubMed.gov and Google Scholar proved to be useful sources for additional medical databases and definitions of medical informatics terminologies. Two key books were found during exploratory search: Digital Medicine: Implications for Healthcare Leaders (Goldsmith, 2003) and Managing of Technical Change: Organizational Aspects of Health Informatics (Lorenzi & Riley, 2004). Two additional books were found afterward: The Heart of Change (Kotter, 2002) and Leading Change (Kotter, 1996). They were both written by John P. Kotter for Harvard Business School.

Selection criteria. All of the literature for this study is searched, reviewed, and selected by using the guidelines recommended by Leedy and Ormrod (2005). Additionally, the following criteria are utilized to determine whether or not to include a reference in the study:

- Subject terms and author keywords are examined against the study's search terms
- Abstract demonstrates key ideas matching the topic scope
- Publication date
- Number of pages (at least two pages)
- Credibility of literature resource
- Credibility of database and search engine
- Intended audience
- Objective reasoning and coverage
- Guidance of faculty and the researcher's own experience (Obenzinger, 2005)
- Check against other resources for accuracy
- Recommendations from health professionals
- Frequency of being referenced by other literature or researchers (Obenzinger, 2005)
- Concepts and ideas derived from reading the literature

Audience. This literature review is written for individuals who perform duties attributed to the CIO and CMIO of the hospital because these are the individuals who are responsible for putting HIT systems in place as well as ensuring their effectiveness throughout the organization.

Topic definition. According to Lorenzi and Riley (2003), IT implementation failures are caused by many reasons outlined in four major categories: technical shortcomings, project management shortcomings, organizational issues, and the continuing information explosion. As part of organizational issues, change management is a process of assisting individuals and

organizations in passing from an old way of doing things to a new way of doing things (Hannah et al., 2005). Lorenzi and Riley (2003) further explain that change management starts early in a technical implementation process, as the need for making major changes starts at the conceptual level. Based on these perspectives, the assumption underlying this study is that successful integration of ICT systems in hospitals critically depends on effective implementation of change management strategies by the CIO and CMIO.

Focus. Though Frisse (2009) suggests that organizational culture, organizational commitment, change management, and skilled personnel are all important determinants of HIT systematic implementation success, literature selected for use in this review focuses on change management strategies, in particular in relation to communication, collaboration, and stakeholder empowerment. In addition, two HIT systems are selected, including EMR and CPOE systems, as the most widely used systems to date.

Preview of Data Analysis and Writing Plans

Data analysis plan. Busch et al. (2005) state content analysis is a research tool used to verify the presence of certain words or concepts within texts or sets of texts. Busch et at. further explain researchers quantify and analyze the meanings, presence, and relationships of such concepts and words, then make inferences about the message within the texts, the audience, and the writers. This study employs conceptual analysis, which is structured in eight coding steps, detailed in the Research Parameters section of this paper.

Writing plan. This literature review is written by utilizing a "thematic" rhetorical pattern. The thematic approach is organized around a topic or issue, rather than the progression of time although progression of time may be an important factor in thematic reviews (Literature

Reviews, n.d.). The writing plan for the Literature Review section of the paper is designed to examine themes identified in selected literature and provide a framework describing relationship among the study's key ideas. The goal is to construct the review in a way that presents information about the two larger areas of inquiry, examined through a set of anticipated themes:

Area One: Discussion of the context of why the CIO and CMIO need to implement HIT in the hospital. Anticipated themes include (a) problems before the introduction of HIT, (b) the decision to focus on two specific HIT systems (EMR and CPOE systems) and descriptions of each system, and (c) the implications of HIT implementation for stakeholders.

Area Two: Discussion of the context of how the CIO and CMIO manage and lead the integration of HIT to improve health system efficiency. Anticipated themes include (a) known barriers when implementing HIT, (b) analysis of specific change management strategies related to communication and collaboration among stakeholders, and (c) suggested applications of those strategies in hospitals.

Definitions

According to the National Alliance for Health Information Technology (2008), as of today, all critical pieces needed for realizing the vision of a complete health information technology infrastructure, one that ultimately allows authorized access to and secure and reliable exchange of fully comprehensive patient and consumer health related information for multiple appropriate activities, are not in place yet. Realizing the vision is not just about enabling technology, but requires even more, managing the processes of social and cultural change (National Alliance, 2008). In order to clearly communicate with one another, so that the information and messages are correctly understood and decisions are properly made, people need a common vocabulary. The successful management of cultural change requires a consistent language that can support a system of public policies, private development, and educational initiatives that allows patients and consumers to experience the actual value of electronic health information infrastructure (National Alliance, 2008). The following set of definitions is provided in order to explain how terminology is used in this study.

Change management – is the process of assisting individuals and organizations in passing from an old way of doing things to a new way of doing things (Lorenzi & Riley, 2003).

Chief Information Officer (CIO) – A high-ranking executive title within an enterprise. He/she is accountable for managing and directing the information and data integrity of the enterprise and its groups, and for all IT functions of the enterprise (*Internet & IT Job*, 2009).

Chief Medical Informatics Officer (CMIO) – A high-ranking executive title within a health organization. He/she is a physician with expertise in informatics, who plans, implements, and operates EMRs, enterprise PACS, and other clinical information systems (Versel, 2006). The

role of the CMIO is to focus on links between the practice of medicine and the information world (Anonymous, 2008).

Computerized physician order entry (CPOE) – A process that allows a physician to enter medical orders directly and to manage the results of these orders (Aarts, Ash, & Berg, 2007).

e-Health - refers to all forms of electronic healthcare delivered over the Internet, ranging from informational, educational, and commercial "products" to direct services offered by professionals, non-professionals, businesses, or consumers themselves. e-Health includes a wide variety of the clinical activities that have traditionally characterized telehealth, but delivered through the Internet. e-Health is making healthcare more efficient, while allowing patients and professionals to do the previously impossible (Oh, Rizo, Enkin, & Jadad, 2005).

Electronic medical record (EMR) – A repository of patient data in digital form, stored and exchanged securely, and accessible by multiple authorized users. It contains retrospective, concurrent, and prospective information and its primary purpose is to support continuing, efficient and quality integrated health care (Hayrinen, Saranto, & Nykanen, 2008).

Health Information Technology (HIT) – The use of a variety of electronic methods for managing information about the health and medical care of individuals and groups of patients (Blumenthal et al., 2006).

Health Technology and Information Systems - Technology used within a healthcare organization to facilitate communication, integrate information, document healthcare interventions, perform record keeping, or support the functions of the organization. This technology has demonstrated potential to provide a positive impact on the delivery of healthcare in a number of ways (Szydlowski & Smith, 2009).

Informatics – Creation, development, and operation of databases and other computing tools to collect, organize, and interpret data (Informatics, n.d.).

Information and Communication Technology (ICT) - Technologies that facilitate communication and the processing and transmission of information by electronic means (Davies, 2006).

Interoperability – The capacity of one health IT application to share information with another in a computable format (Richmond, 2008).

Medical errors – Errors or mistakes committed by health professionals, which result in harm to the patient. They include errors in diagnosis, errors in the administration of drugs, and other medications, errors in the performance of surgical procedures, in the use of other types of therapy, in the use of equipment, and in the interpretation of laboratory findings (*Medical Error,* n.d.).

Medical informatics – The integrative discipline that arises from the synergistic application of computational, informational, cognitive, organizational, and other sciences whose primary focus is the acquisition, storage, and use of information in the health/biomedical domain (Hersh, n.d.).

Picture archiving communication system (PACS) – A system that is able to store, exchange, display and manipulate images and associated diagnoses from any modality within a hospital in a timely and cost-effective way (D'Asseler et al., 2000).

Resistance to change – The action taken by individuals and groups when they perceive that a change that is occurring as a threat to them (Resistance to Change, n.d.).

Stakeholders – Groups or individuals who benefit from or are harmed by, and whose rights are violated or respected by, corporate actions. Focusing more narrowly, a stakeholder is

any individual or group whose role relationships with an organization: help to define the organization, its mission, purpose, or goal, are crucial to the survival, and success of the organization, and are most affected by the organization and its activities (Juciute, 2009).

Technological shortcomings – Lack of basic technical competence in modern information technologies of information system departments (Lorenzi & Riley, 2004).

Research Parameters

This section explains the framework and methods employed to conduct the larger literature review. Presented are the initial set of research questions, the search strategy report, the documentation approach, and the full descriptions of the data analysis and writing plans.

A literature review discusses published information in a particular subject area, and sometimes information in a particular subject area within a certain time period (Literature Reviews, n.d.). A literature review can be a simple summary of the sources, but it usually has an organizational pattern and combines both summary and synthesis; where a summary is a recap of the important information of the source, but a synthesis is a re-organization, or a reshuffling, of that information (Literature Reviews, n.d.). Literature reviews are beneficial because they provide the meaningful context of the project within the universe of already existing research and help researchers (and readers) understand the structure of the problem (Obenzinger, 2005).

Research Questions

Main question. What change management strategies do CIOs and CMIOs of the hospitals in the United States need to understand when implementing EMR and CPOE systems of ICT? [Benham-Hutchins (2009)]

Sub-questions.

- Why do hospitals tend to fail when implementing HIT, even though a large investment is made?
- What problems are hospitals facing now that might be addressed with the implementation of ICT systems?

- What are the primary reported barriers that hospitals must address in order to successfully integrate EMR and CPOE systems?
- What change management strategies hold the most potential to assist in the implementation of HIT in hospitals?
- Who are the stakeholders within the hospital staff who would likely be responsible for ICT systems implementation?

Search Strategy Report

Search terms. Based on the exploratory search results conducted early in the research process, the search strategy is built to assist ongoing searches and provide the criteria for analysis, evaluation, and selection of information resources. Initial search terms were derived through conversations with a professional who works for a private hospital. With this start, subsequent search terms and vocabularies were selected by reviewing exploratory search results and additional researching through medical informatics websites as a way to formulate key definitions. These are revised search terms and controlled vocabularies:

- Change management (strategies) and IT systems
- Resistance to change and IT systems
- Healthcare Information Technology (HIT)
- Medical Technology
- Medical/Health Informatics
- Medical Executives and CIO
- Hospital Leaders
- Information Communication Technology (ICT)

- Collaboration and Managing the Change
- Electronic Medical Record (EMR) system
- Computerized Physician Order Entry (CPOE) system
- Picture Archiving Communications (PAC) system
- Healthcare and Hospitals
- ICT Development & Implementation

Literature resources. Chosen articles are mainly retrieved via UO online libraries and databases such as Academic Search Premier, EBSCOhost, ScienceDirect, The ACM Digital Library, SpringerLink, and UO Libraries' Catalog. The initial search terms were derived through conversations with a healthcare professional, which were later used in QuickSets of OneSearch to collect first groups of results. Google, Google Scholar, and PubMed.gov are search engines used for more literature resources although Google is workable for a quick review of options.

Search engines. Google, Google Scholar, and PubMed.gov are search engines used for more literature resources although Google is workable for a quick review of options. PubMed.gov and Google Scholar are adequate resources for additional medical databases and definitions of medical informatics terminologies.

Additional literature resources. There are two books found during exploratory search: Digital Medicine: Implications for Healthcare Leaders (Goldsmith, 2003) and Managing of Technical Change: Organizational Aspects of Health Informatics (Lorenzi & Riley, 2004). Two additional books were found later: The Heart of Change (Kotter, 2002) and Leading Change (Kotter, 1996). They were written by John P. Kotter who is recognized as an expert on change management by Harvard Business School.

