A READINESS ASSESMENT: PREPARATION FOR IMPLEMENTATION OF COMPUTERIZED PHYSICIAN ORDER ENTRY
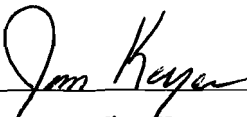
by

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A Research Paper

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INMGT-735 Field Problems

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ABSTRACT

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Recent governmental attention and continually increasing concern for patient

safety has led the healthcare industry to become more focused than ever on reducing the

number of care related errors. In this struggle against inaccuracy, many organizations are

embracing change and implementing systems that allow physicians and care providers to

enter orders directly into electronic systems. Computerized physician order entry (CPOE)

is widely believed to significantly decrease the number of errors made. However,

implementation of these systems is complicated, and for some organizations, often an

unreachable goal. An implementation of CPOE has far-reaching effects on an organization, with several serious risks involved, including patient lives, financial commitment, and organizational reputation.

Several studies have examined significant factors that are considered to be requirements for a successful CPOE implementation. This study evaluates one healthcare facility in relation to a selection of critical success factors in order to determine their level of preparedness for a future CPOE implementation. This facility encompasses both inpatient and outpatient settings, with care providers that deliver treatment in both settings.

ACKNOWLEDGMENTS

I would like to thank my family and friends for encouraging me to continue on and complete this research and ultimately my master's degree. Understanding that I couldn't always come out and play or come down and visit was important to my success. I wish to extend a special thanks to my mother, who worked hard to instill a strong sense of independence in me and forever reaffirming that I could do anything that I set my mind to.

Also, thanks to Jim Keyes for his greatly appreciated effort in working with me and contributing to this research.

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CHAPTER I: INTRODUCTION

In 2000, the Institute of Medicine released a report which acknowledged that up to 98,000 people die each year from medical errors in hospitals in the United States (Institute of Medicine, To Err is Human). That number is greater than all of the people that die from AIDS, breast cancer, or motor vehicle accidents. However in past years, medical errors have received a great deal less attention. The Institute's report emphasized that mistakes are generally not the fault of the healthcare provider, but are the result of the organizational systems in which they must function. Since the release of the Institute's report, there has been a significant amount of national attention focused on patient safety, including President Bush's aim to develop an electronic health record for all patients by the year 2010. (Beaudoin, 2004) To show a commitment to this project, the president's administration has committed noteworthy funding for healthcare information technology projects, and has created a new sub-cabinet position of National Healthcare Information Coordinator.

As a result, the healthcare industry is focusing on computerized physician order entry (CPOE) as one important and underutilized tool for improving patient safety. CPOE aims to error proof patient care as much as possible. A considerable portion of healthcare delivery is performed by humans, and as these care providers are expected do more and more each year, science also progresses making their jobs more clinically complex.

CPOE is a computer application that accepts a physician's orders for diagnostic and treatment services electronically instead of the physician hand writing orders on an orders sheet or prescription pad. Among US hospitals, CPOE has a reputation for being difficult to implement successfully (Stablein & Drazen, 2003). Both the support of

integrated clinical information systems and buy-in on the part of the organization's

practitioners is required. Given the significant impact on both the information technology

environment and the clinical processes within the care environment, understanding an

organization's readiness and commitment to CPOE is essential for a successful

implementation. A number of studies have been completed to better identify key factors

for success, three of the most notable being The 2001 Menucha Conference List

("Considerations Concerning," 2001), Understanding Hospital Readiness for

Computerized Physician Order Entry (Stablein & Welebob, et al., 2003), and

Overcoming Barriers To Adopting and Implementing Computerized Physician Order

Entry Systems In U.S. Hospitals (Poon, Blumenthal, Jaggi, & Honour, 2004)

For confidentiality purposes, the organization to be examined here will be referred

to as XYZ Healthcare throughout the study. XYZ Healthcare plans to begin

implementation of a CPOE system within the next year. This study will help identify

topics for the organization to focus on prior to and during the implementation. Also, this

study will provide a set of recommendations to help ease implementation difficulties.

Having been in business for over 100 years, XYZ Healthcare is well established

and respected in the community. In 1992, they merged with a much larger healthcare

organization, which now provides guidance and financial support. Although there are a

number of clinics and hospitals across the region that are associated with XYZ

Healthcare, this study will focus on the facilities located in one city. Facilities at this

location are situated in western Wisconsin and include both a hospital and clinic. The

hospital is accredited for 310 beds, and over 40,000 patients are seen in the clinic each

month. XYZ Healthcare has approximately 200 physicians with privileges to practice at their facilities.

Currently, the individual healthcare providers primarily use commonplace paper record keeping methods, but XYZ Healthcare is now in the process of implementing an electronic medical record (EMR), which will computerize many records that were formerly maintained on paper. This is often an important first step for organizations planning to progress toward CPOE (Briggs, 2004). In June 2005, the first phase of this EMR should be in use. This system will be used for medical record storage and order entry and management. Initially, physicians will continue to write paper orders, and a receptionist or nurse will be entering those orders into the EMR. Several ancillary departments, such as radiology and laboratory, already use electronic systems for order tracking and order management. These systems will be integrated with the EMR. The practitioners at XYZ currently make wide use of a clinical data repository to retrieve patient clinical information.

The identification of key issues that can be addressed prior to implementation should result in a more successful CPOE implementation. With the number of failed implementations on record nationwide, proper planning and addressing potential issues prior to implementation is vital for success.

Statement of the Problem

Based on a selection of critical success factors, this study will assess XYZ Healthcare's level of readiness for an implementation of a computerized physician order entry system.

Research Objectives

The principal objective of this study is to assess XYZ's level of preparedness for an implementation of a CPOE system. The resulting product will include both an assessment of items that can be expected to be strengths during the implementation of COPE and identification of areas that may need additional attention prior to and during the initial CPOE implementation phase.

Assumptions of the Study

The assumptions of this study include:

1. XYZ will have an electronic medical record in use in all departments prior to using CPOE in a care setting.

2. The vendor used for CPOE will be the same vendor that is used for the EMR, eliminating technical interface issues.

3. XYZ will make no major changes in the management structure prior to or during the implementation of CPOE.

4. The CPOE implementation project will receive adequate financial support throughout the first phase of implementation.

Limitations of the Study

This study will examine a limited number of success factors. Not all identified factors can be examined due to the very nature of those factors, and the quantity of those identified in various studies. The critical success factors that XYZ will be evaluated against will be selected by the researcher. The researcher's personal views regarding the significance of selected versus unselected success factors will come into play.

Each factor and category of preparedness will be equally weighted, while in actuality, some areas may have more of an impact on an implementation than others. Also, existing literature regarding CPOE implementations is primarily focused on hospital implementations; there is a minimal amount of available literature that focuses on the implementation of CPOE in a clinic setting.

This study is applicable to one healthcare facility, and results may not be applied to other organizations. The results reflect the situation at this facility at the current point in time. By the time of implementation the outlook and positions held by the staff at this organization may differ.

Methodology

A survey will be distributed to a selection of employees of XYZ Healthcare. The selection will be chosen from administration, departmental directors, physicians, providers and mid-level providers working in one city. The questions included will be developed primarily from three studies, The 2001 Menucha Conference List ("Considerations Concerning," 2001), Understanding Hospital Readiness for Computerized Physician Order Entry (Stablein & Welebob, et al., 2003), and Overcoming Barriers to Adopting and Implementing Computerized Physician Order Entry Systems In U.S. Hospitals (Poon, Blumenthal, Jaggi, & Honour, 2004).

Summary

Medical errors have the potential to affect all of our lives. CPOE is recognized as an important tool in the attempt to improve patient safety. However putting a CPOE system into operation at a healthcare facility is an extensive venture, which is often met with less than success. This study will assess one healthcare facility's level of

preparedness for such an implementation. The resulting product will alert them to

concerns that should be dealt with prior to the implementation, and it will queue them in

to the strengths of the organization, allowing them to focus on the maintaining the strong

points, and developing the weaknesses.

CHAPTER II: LITERATURE REVIEW

In recent years, a number of studies have identified significant quality issues in the delivery of healthcare. Providers continually face pressure to control costs and to use their time most effectively. A study published in the New England Journal of Medicine concluded that the lack of adherence to recommended practice for even basic care poses serious threats to the health of the American public (McGlynn et al., 2003). Technology has consistently been identified as an important component in most plans for improvement. Computerized physician order entry (CPOE) allows physicians to enter orders directly into a computer system rather than handwriting them in a patient's chart or on a slip of paper. CPOE fundamentally changes the ordering process; it has the potential to substantially decrease costs, shorten the length of stay, decrease medical errors, and improve compliance with a variety of guidelines and standards (Gibson & Kuperman, 2003). The costs of CPOE are substantial both in terms of technology and organizational process analysis and redesign. CPOE, as we know it today, is a relatively new technology, and there is little consensus on the best approach to address many of its challenges, but it may be essential for the safety and future of the healthcare industry.

Since 1998, the Institute of Medicine has released three key reports regarding the quality of healthcare delivery in the United States. The Institute's National Roundtable on Health Care Quality (Chassin & Galvin, 1998), Crossing the Quality Chasm: A New Health System for the 21st Century (Institute of Medicine, 2000), and To Err Is Human: Building a Safer Health System (Institute of Medicine, 2000) all identified substantial problems that must be addressed through significant changes to the current healthcare

system. All three reports contained unsettling results from studies documenting the prevalence of sub-quality care in the United States while focusing on the current state of patient safety and ways that it can improve (Gibson & Kuperman, 2003). All three of these reports also recognized the potential for information technology to be an important agent for change.

CPOE gives healthcare organizations the opportunity to standardize care practices, incorporate clinical decision support, improve interdepartmental communication, facilitate patient transfers, and capture data for research and quality monitoring (Gibson & Kuperman, 2003). With the ever-increasing complexity of today's medical world, CPOE offers physicians and clinicians an environment that is more appropriate than a paper-based setting.