List of criteria used for considering good references. The following criteria are used to determine whether or not to include a reference in the study:

- Subject terms and author keywords
- Abstract demonstrates key ideas matching the topic scope
- Publication date
- Number of pages (at least two pages)
- Credibility of literature resource
- Credibility of database and search engine
- Intended audience
- Objective reasoning and coverage
- Guidance of faculty and the researcher's own experience (Obenzinger, 2005)
- Check against other resources for accuracy
- Recommendations from health professionals
- Frequency of being referenced by other literature or researchers (Obenzinger, 2005)
- Concepts and ideas derived from reading the literature

Search Results

Table 1, Detailed Record of Searches, shows search engines/databases and search terms used to obtain following results and quality:

Search engine/database	Search term	Result	Quality
Academic Search Premier in Advanced (OneSearch)	Healthcare industry & CIO	19	Fair (too broad)
	Medical Informatics & ICT in the US	5	Good
	Electronic Medical Record & CIO	4	Good
	Change and Collaboration & Information and Communication Technology	33	Good
EBSCOhost	Healthcare industry & CIO	1210	Fair (too broad)
	Medical Informatics & ICT in the US	49557	Fair (too broad)
	Electronic Medical Record & CIO	64420	Fair (too broad)
	Change and Collaboration & Information and Communication Technology	16	Good
PubMed	Healthcare industry & CIO	8	Good
	Medical Informatics & ICT in the US	14	Good
	Electronic Medical Record & CIO	18	Good
	Change and Collaboration & Information and Communication Technology	34	Good
Google Scholar	Healthcare industry & CIO	21400	Fair (too broad)
	Medical Informatics & ICT in the US	6420	Fair (too broad)
	Electronic Medical Record & CIO	1220000	Bad
	Change and Collaboration & Information and Communication Technology	491000	Fair (too broad)

Search engine/database	Search term	Result	Quality
OmniMedicalSearch (received the same number of results)	Healthcare industry & CIO	49	Good
	Medical Informatics & ICT in the US	49	Good
	Electronic Medical Record & CIO	49	Good
	Change and Collaboration & Information and Communication Technology	49	Good
Rand Corporation (Rand Health)	Healthcare industry & CIO	1	Fair
	Medical Informatics & ICT in the US	0	
	Electronic Medical Record & CIO	1	Good
	Change and Collaboration & Information and Communication Technology	20	Good
ACM Digital Library	Healthcare industry & CIO	30	Good
	Medical Informatics & ICT in the US	94	Fair
	Electronic Medical Record & CIO	34	Good
	Change and Collaboration & Information and Communication Technology	6441	Fair (too broad)

Table 1: Detailed Record of Searches

Data Analysis Plan

Conceptual analysis strategy. Conceptual analysis is one of the two types of content analysis (Busch et al., 2005). Explained by Busch et al., a conceptual analysis is a process used to choose one or more concepts and determine whether or not selected concepts are present within chosen resources. In conceptual analysis, selected words are determined whether or not they discuss expected concepts in a relevant context (Busch et al., 2005).

Key elements, supporting ideas, and successful past experiences in effective HIT implementation are obtained from a variety of types of selected literature, including healthcare professional recommendations, research, surveys, and case studies found in healthcare journals,

reports, reviews, and books. This information is analyzed and synthesized to reveal change management strategies necessary for successful implementation of two pre-selected HIT systems; EMR and CPOE. Eleven references form the data set used for the conceptual analysis, listed in the Introduction of the Annotated Bibliography section.

Coding procedures. There are eight coding steps employed as a way to operationalize the content analysis strategy selected for this study (Busch et.al, 2005):

1. **Level of analysis** – Single words, such as "communication", and sets of words, such as "change management" or "management of change" or "electronic medical record" are coded.
2. **Pre-defined set of concepts and categories** – Only words that are relevant to these concepts: change management, work communication, work collaboration, and implementation of HIT, health informatics and ICT, are coded. Categories and concepts that are applicable to this review may be modified and added during the conceptual analysis process, as they emerge.
3. **Existence of a concept** – Emphasis is placed on coding for existence of a concept, rather than coding for frequency. For instance, the concept of "information sharing" would be coded once, although it appears many times in the collected literature.
4. **Level of generalization** – Similar concepts and categories, such as "health technology system" and "health information system"; "information sharing" and "information communication"; "electronic medical records (EMR)" and "electronic health records (EHR)"; and "computerized *physician* order entry (CPOE)" and "computerized *provider* order entry (CPOE)" are recorded as the same. However, similar terms that appear in

different forms, such as “change management” and “resistance to change” are coded separately because of their different meanings.

5. **Translation rules** – Coding rules are developed to help the researcher insure that categorization occurs consistently and coherently. For example, “information and communication technology (ICT)” is coded under “health information technology (HIT)” and “electronic medical records (EMR)” and “computerized physician order entry (CPOE)” are coded under “ICT”, which is under “HIT”.
6. **Irrelevant information** – Irrelevant information shall be disregarded as long as they do not influence the analysis result.
7. **Code the texts** – Coding is conducted manually, by first writing down terms and phrases with pen on post-it notes, which are then attached on printed articles. Also an index number, such as 1, 2, and 3, is assigned to each article, which is later transferred to a table in a Word document. The table contains key information, such as index number, article’s name, concepts, coding terms, author, and publication year.
8. **Analyze results** – At this step, the data is scanned by the researcher who draws all possible generalizations and conclusions. Ideas and statements are categorized based on concepts, subtopics, and themes identified in the Writing Plan. Unused information is separated and set aside for future reexamination and coding alteration.

Writing Plan

Lorenzi and Riley (2003) explain that most information system implementation failures occur not because of technology, but because of process. A significant health informatics project typically has impact on a wide range of stakeholders, including physicians, nurses, other

members of the healthcare team, support staff, patients, administrators, etc. The assumption underlying this study is that the CIO and CMIO leading the project must display change management skills at both the individual level and at the organizational level to ensure success (Lorenzi & Riley, 2003). The writing plan is designed to investigate change management strategies that healthcare IT executives, such as the CIO and CMIO, need to understand when implementing HIT systems to avoid health IT project failures while effectively producing health system efficiency in hospitals. Because the implementation process has the potential to greatly impact various stakeholders in the hospital (Hannah et al., 2005), the study is focused on a thematic examination (Literature Reviews, n.d.) of three pre-selected categories of change management: communication, collaboration, and stakeholder empowerment (Szydlowski & Smith, 2009). Resulting themes are aligned with two pre-selected widely used HIT systems: Electronic Medical Record (EMR) Systems and Computerized Physician Order Entry (CPOE). An outline of the thematic presentation format follows:

Topic: Implementation of Effective Change Management for Successful Integration of Health Information Technology (HIT) Systems in Hospitals.

1. **Theme one: The role of HIT in hospitals (context)**
    1.1. Problems addressed by HIT implementation
2. **Theme two: Examination of two pre-selected HIT systems (EMR and CPOE)**
    2.1. Definition
    2.2. Requirements
    2.3. Use and impact
    2.4. Potential benefits of each selected technology to individual stakeholders

3. **Theme three: Change management strategies for successful integration of HIT (context and selected strategies)**

    3.1. Known barriers

    3.2. Choosing strategies for change: three pre-selected change management strategies to overcome barriers

    3.3. Necessary skills for application of these strategies in hospitals

Annotated Bibliography

This annotated bibliography contains 25 key references selected for use in this Review of Literature. Eleven of the key references form the data set for coding. The following titles are included:

1. Managing change: Analysis of a hypothetical case by Hannah, K. J., Ball, M. J., Lorenzi, N. M., Ash, J. S., Einbinder, J., McPhee, W., et al.
2. Leading change: Why transformation efforts fail by John P. Kotter
3. Choosing strategies for change by John P. Kotter
4. Choosing strategies for change by John P. Kotter and Leonard A. Schlesinger
5. Managing technological change by Nancy M. Lorenzi and Robert T. Riley
6. Reflecting on change by Rebecca Wagstaff
7. Implementation of an electronic records system in a small clinic: The view of clinic staff by Pascale Carayon, Paul Smith, Ann S. Hundt, Vipat Kuruchittham, and Qian Li.
8. Evaluating usability of a commercial electronic health record: A case study by Simon Collin, Barnaby C. Reeves, Jane Hendy, Naomi Fulop, Andrew Hutchings, and Eugenia Priedane.
9. Definition, structure, content, use and impacts of electronic health records by Kristina Hayrinen, Kaija Saranto, and Pirkko Nykanen.
10. Extending the understanding of computerized physician order entry: Implications for professional collaboration, workflow and quality of care by Jos Aarts, Joan Ask, and Marc Berg.
11. Frustrated with HIT? Get involved by Marge Benham-Hutchins.

12. Initiatives and barriers to adopting health information technology by Henry A. Dephillips III.
13. Perspectives from nurse leaders and chief information officers on health information technology implementation by Steven Szydlowski and Christina Smith.

Each reference listing contains the complete bibliographic citation, an abstract pulled directly from the reference, an evaluation of the credibility of the source, and a brief explanation of how the reference is used to support the study. References are categorized into three main groups:

- References that address change management
- References that address EMR and CPOE systems
- References that address interactions between change management and EMR and CPOE systems

References that address Change Management

- Goldsmith, J. (2003). *Digital medicine: Implications for healthcare leaders.* Chicago: Health Administration Press.

  Abstract: Although it might be difficult to argue that healthcare needs to spend as much on IT as the financial services, it would not be difficult to argue that the investment in IT in healthcare should increase significantly. Such an increase would lead to higher quality, more efficient, and safer healthcare.

  Regulations and laws require the implementation of some IT applications or related practices. The privacy and transactions code set provisions of HIPAA are examples. The organization must possess a clear and compelling vision of itself that is enabled by IT. This vision must energize a wide range of leadership, endure over the course of years, and be of sufficient clarity to guide a range of decisions. Once organizations decide to pursue IT, they must possess, acquire, or develop the assets needed to effectively implement these applications. Asset development falls squarely on the shoulders of the organization's administrative and medical staff leadership and its board. The assets include: leadership that is smart, honest, seasoned, and committed; the ability to effect change in work processes, culture, and organizational competencies; prowess in a small

number of critical areas of information systems implementation; solid and effective relationship with stakeholders; and good IT infrastructure and applications.

Comments: This book provides a panoramic view of IT innovation in healthcare, and how health systems are successfully developed when healthcare professionals have learned how to use all these powerful new tools. It explores how emerging information technologies will affect hospitals, physicians, consumers, and health plans and how their relationships will change as they take up and use these new tools. Also it examines enlightened leadership required for achieving the transformation in healthcare. This includes willingness on the part of healthcare managers to understand and master the technologies themselves to adapt them, play with them, and collaborate with those who create them, to make them easier to adopt and use. This book is used to explain possible barriers to health information systems development leaders need to understand. Also it is used to support what leaders must understand about change management to successfully transform their organizations by utilizing technologies.

The book was published by Health Administration Press in 2003. The author is Jeff C. Goldsmith, PhD, who was the CIO for the Brigham and Women's Hospital and Partners HealthCare System, and served in several national healthcare information technology organizations and associations.

- Hannah, K. J., Ball, M. J., Lorenzi, N. M., Ash, J. S., Einbinder, J., McPhee, W., et al. (2005, May). Managing change: Analysis of a hypothetical case [Electronic version]. *Health Informatics,* 121-134. Retrieved April 12, 2009, from SpringerLink.

  Abstract: (Case Presentation) Mercer Medical Center has been successfully competing for business because of the strong visionary leadership of Chief Executive Officer (CEO) E.Joseph Burns. However, the pressure has been relentless to constantly update expensive systems and equipment. The latest lawsuit has brought this forcefully home yet again. The publicity will undoubtedly have a negative impact on the public's perception of Mercer and on critical negotiations with the area's largest employer, Syntel. Medical Director of Information Services (MDIS) Kathryn Reed has just left a meeting where she and Chief Information Officer (CIO) Barry Marks were informed that it is critical that the time-line for implementation of the new physician order entry (POE) system be moved up. They now have only 9 months instead 2 of years to make this happen.

  Comments: The Mercer Medical Center was used as a fictitious case for a real-world scenario for presentation and discussion on many points of change management raised by Lorenzi and Riley, who are highly well-known in managing change in organizations. The case provides an examination of why organizations need to become learning organizations if they are going to survive and adapt to change. Different strategy suggestions from stakeholder groups are used to manage change. The material is used to support development of the context of known barriers before implementing HIT systems and what IT executives need to understand about change management, presented in this study as part of change management strategies for successful integration of HIT. The emphasis is focused on communication among stakeholders. This presentation was part

of the Cornerstone on Managing Change, one of four Cornerstone sessions included in the program of the AMIA Annual Fall Symposium, Washington, DC. It was also reprinted from *The Journal of the American Medical Informatics Association.*

- Kotter, J. P. (2002). *The heart of change: Real-life stories of how people change their organizations.* Boston, MA: Harvard Business School.