One of CPOE's greatest contributions to patient safety is a key component called decision support (Gibson & Kuperman, 2003). This technology assists clinicians in making the appropriate choices when ordering care; this makes it an important tool in addressing a number of quality-based concerns. Decision support aims to standardize care for orders such as medications, laboratory, radiology, and other diagnostic tests. For example, these systems can compare medication orders against dosing standards, patient allergies, and interactions with other medications. The system will warn the clinician or physician of potential harms.

Much of the immediate interest in CPOE is focused on medication order entry and its potential to reduce medication errors. Injuries related to medication errors are the most common cause of harm to hospitalized patients and they are often preventable (Bobb et al., 2004). The majority of medication errors do occur at the ordering stage, and

preventable errors are often related to illegible handwriting, drug/allergy interactions, incorrect dose formulation, and simply incomplete orders. Implementation of CPOE has been shown to decrease medication errors by 55% to 80% (Bates, Leape, & Cullen, 1998). Bobb's (2004) study found that of the 1111 studied prescribing errors, 65% were found to be likely preventable with a basic CPOE system and 30% of those were likely to cause patient harm.

Levick and O'Brian (2003) point out that the success of a healthcare IT project is generally 80 percent dependent on social and political interactions and 20 percent implementation of the hardware and software. Because implementing CPOE is an expensive and complex project that touches almost all aspects of the healthcare operation, there are few healthcare organizations in the United States that have been successful in their attempts at implementation (Armstrong, 2000). However, a number of external stakeholders are creating pressure and incentives for organizations to implement CPOE. Associations such as The Leapfrog Group, an assemblage of the country's largest employers, acknowledge and reward health-related quality improvement efforts. They have also identified CPOE as one of three important "leaps" that organizations can take to substantially improve patient safety ("The leapfrog safety," 2004). CIOs of healthcare facilities responding to the Healthcare Information and Management Systems Society annual survey are expecting CPOE to be the fourth most important IT application for them over the next two years (HIMSS, 2004), but it is important to note that all four of the top responses are within one percentage point, and two of the first three applications, electronic medical records and clinical information systems, are both considered to be important first steps toward a CPOE implementation.

Table 1

CIO's Ranking of the Most Important Applications (Next Two Years)(2004 Results vs.

2003 Results)

	2004	2003
Bar Coded Medication Management	52%	46%
Electronic Medical Record	52%	41%
Clinical Information Systems	52%	53%
Computer-Based Practitioner Order Entry (CPOE)	51%	64%
Clinical Data Repository	46%	42%
Digital Picture Archiving (PACS)	43%	N/A
Enterprise-Wide Clinical Information Sharing	40%	36%
Point-of-Care Decision Support	38%	43%

■ 2004 Respondents

☐ 2003 Respondents
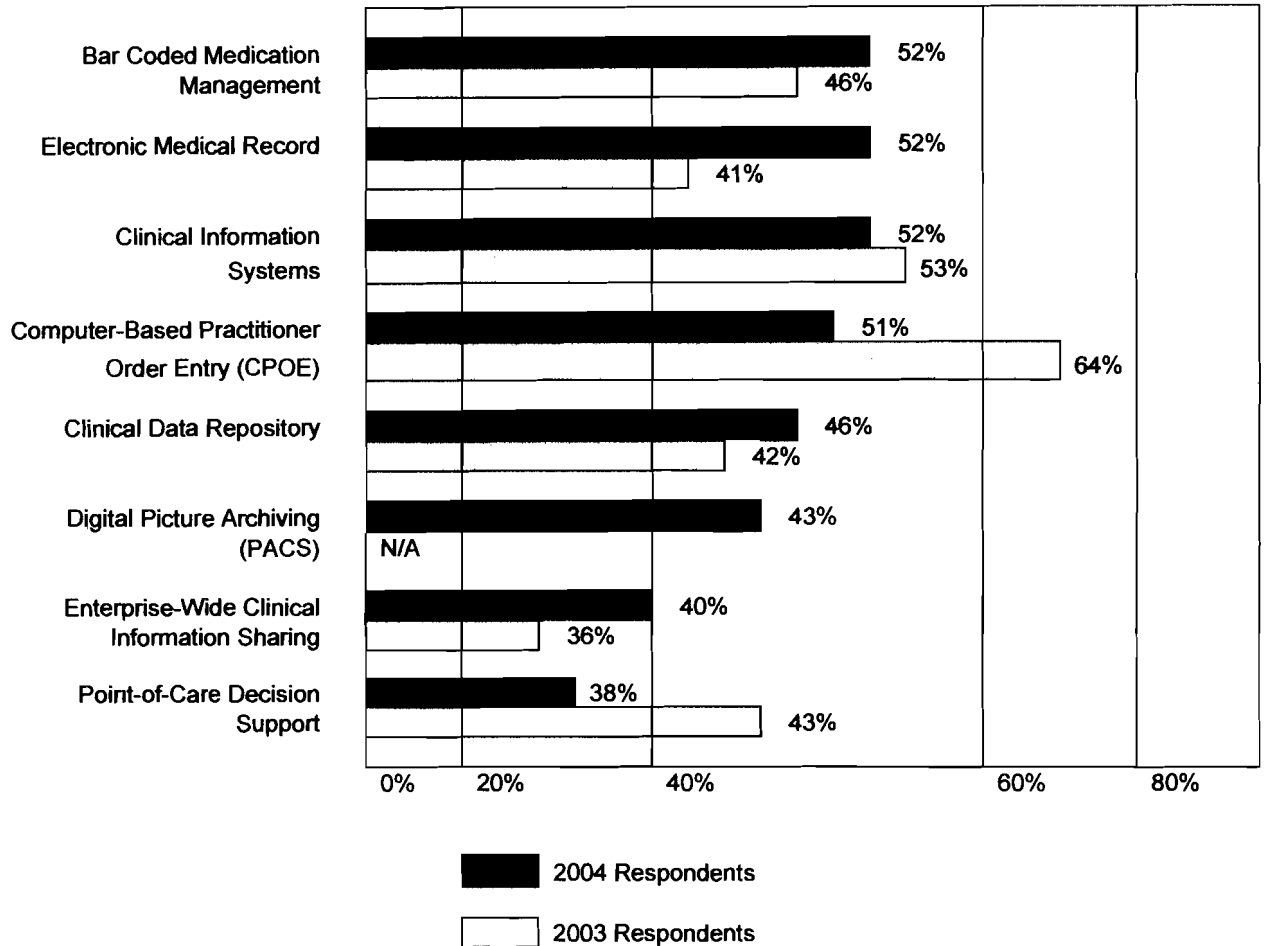
Chief Information Officers of major vendors, suppliers, and consultant companies

that responded to the Healthcare Information and Management Systems Society annual

survey expect CPOE to be the second most important IT application for them over the

next two years (HIMSS, 2004). CPOE was second only to electronic medical records

systems, which are vital for CPOE success.

Table 2

CIO's of Vendor, Supplier, and Consultant Companies Ranking of the Most Important

Applications (2004 Results vs. 2003 Results)

Application	2004	2003
Electronic Medical Record	60%	51%
CPOE	56%	47%
Clinical Information Systems	47%	48%
Enterprise-Wide Clinical Info Sharing	36%	52%
Clinical Data Repository	34%	35%
Point-of-Care Decision Support	33%	33%
Business Intelligence	31%	22%
Digital Picture Archiving (PACS)	31%	N/A

■ 2004 Respondents

□ 2003 Respondents
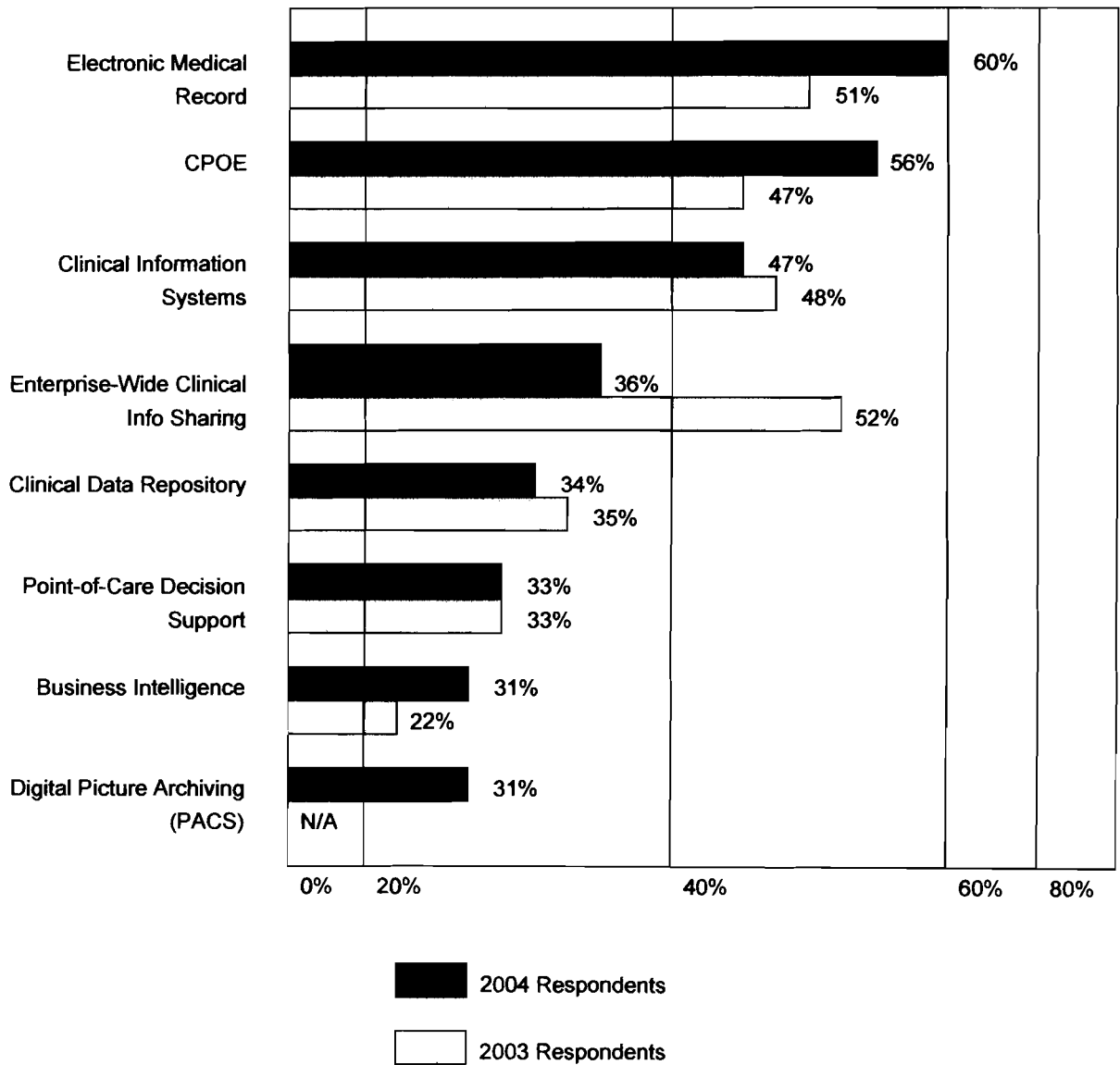
On the reverse side there are some that believe that CPOE will not improve

patient safety, and that it is not the ultimate solution to the patient safety problem in the