  Abstract: People change what they do less because they are given analysis that shifts their thinking than because they are shown a truth that influences their feelings. This is especially so in large-scale organizational change, where you are dealing with new technologies, mergers and acquisitions, restructurings, new strategies, culture transforming, globalization, and e-business. The lessons in the book come from two sets of interview; the first completed seven years ago, the second within the last two years. To understand why some organizations are leaping into the future more successfully than efforts, a set of eight steps that few people handle well are included.

  Comments: This book provides the reasons why people succeed and why they fail at large scale-change. Also it discusses the eight-step path to success when organizations are leaping into the future as well as primary challenge found at each stage of the process. Clear thinking is a critical part of large-scale change, no matter in a big organization or a small department. By learning from story after story of highly successful change methods, the leaders find a pattern that is closer to the heart of the matter. The book includes how change leaders identify a problem and solution in change process. The material is used to support development of known barriers before organizational change and strategies to handle these changes for the leaders, presented in this study as part of change management strategies for successful integration of HIT.

  The author, John P. Kotter, is highly known in organizational change management and he was a professor for Harvard Business School for many years.

- Kotter, J. P. (2007). Leading change: Why transformation efforts fail. *Harvard Business Review.* Retrieved May 3, 2009, from HBR.org

  Abstract: Guiding change may be the ultimate test of a leader—no business survives over the long term if it can't reinvent itself. But, human nature being what it is, fundamental change is often resisted mightily by the people it most affects: those in the trenches of the business. Thus, leading change is both absolutely essential and incredibly difficult.

  Over the past decade, more than 100 companies have tried to remake themselves into significantly better competitors. They have included large organizations (Ford) and small ones (Landmark Communications), companies based in the United States (General Motors) and elsewhere (British Airways), corporations that were on their knees (Eastern Airlines), and companies that were earning good money (Bristol-Myers Squibb). These efforts have gone under many banners: total quality management, reengineering,

rightsizing, restructuring, cultural change, and turnaround. But, in almost every case, the basic goal has been the same: to make fundamental changes in how business is conducted in order to help cope with a new, more challenging market environment.

A few of these corporate change efforts have been very successful. A few have been utter failures. Most fall somewhere in between, with a distinct tilt toward the lower end of the scale. The lessons that can be drawn are interesting and will probably be relevant to even more organizations in the increasingly competitive business environment of the coming decade.

The most general lesson to be learned from the more successful cases is that the change process goes through a series of phases that, in total, usually require a considerable length of time. Skipping steps creates only the illusion of speed and never produces a satisfying result. A second very general lesson is that critical mistakes in any of the phases can have a devastating impact, slowing momentum and negating hard-won gains. Perhaps because we have relatively little experience in renewing organizations, even very capable people often make at least one big error.

Comment: This article is another selection examining organizational change management by John P. Kotter, a change management guru and retired Harvard Business School professor. The article was originally published in the Spring of 1995, previewed Kotter's 1996 book *Leading Change*. It outlines eight critical success factors – from establishing a sense of extraordinary urgency, to creating short-term wins, to changing the culture. The material is used to support development of ideas why organizational transformation hard work fails and how leaders can successfully implement major change in their organizations, presented in this study as part of change management strategies for successful integration of HIT.

- Kotter, J. P., & Schlesinger, L. A. (2008). Choosing strategies for change. *Harvard Business Review.* Retrieved May 3, 2009, from HBR.org.

  Abstract: In 1973, The Conference Board asked 13 eminent authorities to speculate what significant management issues and problems would develop over the next 20 years. One of the strongest themes that runs through their subsequent reports is a concern for the ability of organizations to respond to environmental change. As one person wrote: "It follows that an acceleration in the rate of change will result in an increasing need for reorganization. Reorganization is usually feared, because it means disturbance of the status quo, a threat to people's vested interests in their jobs, and an upset to established ways of doing things. For these reasons, needed reorganization is often deferred, with a resulting loss in effectiveness and an increase in costs."

  Subsequent events have confirmed the importance of this concern about organizational change. Today, more and more managers must deal with new government regulations, new products, growth, increased competition, technological developments, and a changing workforce. In response, most companies or divisions of major corporations find

that they must undertake moderate organizational changes at least once a year and major changes every four or five.

Few organizational change efforts tend to be complete failures, but few tend to be entirely successful either. Most efforts encounter problems; they often take longer than expected and desired, they sometimes kill morale, and they often cost a great deal in terms of managerial time or emotional upheaval. More than a few organizations have not even tried to initiate needed changes because the managers involved were afraid that they were simply incapable of successfully implementing them.

Comment: This literature describes various causes for resistance to change and outlines a systematic way to select a strategy and set of specific approaches for implementing an organizational change effort. The methods described are based on the authors' analyses of dozens of successful and unsuccessful organizational changes. The material is used to support development of understanding resistance to change and strategy choices when approaching an organizational change situation, presented in change management strategies for a successful HIT implementation part of this study. The article was published in *Harvard Business Review* by retired Harvard Business School professor John P. Kotter, a famous expert of organizational change.

- Lorenzi, N. M., & Riley, R. T. (2003). Organizational issues = change. *International Journal of Medical Informatics, 69,* 197-203. Retrieved April 12, 2009, from ScienceDirect.

  Abstract: Information systems fail for a number of reasons. Several failure reasons include communication, complexity, organization, technology, and leadership. Failure can be outlined in four major categories: technical shortcomings, project management shortcomings, organizational issues, and the continuing information explosion. Change management is the process of assisting individuals and organizations in passing from an old way of doing things to a new way of doing things. Change management starts early in a technical process, as the need for making major changes starts at the conceptual level. This paper briefly covers the people side of implementing new information systems, and describes resistance to change and various strategies to manage technological change.

  Comments: Many key ideas used to support development of change strategies when integrating information systems to the existing systems are included to examine why information systems fail during an implementation process. The article nicely organizes and provides four major IS failure categories. Also a feasible definition and implication of change management is provided by the authors. The article was published in the *International Journal of Medical Informatics* in 2002, which was found in the ScienceDirect database. The authors are highly expert in change management as they wrote several books, reviews, and articles in this field.

- Lorenzi, N. M., & Riley, R. T. (2004). *Managing technological change.* New York: Springer.

  Abstract: Employees can be easily overwhelmed by changes instituted in large organizations if they feel they have little or no say in or control over they changes. In addition, computers interact in complex ways with the organization and can significantly affect people's attitudes. Other important factors are the relationship between the technology and normal information processes within an organization. In particular, there are important differences between vertical and horizontal communications. The vertical communication relates mainly to the management control and accountability processes, and was typically what managers sought first. However, performance gains have been most notable when systems perform horizontal communications at the process level: linking activities together, supporting front-line decision makers, and enabling the business to flow more efficiently.

  The types of systems and the types of information handled by these two dimensions are typically very different, and inappropriate use of technology can be destructive. The role of information technology creates a very complex picture. Its impact is often immense and has an extensive impact on the way that organizations are operated and managed. The key is understanding where information technology will be successful, and what problems might be anticipated.

  Comments: This book covers several crucial ideas when linking informatics with change management by examining today's healthcare environment. Key strategic issues are identified to determine the strategic direction, and understand and analyze the change process and organizational structures. The authors also provide methods for successfully preparing for change and effectively implement the change in information systems. Ideas in this material are used to support development of strategies for managing changes in organizations when initiating technology in normal information processes, presented in this study as part of change management strategies for successful integration of HIT.

  This is a second edition published in 2004 by Springer Science. The two authors hold PhD degrees in informatics management. They authored several books and numerous articles on management and managing technological change.

- Wagstaff, R. (2006, May). Reflecting on change. *Nursing Management, 13,* 12-17. Retrieved April 12, 2009, from EBSCOhost.

  Abstract: The article examines some of the behavioral aspects of the introduction and implementation of a computer information system (CIS) in a critical care area over an 18-month period. Managers, professionals and senior clinical staff in the organization focused on the development of improved clinical effectiveness and decided to introduce a CIS that would provide a clear, concise and auditable record of each patient's admission to the critical care unit. Ultimately, this system would improve patient care delivery by

facilitating the development of evidence based knowledge through the collection and assimilation of audit data collected by healthcare professionals.

Comments: This article provides key concepts of change management when introducing a new computer information system in healthcare units. Many important aspects of resistance to change of stakeholders are examined. Ideas in this material are used to support development of known barriers and change management strategies when implementing information systems. The author is a Registered General Nurse (RGN) who is also a senior sister and computer information administrator at the *James Paget Healthcare NHS Trust, Norfolk.*

References that address EMR and CPOE Systems

- Carayon, P., Smith, P., Hundt, S. A., Kuruchittham, V., & Li, Q. (2009). Implementation of an electronic health records system in a small clinic: The view of clinic staff. *Behavior & Information Technology, 28,* 5-20. Retrieved April 12, 2009, from Informaworld.

  Abstract: In this study, we examined the implementation of an electronic health records (EHR) system in a small family practice clinic. We used three data collection instruments to evaluate user experience, work pattern changes, and organizational changes related to the implementation and use of the EHR system: (1) an EHR user survey, (2) interviews with key personnel involved in the EHR implementation project, and (3) a work analysis of clinic staff. A longitudinal design with two data-collection rounds was employed: data were collected prior to EHR implementation and after EHR implementation. Both quantitative and qualitative data were collected and analyzed. Employees of the small clinic perceived few changes in their work after the implementation of the EHR system, except for increased dependency on computers and a small increase in perceived workload. The work analysis showed a dramatic increase in the amount of time spent on computers by the various job categories. The EHR implementation did not change the amount of time spent by physicians with patients. On the other hand, the work of clinical and office staff changed significantly, and included decreases in time spent distributing charts, transcription and other clerical tasks. The interviews provided important contextual information regarding EHR implementation, and showed some positive elements (e.g., planning of training), but also some negative elements (e.g., unclear structure of the project) that would have deserved additional attention.

  Comments: This study provides methods and techniques for health leaders to understanding human factors and organizational issues of the technology implementation process. By employing a systematic evaluation approach, the authors evaluate how employees in the clinic perceived their work as it relates to the EHR implementation. Also organizational aspects of the EHR implementation process and the human factors issues resulting from the EHR implementation are examined. Many keys ideas of the study are used to support development of known barriers before implementing the EHR system, potential benefits of the EHR system, and necessary factors for a successful EHR implementation, presented in the section of examination of two pre-selected HIT systems

of this study. The article was published in *Behavior & Information Technology* by five authors from well-known education and health affiliations.

- Collin, S., Reeves, B. C., Hendy, J., Fulop, N., Hutchings, A., et al. (2008). Implementation of computerized physician order entry (CPOE) archiving and communication systems (PACS) in the NHS: qua before and after study. *British Medical Journal, a939.* Retrieved May 13, 2009, from PubMed.

Abstract:
Objective: To assess the impact of components of the national programme for information technology (NPfIT) on measures of clinical and operational efficiency.

Design: Quasi-experimental controlled before and after study using routinely collected patient level data.

Setting: Four NHS acute hospital trusts in England.

Data sources: Inpatient admissions and outpatient appointments, 2000-5.
Interventions A system for ordering pathology tests and browsing results (computerized physician order entry, CPOE) and a system for requesting radiological examinations and displaying images (picture archiving
and communications system, PACS).

Main outcome measures: Requests per inpatient, outpatient, or day case patient for full blood count, urine culture and urea and electrolytes tests, and plain x ray
film, computed tomography, and ultrasonography examinations.

Results: CPOE was associated with a reduction in the proportion of outpatient appointments at which full blood count (odds ratio 0.25, 95% confidence interval 0.16 to 0.40), urea and electrolytes (0.55, 0.39 to 0.77), and urine culture (0.30, 0.17 to 0.51) tests were ordered, and at which full blood count tests were repeated (0.73, 0.53 to 0.99). Conversely, the same system was associated with an almost fourfold increase in the use of urea and electrolytes tests among day case patients (3.63, 1.66 to 7.94). PACS was associated with a reduction in repeat plain x ray films at outpatient appointments (0.62, 0.44 to 0.88) and a reduction in inpatient computed tomography (0.83, 0.70 to 0.98). Conversely, it was associated with increases in computed tomography requested at outpatient appointments (1.89, 1.26 to 2.84) and computed tomography repeated within 48 hours during an inpatient stay (2.18, 1.52 to 3.14).