US. Kremsdorf (2005) believes that attacking the problem at the point of order entry is not particularly beneficial. He believes that what is truly needed is a better method of clinical surveillance, and improved monitoring of patient status would identify which patients are at greatest risk. Kremsdorf (2005) believes that these steps are more critical up front than implementing a CPOE system; getting patient data into an electronic form and readily available to staff, implementing proactive clinical observation tools, and providing tools for supervisory staff to see the larger picture of a patient's status.

Also, most studies demonstrating that CPOE can reduce errors have been performed in academic medical centers. In these settings, the clinicians that enter the large majority of orders are residents and interns who are dependent on the organization to complete their training, and the use of CPOE is required there (Levick & O'Brien, 2003). By contrast, in a community hospital where most of the physicians are in private practices, the hospital cannot mandate compliance in the same way. Instead, community physicians who are resistant to the change can admit their patients where CPOE has not been implemented or simply refuse to use the system.

The reality is that most studies have a favorable view of the end result of CPOE implementations (Briggs, 2004 ; "Considerations Concerning," 2001; Poon, et al., 2004; Stablein & Drazen, 2003; Stablein & Welebob, et al., 2003). A number of healthcare facilities are working toward implementation of CPOE systems, and several are asking how they best plan for a successful implementation. First they need to define success, and what would constitute a successful implementation at their particular facility.

Much of the research surrounding CPOE implementation success factors began with a conference held in 2001. The 2001 Menucha Consensus Conference was made up

of a number of experts representing clinical leaders, social scientists, information

technology implementers and vendors, all with prior experience in CPOE (Ash & Stavn,

2003). One of several outcomes of Munucha was a report titled *Does failure breed*

success: narrative analysis of stories about computerized provider order entry, where

Ash and Stavn wrote on the success and failures experienced during CPOE

implementations. Not all of the implementations studied were considered to be

successful, but all of the participants did describe success in relation to the

implementation progressing and the overall acceptance by clinical users. Some

participants indicated that others might have viewed implementations as successes, even

though those questioned felt it was a failure because specific goals had not been reached.

Failed implementations ranged from abandon implementations, to changes in the original

system design, to failure to make an impact on the organization. Setting reasonable goals

and remembering that CPOE is not a one-time implementation with a definitive end point

was critical. Systems continue to evolve as part of an organization's ongoing

performance-improvement program. (Stablein & Drazen, 2003).

Additional barriers and strategies to overcome them were identified in a study

conducted by Poon et al. (2004). They interviewed 52 people in senior management

positions from a random selection of hospitals that ranged from having a fully

implemented CPOE systems to having never considered a CPOE implementation.

Another study by leading experts on the subject of CPOE, Ash et al. (2001),

identified perceptions of success factors at facilities where CPOE is used for a minimum

of 80% of all orders. They conducted interviews and focus groups with a wide range of

people from clinicians, to technical staff, to management. From this they developed a list of ten themes for success.

One barrier consistently identified by every study was physician and organizational resistance. The primary reason for this was the perceived negative impact on the physician workflow. Poon et al. (2004) suggest that strong leadership, identification of physician champions, addressing workflow concerns, and leveraging house staff, can overcome this barrier.

For a successful CPOE project, organizations must have leaderships that are openly firm believers in the benefits of CPOE, and show an unwavering commitment to the implementation. Leaders need to feel empowered to make use of CPOE a requirement. (Poon, et al., 2004) One issue identified by Ash et al. (2001), was the difficulties encountered in the communication methods related to terms and concepts between physicians and leadership. Mutual respect and open sharing of ideas and concepts is absolutely necessary, so a collaborative administration can help to ease these difficulties. A clear vision and defined reasons for implementing CPOE should be communicated to the organization along with a declaration of commitment coming from the leadership ("Considerations concerning," 2001). Administration and clinicians need to have a trusting collaborative relationship, and value bi-directional feedback.

Typically, highly respected physicians are selected as physician champions. Their inside perspective on everyday workflow allows them to relate to other physicians, and provide a perspective on the implementation that is critical. Champions can also relay users' concerns to the implementation team and the vendors (Poon, et al., 2004). The physician champion should have strong clinical skills, be respected by other medical

staff, and, if possible, they should have experience in leading physicians through process changes. A strong background in technology is less important than strong interpersonal skills and a good grasp of organizational behavior principles (Levick & O'Brian, 2003).

Also, there should be a method in place to adequately address workflow concerns. Appling the patient safety potential of CPOE means changing the way patients flow through an organization, sometimes leading to significant review and revision of clinical processes. Some believe that few vendor products to date can be used out of the box by hospitals without customization to fit clinicians' workflow (Poon, et al., 2004). Getting uneasy physicians to accept CPOE often requires showing them the technology's value and how it fits into the patient care processes. Briggs believes, it's important for them to understand the entire ordering process so they can see the patient gets medications faster and in a safer environment (2004).

Providers may view the ability to use order sets during the workflow ordering process as a benefit of CPOE. Organizations must devote considerable time and effort when establishing order sets within their CPOE systems (Briggs, 2004). These order sets, or sometimes referred to as care sets, are predetermined lists of common lab, radiology, medication, and other orders, and are critical in speeding up the order entry process. Even though determining what should be included in an order set requires consensus and standardization of care can be difficult to achieve, the end result is a system that is safer and easier to use.

Leveraging motivated staff was also found to be important in the implementation process. In Poon's et al. (2004) study, some younger physicians looked at CPOE as an entitlement, not something that they had to do. These younger physicians were generally

more comfortable with technology, and had been exposed to CPOE as students. They were excited to examine ways to increase their workflow efficiencies.

The time that it actually takes for a physician to enter an order is a significant concern for clinicians. In the strictest sense, CIOs generally acknowledged that it does take longer for a physician to enter an order into a CPOE system than it took them to document the care on paper. (Briggs, 2004) Although, as physicians become more comfortable using CPOE over time the time of order entry generally diminishes. Having physicians that believe in the patient safety benefits of CPOE can alleviate the concerns, and when it comes to measuring the time it takes to enter an order, time should be measured when the clinician begins looking for the patient chart, not when they begin documentation. When you present physicians with evidence, they accept it. They are scientists. (Briggs, 2004)

Another common barrier found in the implementation of CPOE is the economic impact. Organizations can often be taken aback by the costs associated with CPOE projects. Because CPOE is often part of an EMR system implementation, and typically involves IT infrastructure upgrades, CPOE projects can range from millions to tens of millions of dollars, or even much higher for the largest organizations (Briggs, 2004). Organizations need to assess their long-term financial commitment toward CPOE, and have a long-term financial plan.

In the Poon's et al. (2004) study, the high costs and uncertainties associated with implementing CPOE made it easy for hospital officials to focus on other competing and visible priorities. Overcoming the cost barrier was often difficult, but realigning the organizational priorities to focus on patient safety was valuable to getting CPOE moving.

Organizations also found leveraging external forces, such as the Institute of Medicine report and the Leapfrog group, helped in getting the proper funding secured. Focusing on the end result of increased efficiency was also important. One challenge for organizations was to collect data early in the implementation process so that cost savings could be demonstrated.

Davidson and Riordan, and others, have an opinion of CPOE that differs from most. They believe that CPOE will not actually reduce costs, primarily demonstrated by annually increasing IT budgets (2004). These sources have a limited view of cost savings, as they are not only measured in IT dollars. CPOE systems have been shown to reduce costs through avoided adverse events, reduced utilization and shorter lengths of stay, and the reduction of variations in care (Ash & Gorman et al., 2001).

Another barrier identified by many was the overall immaturity of the vendor market. Many vendor products were found to not be a good match for organizational workflow, often requiring software modification. CIOs often identified poorly designed user interfaces and unacceptable processing speeds (Stablein & Drazen, 2003). There is often a large difference in the way that the software is designed to be used, and the way that it is actually used (Ash & Gorman et al., 2001). Individualization of tasks and the ability to adapt CPOE are vital for end user acceptance. While vendor products are definitely improving, few vendors have established a track record of successful implementation in more than a few hospitals. Poon et al. (2004) suggests selecting a vendor that is committed to the CPOE market and that has a product that is easily adaptable to physician workflow differences. Due to the length of time that an implementation can take, vendor stability is also an important consideration.

("Considerations concerning," 2001) The vendor should also have a history of being innovative and flexible.

Getting providers motivated to attend training can also be a barrier in many CPOE implementations (Briggs, 2004). Some organizations have required a minimum number of education hours before issuing user logons. The concept of mandatory training is not always well received with clinicians. Some organizations have started their CPOE training programs with department heads in hopes that they would be able to encourage others to attend. Training sessions need to be offered evenings and weekends to accommodate clinicians' schedules, as some organizations are not directly employed by the organization (Briggs, 2004). In recognition of the time spent in training sessions, some organizations even offered to pay the annual professional dues for physicians who closed their practices or did not schedule surgery for the sake of training sessions.

Managing user expectations and perceptions before and into the implementation is critical. In some cases expectations had gotten out of hand, the system was expected to be a cure-all for all of the organizations problems. Also, clinicians often needed to be reminded that CPOE does not always automate practice, humans are still ultimately responsible for delivering healthcare, and most do not want computers treating patients. Qualified clinicians should be responsible for treating patients (Davidson & Riordan, 2004). Perceptions of end users are equally important and need to be monitored throughout the life of the project.

In conclusion, CPOE implementations are significant undertakings for healthcare organizations. Implementations of this extent can be quite costly, and failed

implementations are a waste of valuable and scarce resources. Reputations are often put on the line, and successful CPOE projects can be looked at as significant accomplishments among peer organizations. Identification of key issues early on, prior to an implementation, can lead to a significant increase in possibility for success.

There is no debate that the healthcare industry is in need of fundamental change, and technology should be a component of the solution. Computerized physician order entry can improve quality by standardizing processes and providing guidance to physicians as they care for patients. Institutions that have a vision of high-quality care should include CPOE among their initiatives.

There is a significant volume of journal literature regarding the ideal vision of CPOE, and what it takes to have a successful implementation. Most of these share a core set of factors that are deemed to be most important. More research would be beneficial to create and evaluate models of CPOE implementation and to understand the specific challenges that exist for institutions of different sizes and different staffing models, as little has been written about the use of CPOE in organizations with diverse physician staffs. Also, the majority of these studies examine hospital settings, but neglect to study the implementation of CPOE in a clinic setting.

CHAPTER III: METHODOLOGY

This chapter provides details of the methodology used to assess XYZ

Healthcare's level of readiness for an implementation of a computerized physician order

entry system. The following items will be included: subject selection and description,

discussion of instrumentation, review of data collection, and an overview of

methodological limitations.

Subject Selection and Description

Participants of this study consisted of employee's of XYZ healthcare that held the

following types of positions during March 2005: administration, director of a clinical

department, physician, provider, or midlevel provider. These categories of employees

were determined to be the best collection of subjects based on an examination of three

critical success factor studies, including The 2001 Menucha Conference List

("Considerations Concerning," 2001), Understanding Hospital Readiness for

Computerized Physician Order Entry (Stablein & Welebob, et al., 2003), and

Overcoming Barriers To Adopting and Implementing Computerized Physician Order

Entry Systems In U.S. Hospitals (Poon, Blumenthal, Jaggi, & Honour, 2004). XYZ's

Corporate Communications and Human Resources Departments assisted the researcher in

compiling the list of subjects. The total pool consisted of 241 people. Surveys' were sent

to 33 employees in the administration and directors category, 165 physicians and

providers, and 43 midlevel providers. Participation was completely voluntary and

subjects were assured of confidentiality.

Instrumentation

The survey used in the study was developed by the researcher, and was based on a comprehensive review of the literature related to CPOE, but questions were primarily formulated from the three studies mentioned above. There were a total of 16 questions, each falling into one of the following six categories:

- Type of position held with the organization,

- motivation for implementing CPOE,

- organizational leadership,

- organizational foundation and culture,

- order management and integration,

- and acceptance and use of technology.

The survey questions were all designed to be clear-cut and quickly completed. Items were answered by circling a number on a likert scale. Respondents were also given the opportunity to provide comments at the end of the survey.

Because this survey was constructed specifically for this study, there were no measures of reliability or validity. A copy of the survey is included in Appendix A.

Data Collection Procedures

During the spring of 2005, permission to conduct the study at XYZ was obtained from various levels of the organization, including the corporate communications department, a department director, and a vice-president. In March 2005, potential survey respondents were mailed a paper cover letter and survey through interdepartmental mail, and were asked to return it within two weeks using the same method.

Limitations

       This study was limited to employees of XYZ that held defined positions during March 2005. The results are particular to this organization, and may not be applicable to other organizations. As anticipated, not all people that were identified responded, leaving some opinions unknown. Due to the great number of potential barriers identified by other researchers and their varying opinions of the significance of these barriers, not all obstacles to CPOE could be measured through this study. The most prevalent factors were selected for this study. The factor of preparedness will be equally weighted, while in reality, some factors may have a greater impact on success than others.

CHAPTER IV: RESULTS

This chapter will present the results from an investigation of key factors in the level of readiness of XYZ Healthcare for a CPOE implementation. Each research question will be addressed in its relation to its more general category of measurement; including type of position held within the organization, motivation for implementation, organizational leadership, organizational foundation and culture, order management and integration, and acceptance and use of technology. All questions, except the type of position held within the organization, were measured using a five point Likert scale (5=strongly agree, 4=agree, 3=undecided, 2=disagree, 1=strongly disagree). Further details of the data collected can be found in Appendix B.

Type of position held within the organization

A total of 241 surveys were distributed. A total of 128 surveys were returned, resulting in an overall return rate of 53.1%. The total returned pool consisted of 26% (n=19) administration and directors, 59% (N=76) physicians and other providers, and 15% (n=33) midlevel providers. Recognizing that this distribution differs from the distribution of surveys mailed (see table three), many of the results will be studied using cross-tabulation by position.

Motivation for implementing CPOE

Questions that were intended to examine the motivation for implementation of CPOE at XYZ Healthcare included:

- XYZ Healthcare is under pressure from JCAHO and/or competitors to implement Computerized Physician Order Entry (CPOE).

- I believe that standardization of care is valuable for improving patient safety.

- Over time, CPOE will make my work more efficient.

Overall results for this set of statements were positive. In all three of the above statements, over 50% of those responding indicated that they agreed or strongly agreed.

Table 3

XYZ is under pressure from JCAHO and/or competitors to implement CPOE
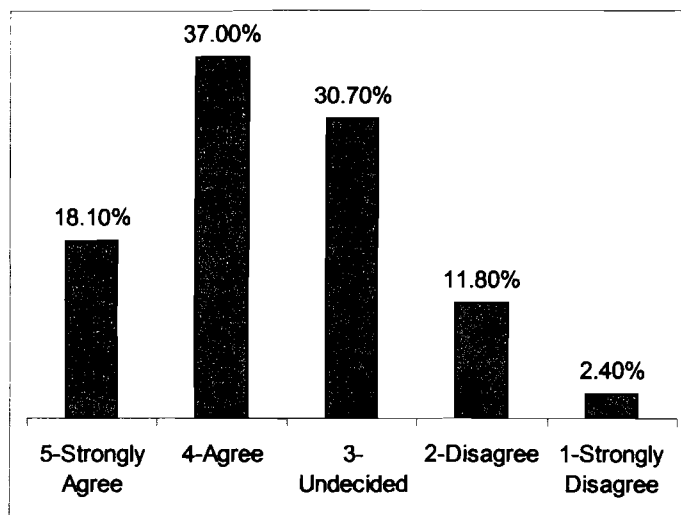
The response regarding standardization of care having a positive impact on patient safety was very powerful, with 96% (n=123) either agreeing or strongly agreeing with the statement.

Table 4

I believe that standardization of care is valuable for improving patient safety
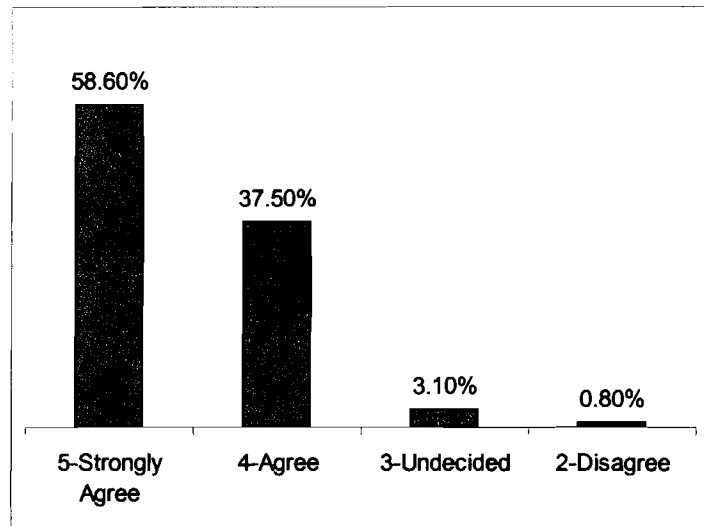
Again, over 50% or total respondents agreed that CPOE would make their work more efficient.

Table 5

Overtime, CPOE will make my work more efficient
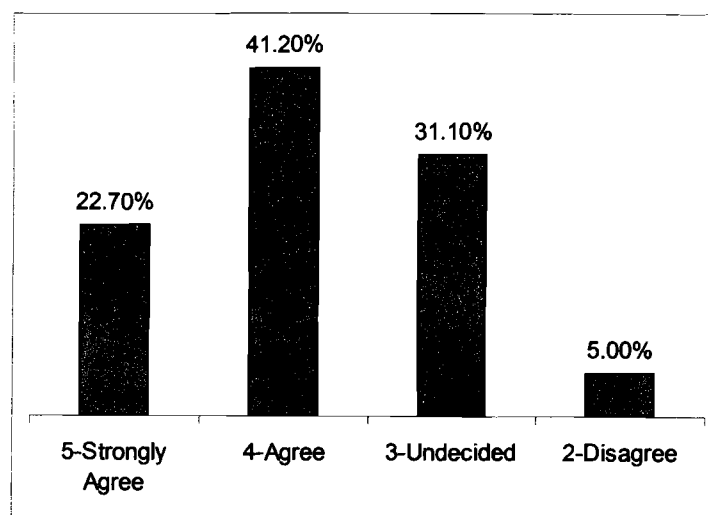
Although there were no physicians that strongly disagreed, they were less

enthusiastic to regard CPOE as eventually making their work more efficient (see table 6).

While the majority of them agreed, there was significant representation that was

undecided.