Conclusions: CPOE and PACS were associated with both increases and reductions in tests and examinations. The magnitude of the changes is potentially important with respect to the efficiency of provision of health care. Better information about the impact of modern IT is required to enable healthcare organizations to manage implementation optimally.

Comments: This study explains CPOE and PACS being associated with possible efficiency gains and reductions. It discusses changes in efficiency from healthcare IT systems based on routinely derived indicators are difficult to quantify because they are difficult to interpret and measure. Ideas in this article are used to support development of CPOE implementation and assessment of the impact on measures of clinical and operational efficiency of IT systems, presented in the parts of examination of CPOE system and potential benefits of CPOE technology to individual stakeholders.

The research report was published online in *British Medical Journal* in 2008 by researcher and professors from well-known universities and schools in England.

- DesRoches, C. M., Campbell, E. G., Rao, S. R., Donelan, K., Ferris, T. G., Jha, A., et al. (2008). Electronic health records in ambulatory care — A national survey of physicians. *The New England Journal of Medicine, 359,* 50-60. Retrieved March 31, 2009, from www.nejm.org

  Abstract: Electronic health records have the potential to improve the delivery of health care services. However, in the United States, physicians have been slow to adopt such systems. This study assessed physicians' adoption of outpatient electronic health records, their satisfaction with such systems, the perceived effect of the systems on the quality of care, and the perceived barriers to adoption.

  In late 2007 and early 2008, we conducted a national survey of 2758 physicians, which represented a response rate of 62%. Using a definition for electronic health records that was based on expert consensus, we determined the proportion of physicians who were using such records in an office setting and the relationship between adoption and the characteristics of individual physicians and their practices.

  Four percent of physicians reported having an extensive, fully functional electronic-records system, and 13% reported having a basic system. In multivariate analyses, primary care physicians and those practicing in large groups, in hospitals or medical centers, and in the western region of the United States were more likely to use electronic health records. Physicians reported positive effects of these systems on several dimensions of quality of care and high levels of satisfaction. Financial barriers were viewed as having the greatest effect on decisions about the adoption of electronic health records.

  Comments: This report discusses how sophisticated electronic health records have the potential to improve healthcare. It includes the report on physicians' adoption of the electronic health records system and barriers to adoption used to support development of EMR system examination and implementation in hospitals, presented in this study as part of the role of EMR in hospitals. The article was published in *The New England Journal of Medicine* by a group of authors who hold Ph.D. and M.D. degrees in 2008.

- Edward, P. J., Moloney, K. P., Jacko, J. A., & Sainfort, F. (2008). Evaluating usability of a commercial electronic health record: A case study. *International Journal of Human-Computer Studies, 66,* 718-728. Retrieved April 12, 2009, from ScienceDirect.

  Abstract: Electronic health records (EHR) are increasingly being implemented by care providers in order to streamline processes and improve quality of care. Due to EHRs' complexity, the usability of these systems is crucial to ensure safety and to enable clinicians (users) to focus on their patients rather than the technology. This case study presents experiences from the implementation of a commercial EHR in a large pediatric hospital system. This case discusses how a predictive evaluation method, Heuristic Walkthrough, was used to evaluate and improve the usability of the EHR system. Outcomes from the evaluation resulted in immediate changes in the system configuration and training materials, which helped to avoid usability problems at rollout, as well as change requests to the vendor to improve overall system usability in the long term. Design trade-offs and lessons learned for future EHR implementations and other healthcare applications are discussed.

  Comments: This study examines the usability evaluation and improvement process utilized during the implementation of an EHR system. It also discusses design trade-offs specific to EHR implementations. This information was derived from EHR designers, hospital executives, and major stakeholders. Ideas in this material are used to support development of information for effectively examining and implementing EMR system, presented in this study as part of the role of EMR in hospitals. The authors are all professionals from the hospital and health informatics field. The article was retrieved from *ScienceDirect* database and published in *International Journal of Human-Computer Studies* in 2008.

- Hagen, S. A. (2008, May). *Evidence on the costs and benefits of health information technology [Electronic version]*. Retrieved April 4, 2009, from http://cbo.gov/ftpdocs/91xx/doc9168/05-20-HealthIT.pdf

  Abstract: Information plays a key role in health care. Providers such as physicians and hospitals generate and process information as they provide care to patients. Managing that information and using it productively pose a continuing challenge, particularly in light of the complexity of the U.S. health care sector, with its many different types of providers, services, and settings for care. Health information technology (health IT) has the potential to significantly increase the efficiency of the health sector by helping providers manage information. It could also improve the quality of health care and, ultimately, the outcomes of that care for patients.

  The term "health IT" generally refers to computer applications for the practice of medicine. Those applications may include computerized entry systems for physicians' ordering of tests or medications, support systems for clinical decision-making, and electronic prescribing of medications. Some or all of those components are housed in the electronic medical record (EMR). The electronic health record (EHR) is the primary

health IT package commonly purchased by a provider. It is an EMR with the capacity to send and receive data electronically and meets the requirements for interoperability.

Comments: This article discusses the evidence on the benefits of adopting HIT, costs of implementing HIT, possible factors of low rates adoption of HIT, and the federal role in implementing HIT. The material is used to support development of the role of HIT in hospital, reasons to explain why HIT is slowly adopted, and strategies needed to successfully integrate HIT in hospitals, presented in the examination of HIT role in hospitals and necessary skills for application of strategies to implement HIT. This paper was prepared by *The Congress of The United States, Congressional Budget Office (CBO)* in 2008. The authors are from CBO's Health and Human Resources Division.

- Hayrinen, K., Saranto, K., & Nykanen, P. (2008). Definition, structure, content, use and impacts of electronic health records: A review of the research literature. *International Journal of Medical Informatics, 77,* 291-304. Retrieved April 5, 2009, from ScienceDirect.

Abstract:
Purpose: This paper reviews the research literature on electronic health record (EHR) systems. The aim is to find out (1) how electronic health records are defined, (2) how the structure of these records is described, (3) in what contexts EHRs are used, (4) who has access to EHRs, (5) which data components of the EHRs are used and studied, (6) what is the purpose of research in this field, (7) what methods of data collection have been used in the studies reviewed and (8) what are the results of these studies.

Methods: A systematic review was carried out of the research dealing with the content of EHRs. A literature search was conducted on four electronic databases: Pubmed/Medline, Cinalh, Eval and Cochrane.

Results: The concept of EHR comprised a wide range of information systems, from files compiled in single departments to longitudinal collections of patient data. Only very few papers offered descriptions of the structure of EHRs or the terminologies used. EHRs were used in primary, secondary and tertiary care. Data were recorded in EHRs by different groups of health care professionals. Secretarial staff also recorded data from dictation or nurses' or physicians' manual notes. Some information was also recorded by patients themselves; this information is validated by physicians. It is important that the needs and requirements of different users are taken into account in the future development of information systems.

Several data components were documented in EHRs: daily charting, medication administration, physical assessment, admission nursing note, nursing care plan, referral, present complaint (e.g. symptoms), past medical history, life style, physical examination, diagnoses, tests, procedures, treatment, medication, discharge, history, diaries, problems, findings and immunization. In the future it will be necessary to incorporate different kinds of standardized instruments, electronic interviews and nursing documentation systems in EHR systems.

The aspects of information quality most often explored in the studies reviewed were the completeness and accuracy of different data components. It has been shown in several studies that the use of an information system was conducive to more complete and accurate documentation by health care professionals. The quality of information is particularly important in patient care, but EHRs also provide important information for secondary purposes, such as health policy planning.

Conclusion: Studies focusing on the content of EHRs are needed, especially studies of nursing documentation or patient self-documentation. One future research area is to compare the documentation of different health care professionals with the core information about EHRs which has been determined in national health projects. The challenge for ongoing national health record projects around the world is to take into account all the different types of EHRs and the needs and requirements of different health care professionals and consumers in the development of EHRs. A further challenge is the use of international terminologies in order to achieve semantic interoperability.

Comments: This paper focuses on research that is concerned with the structure and content of EHR systems. It aims to define electronic health records and describe the structure of these records and contexts in which the EHR is used. Also use and benefits of the EHR system to stakeholders are discussed. Information in this paper is used to support examination of EHR technology, presented in HIT role in hospitals part of the study. The paper was published in *The International Journal of Medical Informatics* by three authors from Department of Health Policy and Management and Department of Computer Science of University of Kuopio and University of Tampere, Finland.

- Institute of Medicine. (2000). To err is human: Building a safer health system. Washington, DC: National Academy Press.

  Abstract: The knowledgeable health reporter for the Boston Globe, Betsy Lehman, died from an overdose during chemotherapy. Willie King had the wrong leg amputated. Ben Kolb was eight years old when he died during "minor" surgery due to a drug mix-up.

  These horrific cases that make the headlines are just the tip of the iceberg. Two large studies, one conducted in Colorado and Utah and the other in New York, found that adverse events occurred in 2.9 and 3.7 percent of hospitalizations, respectively. In Colorado and Utah hospitals, 6.6 percent of adverse events led to death, as compared with 13.6 percent in New York hospitals. In both of these studies, over half of these adverse events resulted from medical errors and could have been prevented.

  When extrapolated to the over 33.6 million admissions to U.S. hospitals in 1997, the results of the study in Colorado and Utah imply that at least 44,000 Americans die each year as a result of medical errors. The results of the New York Study suggest the number may be as high as 98,000. Even when using the lower estimate, deaths due to medical errors exceed the number attributable to the 8th-leading cause of death. More people die in a given year as a result of medical errors than from motor vehicle accidents (43,458), breast cancer (42,297), or AIDS (16,516).

Total national costs (lost income, lost household production, disability and health care costs) of preventable adverse events (medical errors resulting in injury) are estimated to be between $17 billion and $29 billion, of which health care costs represent over one-half.

Comments: This report provides crucial facts of medical errors occurring in healthcare in the US. It also discusses main conclusions of the majority of medical errors and strategies how government, care providers, industry, and consumers can do to prevent medical errors. Ideas in this report are used to support development of problems before implementing HIT, presented in this study as part of problems before integrating HIT. *The Institute of Medicine (IOM)* prepared this well-known report in 2000. It is used as a reference by a number of famous HIT articles, studies, and reports.

References that address interactions between Change Management and EMR and CPOE Systems

- Alpay, L., Toussaint, P., & Zwetsloot-Schonk, B. (2004). Supporting healthcare communication enabled by information and communication technology: Can HCI and related cognitive aspects help? [Electronic version]. In *ACM International Conference Proceeding Series 2004* (pp. 1-4). New York, NY: ACM.

  Abstract: Communication in healthcare makes up an important part of the healthcare professionals' daily practices. Communication encompasses different forms of interaction and dissemination of health-related information, and takes place in contexts such as patient/healthcare professional relationships, and collaborative care. While Information and Communication Technology (ICT) offers a useful means to support the accessibility, the exchange and the sharing of information, the cognitive complexity of these communication processes often remains undermined. Much can be learned from research in Human Computer Interaction (HCI) with its focus on cognitive aspects. This has relevant implications for our work in healthcare communication enabled by ICT.

  Comments: This article explains the role of communication in healthcare, with a specific focus on two contexts: collaborative care and patients' involvement in their own care. Also it discusses how ICT can support healthcare communication. Ideas in this study are used to support development of how ICT supports the accessibility, the exchange, and the sharing of information, presented in the study of change management strategies for successful integration of HIT. The article was written by three Clinical Informatics professionals and published for *ACM International Conference Proceeding Series* in 2004.

- Aarts, J., Ash, J., & Berg, M. (2007). Extending the understanding of computerized physician order entry: Implications for professional collaboration, workflow and quality of care. International Journal of Medical Informatics, 76, 4-13. Retrieved April 19, 2009, from ScienceDirect.

  Abstract:
  Objective: To describe the perceived effect of computerized physician order entry (CPOE) on professional collaboration, workflow and quality of care.

  Design: Semi-structured interviews with experts involved in the design, implementation and evaluation of computerized physician order systems in the United States. Measurements: The interview transcripts were analyzed using six key concepts that identify context, professional collaboration, workflow and quality of care.

  Results: The interviews reveal the complexity of CPOE. Although providers enter the orders, others collaborate in the decision-making process. There is a profound impact on workflow beyond that of the provider. While quality of care is the main impetus for implementation, it remains terribly difficult to measure the impact on quality.