Table 6

Overtime, CPOE will make my work more efficient, Physician/Provider responses
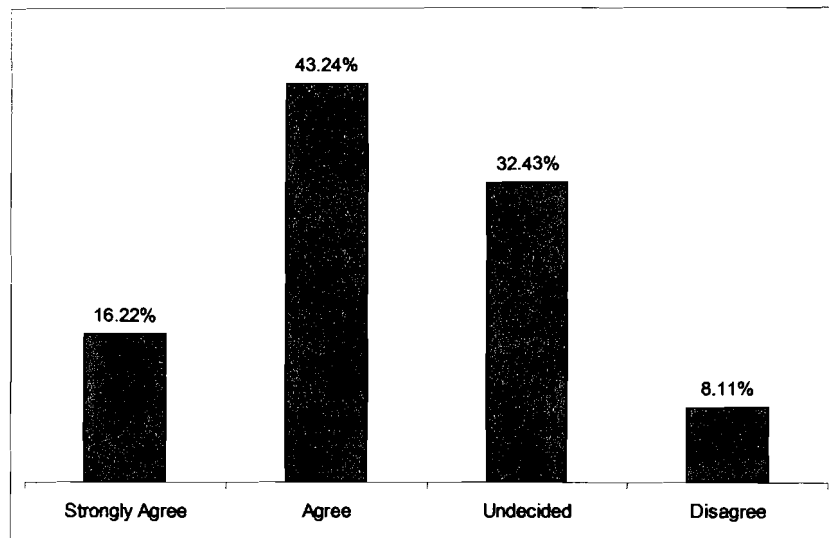
All categories of positions are feeling some pressure from the Joint Commission

Accreditation of Healthcare Organizations (JCAHO) to implement CPOE.

Administration, Directors, and midlevel providers answered as feeing the most pressure,

with physicians feeling less. The responses to this question produced one of the higher

standard deviations from the study with a value of 0.99. A listing of standard deviation

for each question can be found in Appendix C.

Table 7

*XYZ Healthcare is under pressure from JCAHO and/or competitors to implement*

Computerized Physician Order Entry (CPOE)

□ Physician/Provider ■ Administration/Director ▨ Midlevel Provider
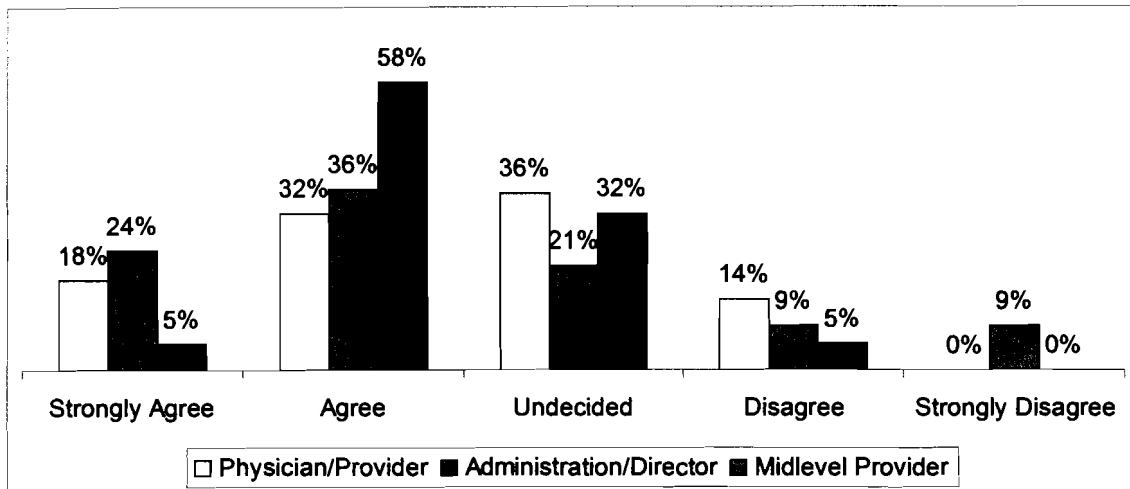
Organizational Leadership

Questions that were intended to study the overall perceptions of the leadership

and their history of working with clinicians included:

- XYZ Healthcare's leadership team clearly communicates what is expected of me.

- Patient safety is a top priority for the leadership at XYZ Healthcare.

- XYZ Healthcare has a history of collaboration between leadership and clinicians.

The greatest number of people agreed that XYZ's leadership team is clear when

in communicating what is expected of them. It may be significant to note that 19%

(n=24) of the overall respondents, 24% (n=19) of physicians/providers, and 21% (n=4) of

midlevel providers, felt that they were undecided or disagreed.

Table 8

XYZ Healthcare's leadership team clearly communicates what is expected of me
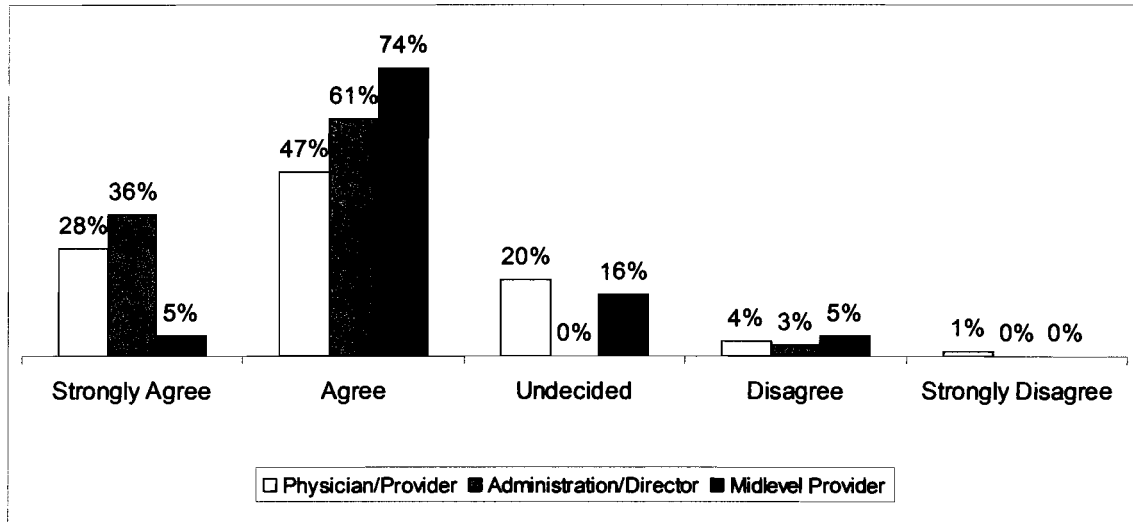
Again, overall people responded positively when asked about the past

collaboration between physicians and administration. There were a few dissenting

opinions, with 11% (n=14) being unsure or disagreeing.

Table 9

XYZ has a history of collaboration between leadership and clinicians
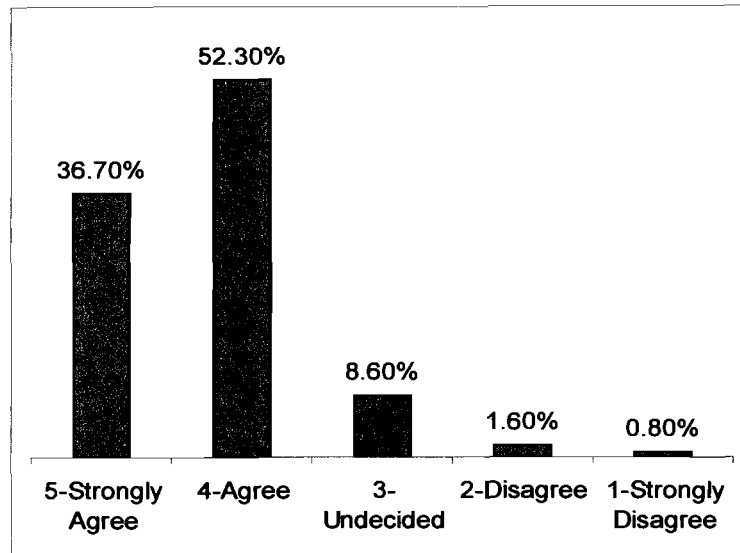
There was remarkably little doubt that XYZ's leadership values patient safety as a top priority. Responses had a standard deviation of just 0.43. All respondents, except for one, agreed and most strongly agreed that patient safety is a significant aim of the organizational leadership.

Table 10

Patient safety is a top priority for the leadership at XYZ
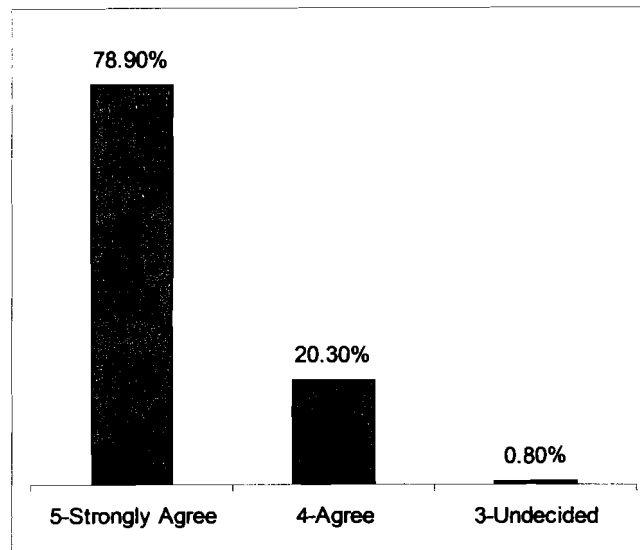
Organizational Foundation and Culture

Questions that were expected to scrutinize the organizational structure and culture

at XYZ Healthcare included:

- XYZ Healthcare strives to be a leader in healthcare delivery, service, and

  technology.

- XYZ Healthcare values feedback and continuous improvement.

- XYZ Healthcare values continuous learning.

- I will have a voice in the CPOE implementation process.

Again, XYZ appears to excel in striving to be a leader in healthcare delivery,

service, and technology with 94% (n=121) of the overall respondents agreeing or strongly

agreeing with this statement. Table 11 shows how each category of position responded.

Table 11

XYZ Healthcare strives to be a leader in healthcare delivery, service, and technology
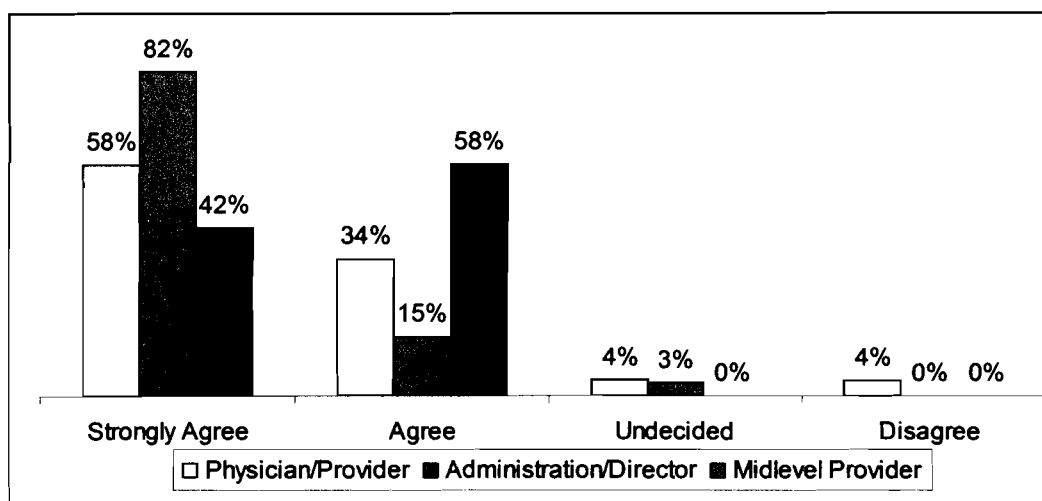
Likewise, 95% (n=122) agreed or strongly agreed that the organization values

feedback and continuous improvement and learning. Administration felt more strongly

about this than others.

Table 12

XYZ Healthcare values feedback and continuous improvement
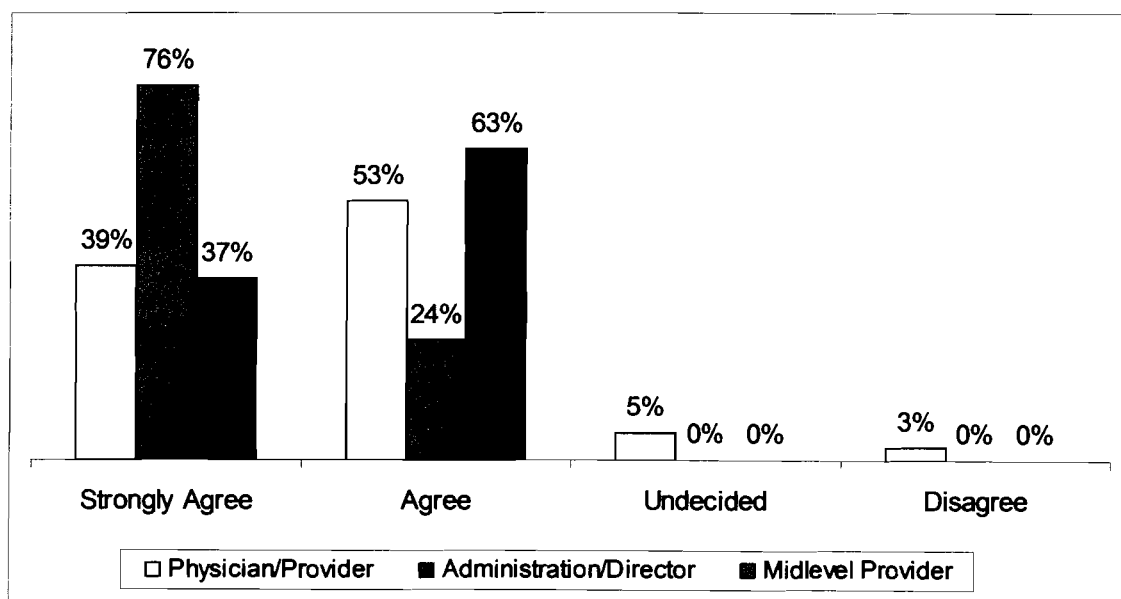
Respondents also showed significant agreement that XYZ Healthcare values continuous learning, with a standard deviation of just 0.55.

Table 13

XYZ Healthcare values continuous learning
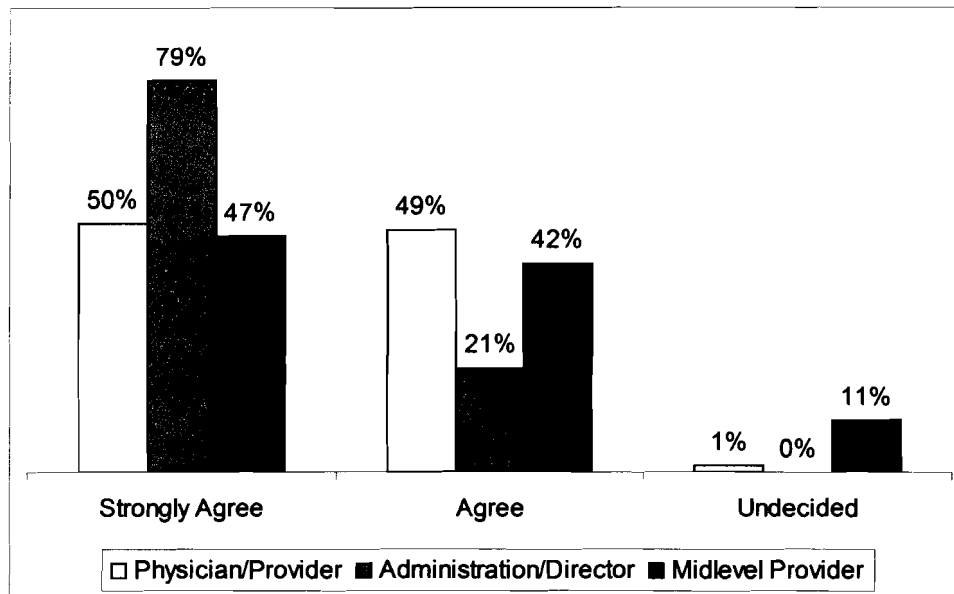
When study participants were asked if they felt that they would have a voice in the CPOE implementation process nearly 41% (n=52) indicated that they were undecided.

Table 14

I will have a voice in the CPOE implementation process
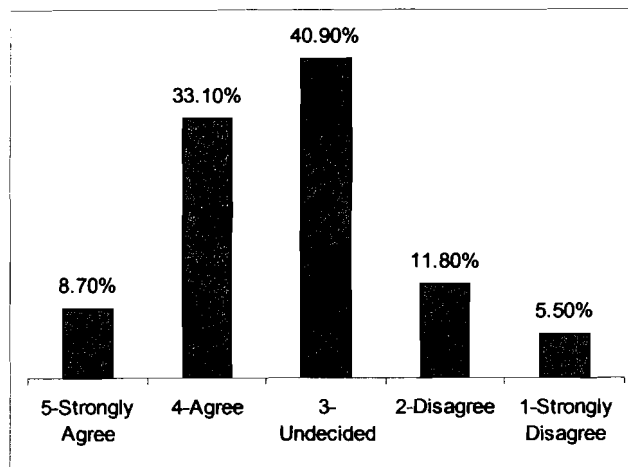
Responses to this question produced a standard deviation of 0.97. Table 15 shows

the distribution of responses by position. 67% (n=50) of physicians/providers indicated

that were undecided or did not believe that they would have an opportunity to contribute

to the CPOE implementation process.

Table 15

I will have a voice in the CPOE implementation process, by position
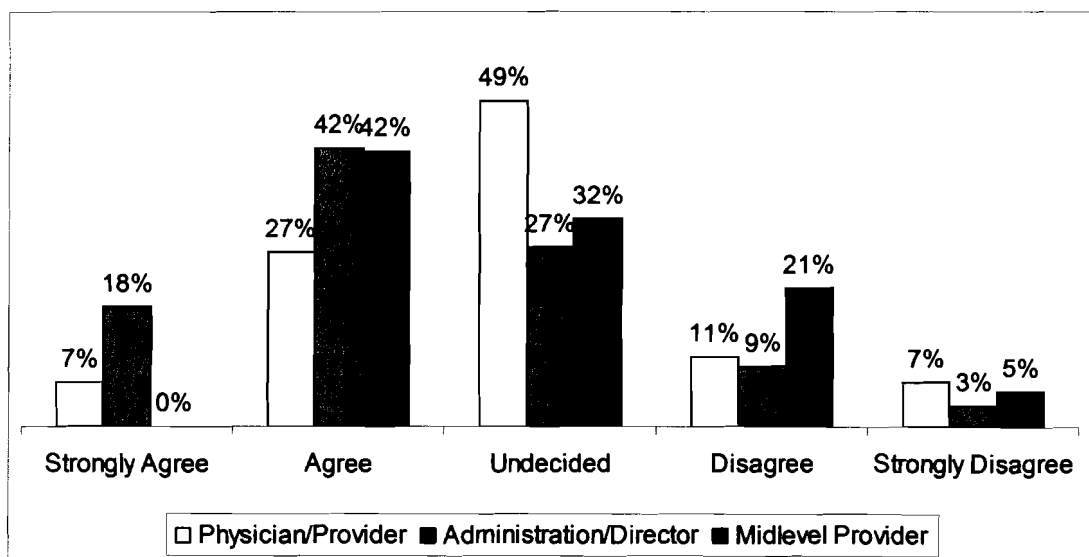
Order Management and Integration

Questions that were intended to assess perceptions of order management and execution included:

- Entering an order into an electronic system should be done by the person responsible for writing that order.

- I am willing to change the manner in which I document patient care.

- CPOE will cause a favorable redistribution of work

This category of questions is significant, as it reflects the respondents' core beliefs about CPOE, which is likely to have a noteworthy impact on the level of acceptance. 64% (n=81) agreed or strongly agreed that an order should be entered into an electronic system by the person responsible for writing that order. 24% (n=31) were undecided, and nearly 12% (n=15) disagreed or strongly disagreed. As Table 16 shows, those that disagreed were primarily physicians or providers. However the physicians or providers that responded had broadly differing opinions, resulting in a standard deviation of 1.06 for that group alone.