  Conclusions: A proper understanding of CPOE as a collaborative effort and the transformation of the health care activities into integrated care programs requires an understanding of how orders are created and processed, how CPOE as part of an integrated system can support the workflow, and how risks affecting patient care can be identified and reduced, especially during hand-offs in the workflow.

  Comments: This article describes the perceived effect of CPOE on professional collaboration, workflow, and quality of care. The article also addresses the implications of the findings for the understanding of CPOE. These ideas are used to support development of the perceptions of high-level experts about professional collaboration and workflow and how they impact the quality of care, presented in the study as part of necessary skills for application of change management strategies in hospitals.

  The article was published in *The International Journal of Medical Informatics* by Jos Aarts and Marc Berg of *Institute of Health Policy and Management, Erasmus University Medical Center* and Joan Ash of *Department of Medical Informatics and Clinical Epidemiology, Oregon Health & Science University.*

- Benham-Hutchins, M. (2009, January). Frustrated with HIT? Get involved. *Nursing Management, 40,* 17-19. Retrieved April 12, 2009, from Nursing Center.

  Abstract: The article discusses the role of nurses and other healthcare providers in the implementation and use of health information technology (HIT). Human factors leading to problems associated with HIT use must be examined, particularly how technology must be designed to adapt to the way healthcare providers do their job. Change management is important in successfully implementing an HIT infrastructure. Nurses

should examine their understanding of how other professions and patients are influenced by HIT, in addition to system design and analysis.

Comments: Key ideas of change management and stakeholder empowerment identified in this reference are used to support development of effective strategies when healthcare providers design, develop, and implement HIT, presented in change management strategies for successful integration of HIT section of the study. Communication between healthcare providers and coordination of patient information is a crucial component. This article was published in *Nursing Management* in 2009. The author is a registered nurse (RN) with Ph.D.

- Blumenthal, D., DesRoches, C., Donelan, K., Ferris, T., Jha, A., Kaushal, R., et al. (2006). Health information technology in the united states: The information base for progress. *Executive Summary.* Institute for Health Policy at Massachusetts General Abstract: Hospital and the School of Public Health and Health Services at George Washington University. Retrieved April 21, 2009, from www.healthinfolaw.org.

  Abstract: Health information technology (HIT) refers to the use of a variety of electronic methods for managing information about the health and medical care of individuals and groups of patients. If health care organizations and systems invest more in health information technology, these investments have the potential to advance health care quality. HIT can improve care processes so that patients with acute and chronic conditions receive recommended care, diminishing disparities in treatment and reducing medical errors.

  Nevertheless, the adoption of HIT has been slow, because formidable barriers still exist: the initial high costs of investing in health information technology, the ongoing maintenance required in all information systems, and short-term loss of productivity because staff need to adapt to new systems. Many worry that if HIT follows adoption patterns of other new medical technologies, these advances may have limited reach, disadvantaging underserved and vulnerable patient populations and increasing or perpetuating disparities in access to and quality of care.

  These and other concerns have spurred public and private efforts to increase the pace of and reduce disparities in HIT diffusion. The efforts include formulating national plans for dissemination, catalyzing the development of standards to encourage interoperability, and promoting public-private partnerships to develop HIT infrastructures at the local and regional levels.

  Comments: This report mainly discusses on HIT adoption in the United States by focusing on definitions of HIT and EHR, incentives and barriers to HIT adoption, and guidelines for improving HIT and EHR adoption. These ideas are used to support development of problems before implementing HIT, and definition, requirements, use, and impact of EMR, presented in the role of HIT and EMR in hospitals section of the study.

This report was produced by a team of researchers at the *Institute for Health Policy at Massachusetts General Hospital and the School of Public Health and Health Services at George Washington University.* The report was also informed by the discussions of an Expert Consensus Panel. The authors hold a master degree of public health and a doctoral degree of medical.

- Dephillips III, H. A. (2007). Initiatives and barriers to adopting health information technology. *Disease Management & Health Outcomes, 15*(1), 1-6. Retrieved April 12, 2009, from EBSCOhost.

  Abstract: In recent years, US healthcare experts have increasingly agreed that the effective application of information technology (IT) can enable the industry to address its three most pressing concerns: an increase in medical errors, rising costs, and the fragmentation of care delivery. While other industries have fully adopted and capitalized on IT to optimize operational efficiencies and customer service delivery, healthcare systems in the US have generally been slow to make a full transition.

  Presently, one of the quickest and most efficient ways health systems can begin to benefit from IT is through the implementation of the electronic health record (EHR). This dynamic resource provides key healthcare stakeholders (patients, payers, and providers) with a comprehensive view of current and historical patient data compiled from various sources. It holds tremendous potential for better management of chronic diseases, improving outcomes, and streamlining expenses.

  While the EHR has been shown to generate positive results in its limited use so far, its widespread implementation faces several hurdles, most notably cost. Additionally, primary EHR users (payers and providers) often experience initial infrastructure and personnel burdens, along with potential workflow disruptions. Despite this, considerable support for the EHR as an entry point for full-scale IT adoption is mounting in the US with a number of high-level government initiatives.

  Although this article exclusively examines the US healthcare system, the author believes that many of the issues and scenarios described herein are universal among healthcare systems worldwide. At the same time, the author acknowledges that, to a great degree, each nation's healthcare system faces its own unique considerations that may or may not be reflected in or relevant to the information in this article.

  Comments: The article examines the current state of health IT efforts in the US, the barriers to further adoption, and how technology can be, and is being, used to meet major challenges in the US healthcare industry. The information is used to support development of known problems when integrating HIT and how HIT adoption can help health providers improve care quality, presented as part of the role of HIT and known barriers of HIT implementation in the US.

  The article was published in *Disease Management & Health Outcomes* in 2007 by Dr. Henry A. DePhillips, Chief Medical Officer of MEDecision, Inc.

- Juciute, R. (2009, January). ICT implementation in the health-care sector: Effective stakeholders' engagement as the main precondition of change sustainability. *AI & Society, 23*, 131-137. Retrieved April 1, 2009, from EBSCOhost.

  Abstract: As modern information and communication technologies (ICT) now offer new possibilities for improving almost every aspect of health care, their implementation is a very relevant and fast accelerating process around Europe and internationally. The processes themselves vary greatly from scattered single initiatives of various IT solutions to large national programmes. Often treated as purely technical in nature, ICT implementation in health care should gravitate towards the "softer/complex" i.e. people-related issues end of the change. The approach taken by the Informing Healthcare programme in Wales broadens understanding on the value that engagement of stakeholders can bring to the process.

  Comments: This article discusses sustainability of change through ownership, trust, and commitment by end users, and delivering real benefits to the heath service. Change management and involvement of stakeholders are key components to success in implementing IT projects. Key ideas in this article are used to support development of change management for IT project implementation, presented in managing of change strategies for successful integration of HIT. The article was retrieved from EBSCOhost database and published in January 2009 in *AI & Society Journal* of Springer-Verlag London, an open forum journal. The author affiliates to *Mykolas Romeris University* and *Kingston University.*

- Paul, S. A., Reddy. M., Abraham, J., & DeFlitch, C. (2008). The usefulness of information and communication technologies in crisis response [Electronic version]. In AMIA Annual Symposium Proceeding 2008, pp. 561-565. Bethesda, MD: American Medical Informatics Association.

  Abstract: Information and communication technologies (ICTs) play a vital role in coordinating crisis response between pre-hospital services and emergency departments of hospitals. In spite of the advances in these technologies, there remain a variety of challenges to their usage during a crisis. To identify these challenges, we conducted focus group interviews with emergency department (ED) and emergency medical services (EMS) personnel. We found that ED and EMS personnel have widely varying perceptions about the usefulness and ease-of-use of information tools and communication tools used in crisis management. We discuss the importance of bringing together communication and information tools into integrated networks of ICTs for effective crisis response. We also highlight design features of ICTs which can support seamless and effective communication and coordination between ED and EMS teams.

  Comments: This report examines healthcare personnel's perceptions of the potential role, usefulness, and ease of use of ICTs. It also discusses a difference in how these care providers perceive and use information technologies. Ideas in this report are used to support development of how care providers use ICTs in their organization and benefits of

ICTs to care providers, presented in the study as part of potential benefits of each selected ICT to individual stakeholders. This report was prepared by *American Medical Informatics Association* in 2008 from the AMIA Annual Symposium Proceeding 2008. All authors are from College of Information Sciences and Technology and Department of Emergency Medicine.

- Szydlowski, S., & Smith, C. (2009, Winter). Perspectives from nurse leaders and chief information officers on health information technology implementation. *Hospital Topics, 87,* 3-9. Retrieved March 30, 2009, from EBSCOhost.

  Abstract: To enhance the limited empirical evidence in the literature, the authors developed new knowledge and information on the basis of implementation experiences (e.g., strategic planning, goals, outcomes, barriers, mistakes) hospital executives with actual health information technology (HIT). The authors asked why hospital leaders implement HIT and how they do so, and then applied the answers to the theoretical framework of change management and leadership. The authors accomplished this through a qualitative research study design. Various employees from different levels of the organizational chart provide their perspectives, allowing the authors to examine internal trends related to HIT. The authors examined external trends through a comparative analysis of healthcare markets.

  Comments: The article presents trends of healthcare leadership and management with regard to implementation and management of IT in the hospital setting, as presented in the role of HIT and leadership in hospitals part and change management strategies for integration of HIT part of the study. The basis of hospital executives' actual HIT implementation experiences (strategic planning, goals, outcomes, barriers, mistakes, etc.) are used to develop new knowledge and information. Also the theoretical framework of change management, leadership, and management is included. Many references included in this article are from well-known works and authors in HIT project implementation and change management.

- Tsiknakis, M., & Kouroubali, A. (2009). Organizational factors affecting successful adoption of innovative eHealth services: A case study employing the FITT framework [Electronic version]. *International Journal of Medical Informatics, 78,* 39-52. Retrieved April 3, 2009, from ScienceDirect.

  Abstract:
  Objective: The paper presents an application of the "Fit between Individuals, Task and Technology" (FITT) framework to analyze the socio-organizational-technical factors that influence IT adoption in the healthcare domain.

  Method: The FITT framework was employed as the theoretical instrument for a retrospective analysis of a 15-year effort in implementing IT systems and eHealth services in the context of a Regional Health Information Network in Crete. Quantitative

and qualitative research methods, interviews and participant observations were employed to gather data from a case study that involved the entire region of Crete.

Results: The detailed analysis of the case study based on the FITT framework, showed common features, but also differences of IT adoption within the various health organizations. The emerging picture is a complex nexus of factors contributing to IT adoption, and multi-level interventional strategies to promote IT use.

Conclusion: The work presented in this paper shows the applicability of the FITT framework in explaining the complexity of aspects observed in the implementation of healthcare information systems. The reported experiences reveal that fit management can be viewed as a system with a feedback loop that is never really stable, but ever changing based on external factors or deliberate interventions. Management of fit, therefore, becomes a constant and complex task for the whole life cycle of IT systems.

Comments: This article provides a concept of the FITT framework by focusing on the idea that IT adoption in a hospital environment depends on the fit between the attributes of the individual users, attributes of the technology, and attributes of the hospital tasks and processes. The ideas in the article are used to support development of the factors that influence the adoption and diffusion of innovative ICT throughout a distributed health, presented in the study as part of necessary skills for application of change management strategies in hospitals.

The article was published in *The International Journal of Medical Informatics*, a peer reviewed journal, in 2009. The authors are with Biomedical Informatics Laboratory, Center of eHealth Technologies, Institute of Computer Science.

- Valerius, J. D. (2007). The electronic health record: What every information manager should know. *Information Management Journal, 41,* 56-59. Retrieved April 12, 2009, from EBSCOhost.

  Abstract: The article discusses issues in the implementation of interoperable health information infrastructure in the U.S. In 2004, President George W. Bush appointed the nation's first National Health Information Technology Coordinator with a goal of creating an interoperable health information infrastructure. The infrastructure would ensure that most Americans have secure electronic health records (EHR). It would also provide healthcare workers a quick, reliable access to EHR. There are several components that are needed in order to transfer a hard-copy format to an EHR system, such as order communication/results retrieval, electronic document/content management, and clinical messaging. Information on the top security risks to EHR is presented.