Table 16

Entering an order into an electronic system should be done by the person responsible for

writing that order
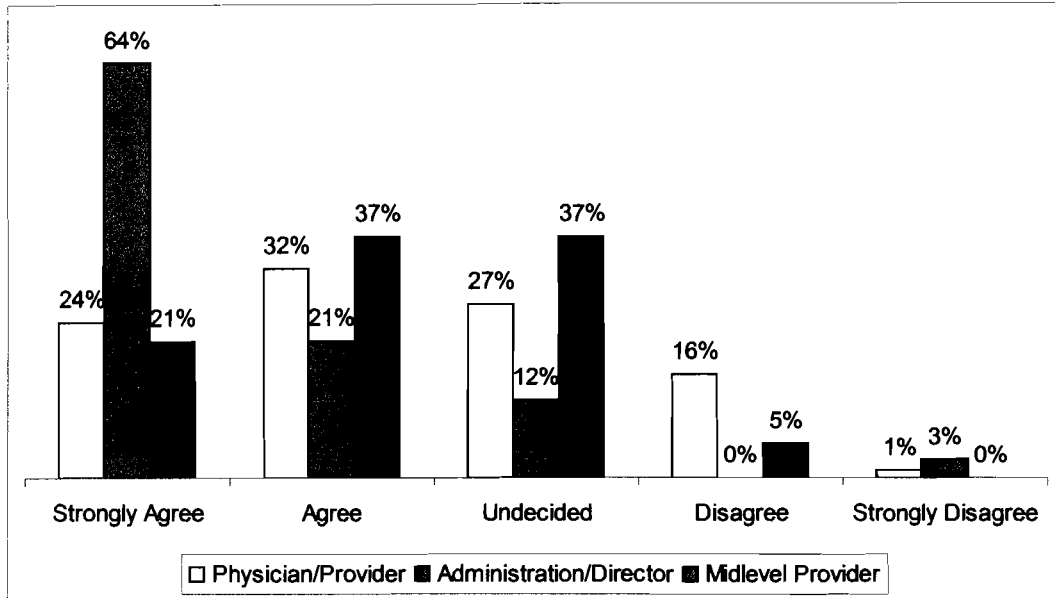
All respondents indicated that they are willing to change or are undecided about

changing the way in which they document patient care. Some comments indicated that if

the new methods were as efficient as or more efficient than current practices, they would

be willing to change. See Appendix D for participant comments.

Table 17

I am willing to change the manner in which I document patient care
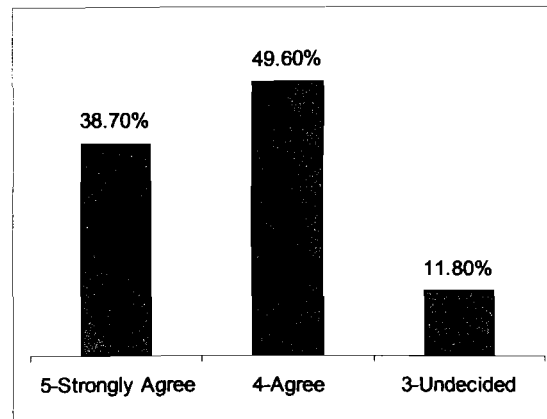
Responses from every category of position indicated that they were undecided as to whether CPOE will cause a favorable redistribution of work. Over 57% (n=73) of respondents indicated that they were undecided. Almost 30% (n=38) agreed or strongly agreed, with the greatest number of those coming from administration and directors, and 13% (n=16) disagreed or strongly disagreed with the greatest number of those coming from physicians and providers.

Table 18

CPOE will cause a favorable redistribution of work

Bar chart: Strongly Agree — Physician/Provider 11%, Administration/Director 15%, Midlevel Provider 11%; Agree — 12%, 33%, 16%; Undecided — 59%, 48%, 68%; Disagree — 11%, 3%, 5%; Strongly Disagree — 8%, 0%, 0%.

Legend: □ Physician/Provider ■ Administration/Director ■ Midlevel Provider
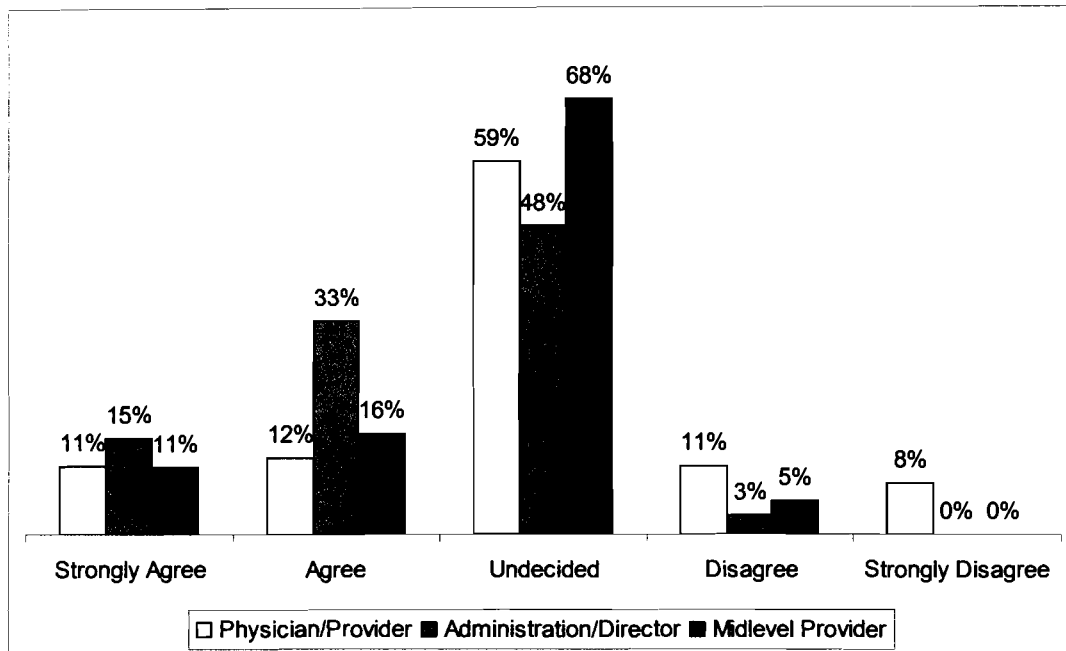
Acceptance and Use of Technology

Questions that examined acceptance and use of technology included:

- XYZ Healthcare effectively applies technical solutions to improve clinical care.

- I enjoy working with new technology.

There were some respondents that indicated that they do not enjoy working with new technology (7%, n=9)), but the vast majority agreed or strongly agreed (80%, n=103) that they like working with new technology.

Table 19

I enjoy working with new technology
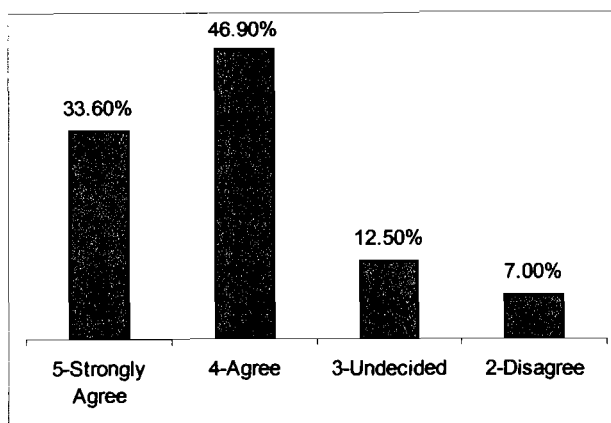
The majority of people also agreed that XYZ Healthcare effectively applies technical solutions to improve clinical care, with 68% (n=87) responding with an answer of agree or strongly agree. Administration energetically believes that technology is being effectively applied, with 88% (n=29) indicating that they agree or strongly agree. Physicians and midlevel providers are somewhat less enthusiastic, but still responded with 62% (n=11) and 58% (n=47) respectively indicating that they agree or strongly agree.

Table 20

XYZ Healthcare effectively applies technical solutions to improve clinical care

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Physician/Provider	11%	51%	30%	5%	3%
Administration/Director	27%	61%	6%	6%	0%
Midlevel Provider	5%	53%	32%	11%	0%
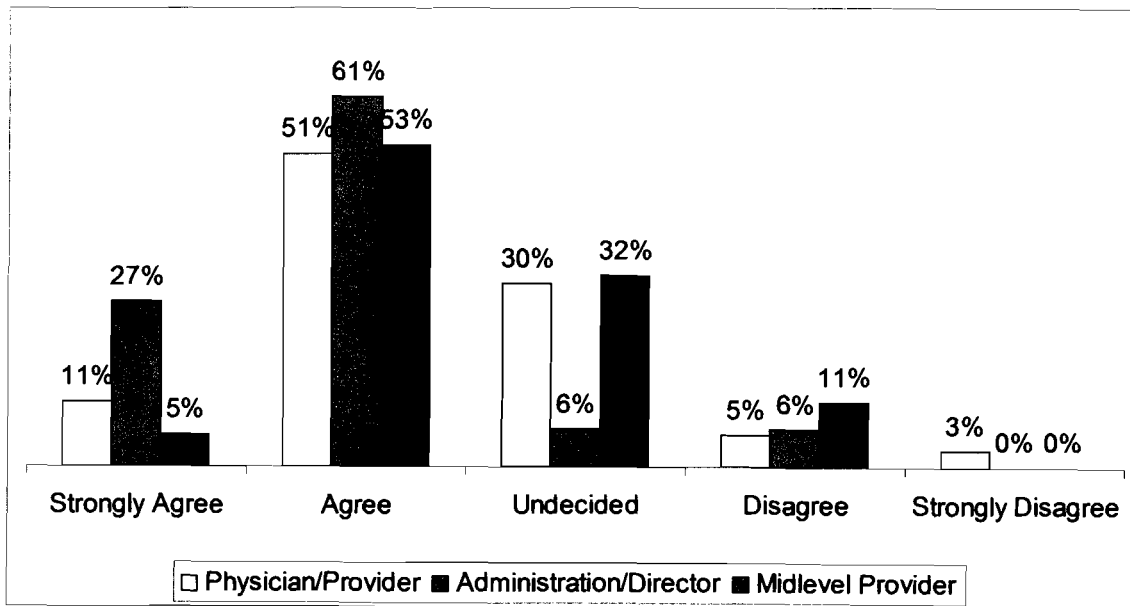
CHAPTER V: DISCUSSION

Summary and Discussion

There is little debate that the healthcare industry is in need of fundamental

change, and technology is a likely component of the solution. Computerized physician

order entry can improve quality of care by standardizing processes and providing

guidance to physicians as they care for patients. The purpose of this study was to evaluate

XYZ Healthcare in relation to a selection of critical success factors in preparation for a

CPOE implementation. A review of pertinent literature revealed several studies that

intend to identify noteworthy factors that were evident in successful CPOE

implementations. These studies were used in the development of the survey instrument

that was designed specifically for this investigation.