  Comments: The article provides necessary components when migrating from a hard-copy format to an EHR system. It also defines the EHR system as well as various electronic systems and describes the roles information professionals and medical professionals play in EHR system adoption. The ideas are used to support development of benefits of EHR system and roles of stakeholders when implementing EHR system in

health care environment, presented as part of potential benefits of EHR technology to individual stakeholders. The article was produced in the *Information Management Journal* by Joanne D. Valerius, who is an Associate Professor at the *College of St. Catherine, Minnesota*. She is also chair of the Information Management program.

- Zandieh, S. O., Yoon-Flannery, K., Kuperman, G. J., Langsam, D. J., Hyman, D., & Kaushal, R. (2008). Challenges to EHR implementation in electronic- versus paper-based office practices. *Journal of General Internal Medicine, 23,* 755-761. Retrieved April 5, 2009. Retrieved April 5, 2009, from SpringerLink.

Abstract:
Background: Challenges in implementing electronic health records (EHRs) have received some attention, but less is known about the process of transitioning from legacy EHRs to newer systems.

Objective: To determine how ambulatory leaders differentiate implementation approaches between practices that are currently paper-based and those with a legacy EHR system (EHR-based).

Design: Qualitative study.

Participants: Eleven practice managers and 12 medical directors all part of an academic ambulatory care network of a large teaching hospital in New York City in January to May of 2006.

Approach: Qualitative approach comparing and contrasting perceived benefits and challenges in implementing an ambulatory EHR between practice leaders from paper- and EHR-based practices. Content analysis was performed using grounded theory and ATLAS.ti 5.0.

Results: We found that paper-based leaders prioritized the following: sufficient workstations and printers, a physician information technology (IT) champion at the practice, workflow education to ensure a successful transition to a paperless medical practice, and a high existing comfort level of practitioners and support staff with IT. In contrast, EHR-based leaders prioritized: improved technical training and ongoing technical support, sufficient protection of patient privacy, and open recognition of physician resistance, especially for those who were loyal to a legacy EHR. Unlike paper-based practices, EHR-based leadership believed that comfort level with IT and adjustments to workflow changes would not be difficult challenges to overcome.

Conclusions: Leadership at paper- and EHR-based practices in 1 academic network has different priorities for implementing a new EHR. Ambulatory practices upgrading their legacy EHR have unique challenges.

Comments: This article focuses on implementing EHR systems in paper-based practices in hospitals. Perceived benefits and challenges to implementation of an EHR system are discussed. The ideas in this article are used to support development of advantages and barriers when integrating HIT system in hospitals, presented in change management strategies and known barriers when integrating HIT systems. The article was published in Journal of General Internal Medicine by six authors from various medical and academic institutions. The corresponding author, Stephanie O. Zandieh, holds a doctor's degree in medicine and a master's degree in science.

Review of the Literature

A globalized economy is producing both more hazards and more opportunities for every organization, large or small, forcing firms to make dramatic improvements not only to compete and succeed in the market, but also to simply survive (Kotter, 2002). Kotter (2002) further explains that globalization is consecutively being driven by a broad and powerful set of forces associated with technological change, international economic integration, domestic market maturation within the more developed countries, and the collapse worldwide of historical communism. But the problem is that few managers have a history or legacy to direct them through the change (Kotter & Schlesinger, 2008). Lorenzi and Riley (2003) propose that managers can learn by attending to reports of both failures and successes from the recent past.

In today's rapidly changing environment, the ability to respond to a range of external factors quickly, efficiently, and almost continually is a major dilemma for organizations (Lorenzi & Riley, 2003). One of the most difficult problems organizations face is dealing with change (Kotter, 2002). Kotter (2007) states that all institutions need effective leadership, but nowhere is the need greater than in the organization seeking to transform itself.

The healthcare field is in the midst of a technological transition, of which the outcome has dramatic implications (Goldsmith, 2003). The rate at which information technology (IT) systems are being ordered and deployed by healthcare providers around the world has far outpaced the growth of the clinical and operational benefits associated with such systems (Collin et al., 2008). However, Goldsmith (2003) believes that a technological transition always comes with the price of resistance to change of stakeholders. As noted by Lorenzi and Riley (2004), most of the IT system failures occur not because of the technology, but because of the process;

for examples, under-planning, over-promising, and lack of communication and stakeholder involvement – two of the key strategies of change management.

The purpose of this review is to investigate change management strategies that the CIO and CMIO need to understand in order to successfully implement ICT systems to improve health quality services in hospitals. This review of literature is organized around three major themes: the role of selected HIT systems in hospitals, the two pre-selected HIT systems (EMR and CPOE), and change management strategies for successful integration of HIT in hospitals. The ***first theme*** is structured to examine problems to be addressed by implementing HIT: definition and requirements. The ***second theme*** examines the use and impacts of two pre-selected HIT systems (EMR and CPOE) and the potential benefits of each selected technology to stakeholders. The ***third theme*** is framed to examine known barriers when IT leaders integrate HIT systems in hospitals, potentials benefits of selected change management strategies to overcome barriers, and necessary skills for application of these strategies.

Theme #1: The Role of HIT in Hospitals

In healthcare, the goal is to employ IT so that providers can make sure patients receive the highest quality of care and best outcomes while improving operational efficiencies and reducing costs in the healthcare system (DePhillips, 2007). Healthcare experts believe that the use of IT offers the industry tremendous potential for resolving some of its most important problems, namely the rising number of medical errors, poor health service quality, care fragmentation, and limited access and integration to patient information (DePhillips, 2007). DePhillips states that HIT adoption has been slow because the healthcare industry itself is significantly different from most others and because it spends roughly 50% less on IT than most

other fields. Healthcare organizations, particularly hospitals, have a combination of attributes that make them quite different from other types of organizations (Lorenzi & Riley, 2004). Life-and-death issues, a complex personnel structure, alternative ownership characteristics, many and varied stakeholders, and exploding technologies are major types of factors that Lorenzi and Riley (2004) examine in relation to different characteristics of U.S. hospitals.

Problems addressed by HIT implementation. Healthcare in the United States is not as safe as it should be and can be (DePhillips, 2007). At least 44,000 people, and perhaps as many as 98,000 people, die in hospitals each year as a result of **medical errors** that could have been prevented (Institute of Medicine, 2000). Medical errors can be defined as the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim (Medical Error, n.d.). Beside the cost in human lives, medical errors are also costly in terms of loss of trust in the healthcare system by patients and decreased satisfaction by both patients and health professionals (Institute of Medicine, 2000). Society bears the cost of errors as well, in terms of lost worker productivity, reduced school attendance by children due to unnecessary illness cased by the medical error, and lower levels of population health status (Institute of Medicine, 2000). Most medical errors made at the point-of-care can be traced to providers having insufficient or incomplete patient data (Institute of Medicine, 2000). Paul, Reddy, Abraham, and DeFlitch (2008) suggest that HIT can help to resolve the problem of having inadequate information by generating electronic medical records from different data sources in the healthcare system and then delivering a report to physicians and other caregivers for their use in making more informed medical decisions, thus reducing medical mistakes.

The ***quality of care and safety*** in hospitals is often poor and must be tremendously improved in order to avoid outcomes that are costly and harmful to the organization's reputation (Zandieh et al., 2008). Hagen (2008) reports a high percentage of inaccurate decisions by physicians when diagnosing complicated conditions, forgotten test schedules for patients, and inappropriate implementation of protocols for complicated treatment. A large number of potential conflicts are made in prescribing medications for patients when physicians have insufficient medical records because they need to see the complete medications history in order to avoid possible drug allergies and drug interactions (Hagen, 2008).

Medical care fragmentation is largely the result of patients receiving different types of care at multiple facilities from various providers (DePhillips, 2007). Every care encounter generates patient data that remain with the respective provider within each individual facility because physicians do not routinely communicate with one another and share important clinical information about common patients (DePhillips, 2007). Consequently, crucial medical data are not always available for physicians' decisions, increasing the level of potential error in care and even requests that can lead to deadly treatments (Hagen, 2008). When healthcare is highly fragmented, various hospitals, providers, and payers are not provided with a complete view of a patient's clinical history, increasing the risk of medical errors, costs to patients and payers to do unnecessary tests, and amount of time providing care to patients (DePhillips, 2007).

Theme #2: Examination of two HIT systems: EMR and CPOE (definition, requirements, use and impacts, and benefits to stakeholders)

According to Juciute (2009), modern information and communication technologies (ICT) offer new possibilities for improving almost every aspect of healthcare, from better access to

integrated patients' information and delivering improved healthcare in its broadest sense, to patients' empowerment and an instrument for healthcare systems' restructuring. Juciute (2009) reports that the two most commonly implemented ICT systems are Electronic Medical Record (EMR) systems and Computerized Physician Order Entry (CPOE) systems. Implementation processes can vary greatly, from scattered single initiatives of various IT solutions to large national programs (Juciute, 2009, p. 131).

EMR is defined as a repository of patient data in digital form, stored and exchanged securely, and accessible by multiple authorized users (Hayrinen, Saranto, & Nykanen, 2008). DePhillips (2007) adds that the EMR is created through the combination of the three sources of data: the patients themselves; physicians, hospitals, and other providers; and the patient's health plan or other healthcare payers. The goal is to develop a common view of a patient's health that the authorized users can properly and correctly retrieve, change, and store back to the systems. It is a secure, real-time, point-of-care, patient-centric information resource for physicians and clinicians that supports decision-making by providing access to medical information about the patient and evidence-based decision support where and when it is needed (Carayon, Smith, Hundt, Kuruchittham, & Li, 2009). Hagen (2008) provides an example, when the physician decides to refer the patient to a specialist for a consultation:

1. The physician electronically inputs notes of the patient's condition elements as does the nurse, who takes the patient to the exam room, and then electronically records vital statistics (pulse, blood pressure, height and weight, and temperature) in the EMR system.
2. A referral to a specialist is handled electronically. The medical information needed for the visit to the specialist is automatically transmitted to his or her office with the results

of diagnostic procedures that the referring physicians ordered, such as digital images from radiological procedures.

3. After the consultation with the specialist, his or her notes and recommendations are electronically transmitted back to the referring physician's office, where they are carefully reviewed and become part of the patient's chart.

The amount and quality of EMR available to physicians and caregivers in patient care has the potential to impact both the outcomes of patient care and the continuity of care (Hayrinen, et al., 2008). The EMR automates and streamlines the clinician's workflow, closing loops in communication, and reducing response time that result in delays or gaps in care (DesRoches, 2008). Hayrinen et al. (2008) highlight that the EMR also supports the collection of data for uses other than direct clinical care, such as billing, quality management, outcomes reporting, resource planning, and public health disease surveillance and reporting. Moreover, the EMR automatically checks any prescriptions for errors in dosing, allergies, and drug interactions; if the patient's health insurance plan includes a *formulary* (a list of prescription drugs approved for use), the physician can discuss information about prices and copayments while the patient is in the office and the prescription is electronically delivered to the patient's pharmacy (Hagen, 2008, p. 5).

The EMR is used by different healthcare professionals and also by administrative staff (Hayrinen et al., 2008). Hayrinen et al. further explain that among the various healthcare professionals who use various components of the EMR are physicians, nurses, radiologists, pharmacists, laboratory technicians, and radiographers. According to Edwards, Moloney, Jacko, and Sainfort (2008), the EMR is the most studied medical data, as different medical data components are analyzed. These authors listed the data components of the EMR as *referral, present complaint (or symptoms), past medical history, life style, physical examinations,*

diagnoses, radiology and laboratory tests, family health history, treatment, medication, and *procedures*.

Georgiou, Ampt, Creswick, Westbrook, and Braithwaite (2009) define ***CPOE*** systems by their ability to provide doctors, or other authorized clinicians, with the facility to enter orders, such as laboratory, medication, and imaging, directly into computers. The primary goal of such systems is to increase opportunities for improving the efficiency, effectiveness, and quality of healthcare systems.

CPOE systems are widely recognized as a critical component of the future electronic medical record for both accessing and sharing information across healthcare settings, and for making delivery of patient care safer (Georgiou et al., 2009). Order communication is a highly collaborative process (Collin et al., 2008). Collin et al. suggest that the notion of interdependence in work is a key feature in producing medical orders. Decisions about medical care are vital to managing patient trajectories and result from a process of often implicit negotiations among stakeholders, including the patient (Aarts, Ash, & Berg, 2007, p. S6). Aarts et al. (2007) further describe, because knowledge about the patient's illness and treatment is distributed among the participants in the trajectory (a time-ordered set and path of states or a course of development), creating and processing medical orders result from the interaction of physicians, nurses, other health professionals, and occasionally the patient.

Many different professionals, including nurses, pharmacists, physiotherapists, radiologists, and lab technicians, are involved in the routing of medical orders, which includes the order creation and communication process, and the processing of the order at the routing end and the returning of the results of an order result (Aarts et al., 2007). The role of the physician is crucial to CPOE implementation because the physician is expected to be responsible for entering

orders (Aarts et al., 2007). However, the study of Collin et al. (2008) reports the major concern about physicians interacting with CPOE systems is the amount of time they need to do the work. As a result, revisions to the system are being developed to enable physicians to accomplish tasks more quickly.

Potential benefits of EMR and CPOE technology to individual stakeholders. Juciute (2009) believes that EMR and CPOE should be part of an integrated IT system fully supporting the continuum of care. Such a system requires a transformation of the delivery care system into care programs with measurable outcomes, integrated planning, restructuring and delegation of task, and IT supporting the process of care (Aarts et al., 2007). Hagen (2008) finds potential reductions in error rates from the use of EMR and CPOE of between 50% and over 90%.

Evaluation studies of CPOE implementation in hospitals in the 1970s and 1980s by Aarts at al. (2007) reveal economic savings and better patient outcomes in terms of reduction in length of patient stay and improvement of the quality of medication orders in terms of legibility, completeness, and decrease of transcription errors. Additionally, studies by Collin et al. (2008) that focused on medication errors and poor drug incidents conclude that CPOE significantly decreased medication error rates and increased medication safety and care quality.

Ideally, the EMR potentially simplifies operations in physicians' offices (Hagen, 2008). It helps the physician check for the patient's prescription errors as well as perspective conflicts among physicians, specialists, clinicians, and payers, and recommends better choices or solutions, given the specifics of the patient's condition (Hagen, 2008). The adoption of EMR eases exchanges of patient information, which might not only improve the quality of care, but also reduce costs by lessening the duplication of diagnostic procedures, preventing medical errors, and lowering administrative costs (Hayrinen et al., 2008). As part of the motivation for

the broader adoption of EMR due to deficits in the quality of healthcare in the U.S., Hagen (2008) reports that many HIT systems, such as the EMR system, have clinical decision support functions, such as automated reminders about preventive care, that help physicians stay within evidence-based guidelines, circumvent preventable errors, reduce the use of procedures having no demonstrated clinical values, likely cut costs, and eventually improve quality of the care they provide. In addition, Caroyon et al. (2009) agree that tools to support administrative procedures, such as billing, scheduling, claim generating, processing, and documenting, are becoming common EMR features to facilitate administrative decision-making and minimize potential mistakes due to the inaccuracy and incompleteness of paper records.

Theme #3: Change Management Strategies for Successful Integration of HIT

Lorenzi and Riley (2003) believe that while we continue to see new drugs, new devices and tools, and new medical techniques and procedures, the true megachanges in healthcare will center on gathering, managing, and using clinical information, including whole new types of information unavailable to current clinicians. Lorenzi and Riley (2003) further describe these changes are driven by the requirements for improved access to healthcare, the development of dynamically integrated delivery systems, the anticipation of quality healthcare provided at lower costs, and the increased attention upon wellness. According to Carayon et al. (2009), the key to a successful HIT implementation project is how well the technology is implemented and how the technology can be used to improve clinician performance and produce positive individual and organizational outcomes.

DePhillips (2007) notes that employing IT in any application involves a basic, universal principle: maximizing IT implementation in order to create the richest product offering at the

lowest cost (p. 1). Numerous successful transformation stories document that organizations have discovered how to make new strategies, acquisitions, reengineering, quality programs, and restructuring work well for them (Kotter, 2002). Furthermore, after examining these success stories, Kotter (2002) discloses two important patterns: first, useful change is likely associated with a multistep process that creates sufficient power and motivation to overcome all the sources of apathy, and second, this pattern is never utilized effectively unless it is motivated by high-quality leadership in the organization, not just exceptional management. Kotter (2002) adds people change what they do less because they are given *analysis* that shifts their *thinking* than because they are *shown* a truth that influences their *feelings* (p. 1).

According to Blumenthal et al. (2006), implementing HIT systems involves more than just deciding to spend money; it is a major organizational commitment that might last for several years for hospitals. Szydlowski and Smith (2009) believe that it is common to see a healthcare organization spend large amounts of money on HIT systems, only to see the implementation fail because of poor change leadership. It is often the case that HIT implementation in hospitals, such as EMR and CPOE systems, is treated as purely technical in nature (Juciute, 2009). According to Juciute, a "hard/mechanistic" approach is taken, at the purely technical end of the change spectrum, and corresponding implementation strategies are applied from the top down with the assumption that there will be little or no resistance, and physical change will go ahead (p. 132). The most common reason for failure of HIT implementation is that the implementation process is treated as a technological problem alone, and the human factors and organizational issues are not fully addressed (Carayon et al., 2009). Because the introduction of a new technology is likely to change jobs and work processes of key stakeholders in the hospital, resistance to change is inevitable (Wagstaff, 2006). Benham-Hutchins (2009) reports that because change management

is a critical component of successful HIT implementation, it is essential that the CIO and CMIO also consider the two major aspects of change management during the implementation process; communication and collaboration among stakeholders.

Open communication. One of the most common ways to overcome resistance to change is to educate users about the project beforehand (Kotter & Schlesinger, 2008). A communication program in hospitals can be ideal when resistance is based on inadequate or inaccurate information and analysis, particularly if the CIO and CMIO need the resisters' help in implementing the change (Kotter & Schlesinger, 2008). Wagstaff (2006) examines the problems that arose and found too little has been done to explain and promote the vision of the future. Kotter (2002, p. 83) believes the direction of change should be widely communicated by leaders, and communicated for both understanding and gut-level buy-in. Kotter also states that the key is good communication, not just data transfer. When the CIO and CMIO communicate about a large-scale change, they need to show their stakeholders something that addresses their anxieties, that accepts their anger, and that evokes confidence in the vision (Kotter, 2002). Management by participation is a management style that is based on strong and effective communication (Wagstaff, 2006). During the decision phase, Hannah et al. (2005) suggest that key users and user groups must be included in project team actions, informed in a timely manner about the status of the implementation, and involved in the decision process. Staff training is seen as an effective tool to build awareness and support open communication and must be available to system users during implementation (Wagstaff, 2006).

According to Benham-Hutchings (2009), communication between healthcare providers for coordination of patient information within the current disjointed environment is identified as a crucial problem to be addressed, in order to reduce medical errors and provide quality care.

Communication is penetrating the healthcare field as an area of professional focus and makes up a major part of the healthcare professionals' daily practices (Alpay, Toussaint, & Zwetsloot-Schonk, 2004). Healthcare professionals, such as physicians, nurses, technicians, and specialists, need to share, exchange, and communicate information, knowledge, and resources pertaining to the care of their patients (Alpay et al., 2004). For systems to work smoothly in the HIT environment, project stakeholders, leaders, and managers must be a part of the team (Valerius, 2007). To be effective and successful, they must have in-depth knowledge of IT, and they must form strong working relationships and close communication with those in the IT and information management units as well as those in the health and medical management division (Valerius, 2007).

Collaboration. Lorenzi and Riley (2003, p. 90) define collaboration as the ability of organizations to create relatively unique organizational forms that meet their particular needs. When managing a change, the CIO and CMIO need a strong guiding coalition, one with the right composition, level of trust, and shared objective (Kotter, 2007). Building such a collaboration (team) is always an essential part of the early stages of HIT implementation (Lorenzi & Riley, 2003). Although medical practitioners and IT professionals have some common understanding of technology, working together successfully requires each to understand the other's role and to find a common language that levels the field and allow meaningful discussion (Valerius, 2007).

Known barriers to HIT adoption. In spite of the seeming advantages that HIT provides to physicians and hospitals, the proportion of those providers that really use such systems is relatively small (Hagen, 2008). Because integrating HIT systems is greatly more than just wanting to spend money, it is an important organizational commitment for many years (Hagen, 2008). The need to adopt and adapt methods and techniques to understanding human factors and

organizational issues of the technology implementation process has been increasingly recognized by care providers and hospitals (Carayon et al., 2009). Without a complete understanding of end-user experience and the organizational changes produced by HIT adoption, the CIO and CMIO are missing significant opportunities to develop better approaches to designing and implementing HIT in hospitals (Carayon et al., 2009).

People can be easily overwhelmed by change, especially within large organizations like hospitals, where they may perceive they have little or no voice in or control over the changes that they understand are coming down to them (Lorenzi & Riley, 2003). Therefore, because the normal response is fight or escape, not collaboration, supervisors frequently interpret such human resistance to change as stubbornness or "not being on the team" (Lorenzi & Riley, 2003). Carayon et al. (2009) believe that challenges in dealing with ***human factors and organizational factors*** partially explain why the majority of hospitals and clinics are unwilling or unable to consider the use of HIT in their organizations. Lorenzi and Riley (2003) state that computers interact in complex ways with the organization and considerably affect people's attitudes. To take full advantages of HIT systems, physicians may be required to substantially redesign the way they practice medicine (Hagen, 2008). As a result, physicians are reluctant to adopt new ways of doing things that interfere with their workflows and take time away from patient care, provoking resistance to change, a crucial challenge for the success of the innovation and implementation (Zandieh et al., 2008).

Zandieh et al. (2008) also believe that ***costs*** are another important barrier to HIT adoption. While HIT undoubtedly delivers the potential to significantly reduce costs for hospitals, it is widely viewed as a major expense in and of itself (DePhillips, 2007). DePhillips further explains that costs come in the form of personnel, software, hardware, maintenance, and

ongoing upgrades, and many hospitals fail to plan for this fact and are thus blindsided by significant training and change management expenditures, which occur regularly into the implementation of HIT. Carayon et al. (2009) note that plans for change management, process and workflow improvement, user support and system ownership, and comprehensive training are all important to HIT success and require funding. In addition, some benefits to be received from HIT increase in value as the network of those using the technology expands; that is as other providers also purchase HIT systems (Hagen, 2008). Hagen further describes that providers who can perform functions electronically gain benefits when other providers develop similar electronic capabilities.

HIT can contribute to improvements in the quality of healthcare that care providers deliver, but it is relatively rare for providers to be compensated for such improvement (Zandieh et al., 2008). According to Hagen (2008), Pay-for-performance programs are in effect in some managed care plans as pilot programs in the fee-for-service sector of Medicare; however, such programs do not create a strong monetary incentive to invest in HIT because the payments are relatively modest. Furthermore, the financial rewards for physicians and hospitals from improving the quality of their care services (or avoiding the delivery of poor services) are indirect (Hagen, 2008). A physician's reputation for providing high-quality care may improve because of HIT investment, and patients may want to see a physician who uses HIT systems because they feel they will get better services (Hayrinen et al., 2008). As a result health plans may want to recruit doctors who use HIT systems for their networks of physicians more than physicians who do not, in order to attract and retain enrollees (Hagen, 2008).

In other instances, HIT implementation may create major disruptions in workflows and tremendous turmoil among care staff during initial stages (DePhillips, 2007). Carayon et al.

(2009) report that key hospital staff complained of the increased workload and confusion due to the technical problems and time pressure associated with EMR implementation. Aarts et al. (2007) report that the growing shortage of healthcare personnel created stress and anxiety for nurses, clinicians, physicians, and specialists due to their overbearing daily responsibilities and workload before their health organizations decided to integrate HIT to existing work processes. Moreover, resource shortages, such as training and IT support during implementation, and failure to assess the basic computer and software skill set necessary for HIT users, are elements identified by Szydlowski and Smith (2009) as key barriers to successful HIT integration.

Choosing strategies for change: pre-selected change management strategies (communication, collaboration, and empowerment) to overcome barriers. Organizational change efforts often run into some form of human resistance (Kotter & Schlesinger, 2008). The rate of change in practically all organizations is increasing, and healthcare organizations are no exception (Goldsmith, 2003). Though experienced CIOs and CMIOs are usually all too aware of this fact, very few of them take time before HIT systems implementation to assess systematically who might resist the change initiative and for what reasons (Kotter, 2002). Szydlowski and Smith (2009) underline the fact that the installation of new technology systems within a hospital is a change that affects many and sometimes all departments. Furthermore, because of the many different ways in which individuals and groups can react to change, correct assessments are frequently not instinctively clear and require careful thought (Goldsmith, 2003). Goldsmith further explains many hospital executives underestimate not only the variety of ways people can react to HIT implementation, but also the ways they can positively influence specific physicians, nurses, specialists, and user groups during a change.

According to Lorenzi and Riley (2004, p. 100), change management is a process by which an organization gets to its future state: the vision. They explain that the role of change management is to facilitate the journey that traditional planning processes represent. Creating change starts with creating a vision for change and then empowering individuals, like doctors, nurses, radiologists, etc., to act as change agents to attain that vision (Kotter, 2007). Change management encompasses the effective strategies and programs, such as *communication, collaboration, and empowerment*, to overcome barriers when initiating HIT systems.

Whether talking about leadership or stakeholder involvement, ***communication*** is the cornerstone of success when implementing HIT systems (Lorenzi & Riley, 2004). Because both processes and systems are complex, the potential stresses on the clinical staff are also complex. Providing rich and frequent information about the effort under way is one effective approach available to deal with all of the personal security and insecurity issues that occur from the clinical staff (Lorenzi & Riley, 2003). The direction of change should be broadly communicated in order to get as many stakeholders as possible acting to make the vision a reality (Kotter, 2002). Hospital leaders need to clearly communicate the organization's vision and the role that HIT systems being considered will play in that vision (Lorenzi & Riley, 2004). During the planning phase, the CIO and CMIO need to communicate their feelings to clinical stakeholders about the use of the current system and their desires for new systems. They also need to inform (via memos, staff meeting, announcements, etc.) in a timely manner all stakeholders who are part of the organization and present an overview of the findings to key staff and personnel throughout the hospital (Lorenzi & Riley, 2004). During the decision and implementation phases, the CIO and CMIO need to include key clinical staff and departments in decision-making processes and project implementation (Szydlowski & Smith, 2009). Training is a key communication tool in

the implementation process as stakeholders share opinions, ask questions, and obtain additional information about the new information systems project (Wagstaff, 2006).

More information about the project should be made available, and more opportunities to participate in planning and implementation should be created, to encourage in stakeholders a sense of ownership and familiarity (Wagstaff, 2006, p. 14). According to Lorenzi and Riley (2004), the keys to success are "Involve and communicate. Communicate and involve" (p. 157). Juciute (2009) believes that early involvement of stakeholders and especially end users, like physicians, nurses, specialists, etc., into the specification and development stage, as well as throughout the whole HIT systems project lifecycle, is a key success factor for complex IT implementation. Also a correlation between lack of engagement with stakeholders and implementation failure is noted by Zandieh et al. (2008). Juciute (2009) explains the key benefits of communicating the right information to the right people. His list of benefits include the following: the CIO and CMIO are aware of stakeholders' needs and preferences to effectively build the business case and service design that reduce costs, and the end users have effective and right systems that contribute to the quality of the finished care services, a sense of ownership, and commitment for changes to take place.

As hospitals strive for higher productivity in a highly competitive market, effective HIT systems play a key role in the successful management of human resources: they can support the managers' ability to make the needed changes to redesign systems to meet current needs (Lorenzi & Riley, 2003). To deal effectively with the implementation reality, it is important that people are involved in any change processes that an organization begins (Kotter, 2007). Leaders throughout the hospital need to directly involve the workers in the change process and train them not only in how to handle the new technology systems, but also in basic core values (Lorenzi &

Riley, 2004). It is important to look at how to effectively build good teams in healthcare organization in order to create successful workforce ***collaboration*** (Goldsmith, 2003). This enables the implementation team to understand the importance of dealing with healthcare professionals in system implementation and the strategies needed to create a temporary team of people who are interested in and who support the information system (Goldsmith, 2003). Effective teams have these characteristics (Lorenzi & Riley, 2004):

- Members are informal, comfortable, and relaxed.
- Members respect and listen to each other.
- The task and the object of the group are understood and accepted by the members.
- Criticism is frequent, frank, and comfortable.
- Members are free to express their feelings and ideas.
- When action is taken, clear assignments are made and accepted.

Collaboration ensures a more effective use of individual talents (Kotter, 2007). There is no single individual who possesses all knowledge, skills, and techniques required (Tsiknakis & Kouroubali, 2009). When more than two professionals collaborate, there is a bigger potential that they will have a necessary set of skills. Besides, collaboration is one way of transferring new knowledge and information (Lorenzi & Riley, 2004). This way, the CIO and CMIO obtain needed information on stakeholders' needs and feedback on the new systems, and physicians, nurses, administrators, and clinicians remain informed to understand the implementation process and effectively operate the systems for better quality care services (Juciute, 2009).

Key individuals or groups responsible for implementing an HIT change must be directly involved and empowered in the project (Benham-Hutchins, 2009). Implementing, sustaining, and optimizing EMR and CPOE systems in healthcare networks requires staff training, development,

and ***empowerment***, and often leads to shifts in roles and responsibilities as job descriptions evolve with changes in the operational workflow (Alpay et al., 2004). System buy-in and ownership can be effectively created by empowering the team members with new knowledge of the HIT initiatives because the team members are the stakeholder groups who are most knowledgeable, possess various skill sets, and have existing trust relationships with other staff and providers (Wagstaff, 2006). A report by the Institute of Medicine (2000) shows the importance of a positive work environment for ensuring patient safety in hospital settings. Creating and sustaining trust throughout the hospital is identified as a critical leadership activity (Institute of Medicine, 2000). Lack of trust and respect in the work environment has damaging effects on both the hospital and staff because employees who are distrustful are less likely to contribute to organization vision, goals, and activities (Kotter, 2002). According to Szydlowski and Smith (2009), behaviors, such as positive relationships with peers and superiors, as well as respect and delegation from peers and superiors within the workplace, lead to effective alliances and eventually successful change management to overcome HIT implementation barriers. This holds true because these behaviors enable clinical staff to complete their work in meaningful ways, such as access to information, necessary resources and technical support, and opportunities to learn. Furthermore, greater confidence and commitment to the systems implementation by the stakeholders is developed, lessening the pressure during the systems maintenance stage (Szydlowski & Smith, 2009).

Necessary skills for application of these strategies in hospitals. Training is a major tool providing clinical staff and stakeholders necessary and important skills for applying change management strategies to health technology adoption (Hannah et al., 2005). Kotter (2002) states that organizations tend to provide inadequate training, or training that is not the right kind, or

training that is not offered at the right time. In addition, users are often taught technical skills, but not the social skills or attitudes needed to make new arrangements or innovations work (Kotter, 2002). Lorenzi and Riley (2003) report that lack of technical expertise of physicians, nurses, administrators, clinicians, and technicians, is not the main impediment to successful change, but rather the lack of leadership and management skills, such as visioning, prioritizing, planning, providing feedback, and rewarding success. These are the key factors in a successful change initiative. Goldsmith (2003) further adds the attributes that make a person a good technician may not be the attributes necessary for a good project manager. The author describes that managing significant HIT systems projects is a challenging task, requiring those responsible individuals or departments to develop skills in project scoping, time management, and budget administration. Kotter and Schlesinger (2008) indicate that good managers must also have interpersonal skills in order to effectively manage an organizational change. The authors explain interpersonal skills are those essential skills in dealing and relating to people. Good interpersonal skills can lead to improvement in care quality, a friendlier environment for patient and staff, effective time management, increased productivity, and increased hospital reputation.

Conclusions

According to Szydlowski and Smith (2009), effective change management can lead to more efficient and effective HIT implementation. Although IT offers the healthcare industry tremendous potential for addressing and correcting some of its greatest barriers, the CIO and CMIO need to exercise caution when planning, deciding, and implementing EMR and CPOE systems, in response to a particular set of unique challenges (DePhillips, 2007). Because technology investments are largely made up of software and hardware, it is easy to make a mistake in believing that a technology is successfully implemented once it has been purchased and installed (Szydlowski & Smith, 2009). Many work process redesign projects focus exclusively on technology and fail to address the human and organizational aspects (Lorenzi & Riley, 2003).

There are several known barriers to HIT systems adoption that are driven by a combination of technical, organizational, and human shortcomings (Kotter & Schlesinger, 2008). Unfortunately all of these shortcomings can lead to stress and resistance behaviors of clinical stakeholders (Wagstaff, 2006). The goal of this review is to discuss the effective adoption of change management strategies for successful health informatics implementations.

The Role of HIT Systems

Information plays a key role in healthcare (Hagen, 2008). Managing that information and using it productively pose a continuing concern, particularly in hospitals (Tsiknakis & Kouroubali, 2008). Though information systems (ISs) are now considered central to most changes in healthcare industry, implementing major IS projects or making systems changes in any organization is challenging, and many projects have had some types of failure (Lorenzi &

Riley, 2003). DePhillips (2007) reports that implementing IT systems, even on a small scale, to furnish payers, providers, and patients with more thorough data enables better decision-making at the point-of-care, resulting in better outcomes and streamlined administrative and financial efficiencies. Also HIT systems, particularly EMR and CPOE, offer the foundation for the healthcare industry to better address major challenges, such as high medical errors, medical care fragmentation, and poor quality of care and safety (Hagen, 2008).

The Role of Management Leadership

Leadership is also the essential ingredient needed to transform the health system (Goldsmith, 2003, p. xiii). Kotter (2002) states that, because leaders are so central to any major change effort, it is sometimes concluded that transformation equals leadership. Certainly without strong and capable leadership from many people, restructuring, turnarounds, and cultural changes cannot happen (Kotter, 2002, p. 129). To accomplish the transformation in healthcare requires a willingness of healthcare practitioners and management to understand and master the technologies themselves, and to adapt them and collaborate with those who create them, to make them easier to adopt and use (Kotter, 2007). In the new environment, hospital leaders must have the capability to develop trust and respect among their staff, and in turn there is a likelihood of higher level of employee commitment (Lorenzi & Riley, 2004). Integrated information management systems will facilitate the change in the role of management and leadership in the future (Kotter & Schlesinger, 2008). Lorenzi and Riley (2004) further explain that the key to success for the leader and manager is the effective upgrading of the trust and respect for the hands-on staff within the hospitals and the gradual extinction of the “high task-low interpersonal” management approach.

The role of the change leader typically requires good skills in technical, organizational, project management, and interpersonal areas (Rorenzi & Riley, 2003). The authors further clarify that more importantly, the change leader has to be able to constantly and rapidly shift between these skill areas on any given day.

The Role of Change Management Strategies

Resistance to change is always a crucial challenge for the success of any innovation (Zandieh et al., 2008). However, Lorenzi & Riley (2004) believe that it is possible to introduce a new technology-based system into an organization without seeing a negative impact of the change. The challenge to organizations is to acknowledge the stress that change will bring to both employees as individuals and the organization as a whole (Kotter, 2007). Szydlowski and Smith (2009) provide a list of recommendations to help hospitals reduce the risk of HIT implementation failure. Some of these recommendations include ensuring that IT initiatives have clear objectives and vision, communicating frequently, creating or changing the reward system to provide a participation incentive for implementation success, accepting and welcoming debate, involving and empowering staff with respect and trust, and using the best resources and staff for building a good team with a necessary combination set of skills.

One of the most important methods to overcome resistance to change is to communicate about it beforehand (Kotter & Schlesinger, 2008). ***Communication*** of ideas helps people see the need for and the logic of a change, especially when resistance is based on inadequate or inaccurate information and analysis, and if the leader needs the resisters' help in implementing the change (Kotter & Schlesinger, 2008).

When people fail to develop the coalition needed to guide change, the most common reason is that they really do not think a transformation is essential or they do not think a strong ***collaboration*** is needed to direct the change (Kotter, 2002; Kotter & Schlesinger, 2008). To ***empower*** people to effect change, Kotter (2007) believes that organizations need to communicate a reasonable vision to employees, provide training that the employees need, and align information and systems to the vision. Kotter (2002) further explains that trust and a common goal are crucial components for building an effective collaboration as they bind individuals together on guiding change coalitions. According to Kotter (2007), with the right structure, training systems, and supervisors to build on a well-communicated vision, increasing numbers of organizations are finding that they can tap a large source of power to improve organizational performance.

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