Because strong forces, both external and internal, can influence an organization's

overall commitment to a CPOE implementation, researchers have identified the

motivation for implementing CPOE as a critical factor of implementation success

("Considerations Concerning," 2001; Poon, et al., 2004). While most people at XYZ

acknowledge pressure from JCAHO and competitors to implement CPOE, there is a

significant portion that is undecided. XYZ strongly believes that standardization of care

is essential for improving patient safety. The future users of CPOE at XYZ should be

shown the link between standardized care and CPOE. Work should also be done to

encourage providers to look at ways in which CPOE can make their work more efficient.

Again, a significant portion of study respondents indicated that they were unclear if

CPOE would make their work more efficient. As physicians become more comfortable

using CPOE over time the time that it takes to actually enter an order into the system

generally diminishes. Having physicians that believe in the patient safety benefits of CPOE can alleviate some concerns. Communication efforts on the subject of CPOE at XZY should include case studies of physicians and providers experiencing increased efficiencies and the benefits to patient safety. One barrier identified in every study was physician and organizational resistance. The primary reason for this was the perceived negative impact on physician workflow. Poon et al. (2004) suggest that strong leadership, identification of physician champions, and addressing workflow concerns early on can overcome this barrier.

Organizational leadership was also identified as being a key factor in the success of CPOE implementations in nearly every study, including The 2001 Menucha Conference List ("Considerations Concerning," 2001), Understanding Hospital Readiness for Computerized Physician Order Entry (Stablein & Welebob, et al., 2003), and Overcoming Barriers to Adopting and Implementing Computerized Physician Order Entry Systems In U.S. Hospitals (Poon, et al., 2004). XYZ scored high in all questions that were designed to measure key aspects of leadership, and should be commended for being so well received. Leaders at XYZ need to be firm believers in the benefits of CPOE, and they should strive to show a visible commitment to the implementation project. Some physicians in leadership positions may want to consider leading by example, and being the first to make use of CPOE. Leadership must be able to communicate a common vision which not only stresses how CPOE will improve patient safety, but also how it will strengthen XYZ's core mission to improve patient safety.

Mutual respect and open sharing of ideas and concepts is also essential. A collaborative administration can help ease difficulties. A clear vision and defined reasons

for implementing CPOE should be communicated to the organization along with a declaration of commitment coming from the leadership. Administration and clinicians need to have a trusting collaborative relationship, and see benefits in bi-directional feedback.

End users generally want to feel that they will have a voice in projects that will so closely affect their daily work. A highly significant portion of respondents were undecided when asked if they believed that they would have a voice in the CPOE implementation. Stablein and Welebob, et al. (2003), stressed that when an organization has a history of collaboration the necessary foundation and culture are present for an implementation where physicians and providers can feel that they have a voice in the implementation. XYZ has this foundation of collaboration, and hopefully physicians and providers will be given the opportunity to provide input throughout the CPOE implementation process. Having a voice in the implementation is one more step toward acceptance and can lead to greater understanding of expectations and limitations.

Again, XYZ scored well when measuring order management and integration. This is significant, as it reflects the respondents' core beliefs about CPOE, which is likely to have a noteworthy impact on the level of success. There was significant division among the physicians and providers when asked if entering an order should be done by the person responsible for that order. This should be seen as an expected hurdle to be faced at XYZ during the CPOE implementation. Entering orders into the CPOE system must be made as straightforward as possible, and not be an encumbrance on the care of the patient. Potential technological solutions such as order sentences, where the physician

completes one entry, and a list of standard tests are ordered based on a particular diagnosis, should be fully examined and developed prior to implementation.

Re-engineering the order entry process will have an impact on more than just physicians and providers. All workflow must be reexamined and changes made where needed. CPOE will cause changes in the communication and decision-making process, so people's work will change. These workflow changes can be seen as a part of larger strategy of process change, an institutional strategy. XYZ faired very well, with a significant majority of respondents stating that they are willing to change the manner in which they document care. We can interpret this to mean that moving to CPOE, as long as the system is efficient and easy to use will be well received at XYZ.

The respondents to the study are less sure that the redistribution of work that CPOE may bring is a favorable one. XYZ should attempt to more clearly define people's concerns as they relate to this redistribution of workload, and see if anything can be done to alleviate those concerns. Potentially XYZ can stress that the workflow changes are part of a larger strategy of process change, an institutional strategy related to patient safety. Overall, institutional support appears to be high at XYZ, so that may help to ease acceptance of the changed workload. The variation between administration's and physicians' response to this issue should be noted, with administration believing that this move toward physician order entry being a positive one, and physicians being less enthusiastic. The administration at XYZ needs to listen to physician and provider concerns, and attempt to discover ways to bridge that gap.

Another key success factor relates to technology acceptance and application. Most of the respondents at XYZ agree that they enjoy working with new technology, but there

are certainly some that disagree. Most also feel that XYZ has a past of effectively applying technical solutions to improve clinical care. This is positive, in that XYZ has a track record of being successful with these types of projects in the past. While these are positive points for the implementation, a strong background in technology is less important than strong interpersonal skills and a good grasp of organizational behavior principles (Levick & O'Brian, 2003).

CPOE implementations are significant projects which are generally quite costly. Reputations are often at stake and successful CPOE projects can be looked at as significant accomplishments. Working through key issues early on, prior to implementation, can lead to a significant increase in the prospect for a successful implementation. Overall XZY measured very well against the success factors identified in the literature. This should not be taken to mean that the implementation will be easy, as any project of this magnitude, which is as far reaching as CPOE, will be is always a challenge, but this study shows that XYZ Healthcare has a solid foundation to build upon.

Further Research

Once XYZ Healthcare completes the first phase of a CPOE implementation, a second study that measures the level of success would be valuable in validating the survey instrument used in this study. If found to be valid, the instrument could potentially be applied at other organizations. This could also corroborate the success factors identified in the applicable literature.

Not specific to XYZ healthcare, more research would be beneficial to create and evaluate models of CPOE implementation and to understand the specific challenges that exist for institutions of different sizes and different staffing models, as little has been

written about the use of CPOE in organizations with diverse physician staffs. Also, the

majority of existing studies examine hospital settings, but neglect to study the

implementation of CPOE in a clinic setting.

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APPENDIX A: Survey

Computerized Physician Order Entry Readiness Assessment

> Computerized Physician Order Entry (CPOE) is an application that accepts a physician's orders electronically instead of the care provider hand writing orders. Given the significant impact on the clinical processes within the care environment, understanding an organization's level of readiness and commitment to CPOE is significant.
>
> The principal objective of this survey is to assess the level of preparedness for an implementation of a CPOE system at XYZ Healthcare. The outcome will include both an assessment of items that can be expected to be strengths during the CPOE implementation and identification of areas that may need additional attention prior to and during the initial CPOE implementation phase.

What is your position in the organization? ☐ Administration, Director

(Please choose only one) ☐ Physician/Provider

☐ Midlevel Provider

Please circle one number per question.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1 XYZ Healthcare strives to be a leader in healthcare delivery, service, and technology.	5	4	3	2	1
2 XYZ Healthcare values feedback and continuous improvement.	5	4	3	2	1
3 XYZ Healthcare has a history of collaboration between leadership and clinicians.	5	4	3	2	1
4 XYZ Healthcare is under pressure from JCAHO and/or competitors to implement Computerized Physician Order Entry (CPOE).	5	4	3	2	1

		Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
5	Entering an order into an electronic system should be done by the person responsible for writing that order.	5	4	3	2	1
6	Patient safety is a top priority for the leadership at XYZ Healthcare.	5	4	3	2	1
7	XYZ Healthcare's leadership team clearly communicates what is expected of me.	5	4	3	2	1
8	I will have a voice in the CPOE implementation process.	5	4	3	2	1

Computerized Physician Order Entry Readiness Assessment, Page 2

		Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	Not Applicable
9	Over time, CPOE will make my work more efficient.	5	4	3	2	1	NA
10	I believe that standardization of care is valuable for improving patient safety.	5	4	3	2	1	
11	I am willing to change the manner in which I document patient care.	5	4	3	2	1	NA
12	CPOE will cause a favorable redistribution of work.	5	4	3	2	1	
13	XYZ Healthcare effectively applies technical solutions to improve clinical care.	5	4	3	2	1	
14	I enjoy working with new technology.	5	4	3	2	1	
15	XYZ Healthcare values continuous learning.	5	4	3	2	1	

Your comments and suggestions are welcome and appreciated.
Please add any comments below or on the back of this sheet.

Thank you for completing this survey, please return it to:
Lisa Sword, XYZ

APPENDIX B: Survey Data

Table B1

Survey Return Rate by Position

Position	Surveys mailed	Surveys returned	Percentage of surveys returned
Physician/Provider	165	76	46.06%
Administration/Director	33	19	57.58%
Midlevel Provider	43	33	76.74%
Total	241	128	53.11%

Table B2

Survey Pool by Position

Position	Total returned surveys	Percentage of each position in the final survey pool
Physician/Provider	76	59.38%
Administration/Director	19	14.84%
Midlevel Provider	33	25.78%
Total	128	100.00%

Table B3

Survey Question 1: XYZ Healthcare strives to be a leader in healthcare delivery, service,

and technology.

Position	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Total
Physician/Provider	44	26	3	3	0	76
Administration/Director	27	5	1	0	0	33
Midlevel provider	8	11	0	0	0	19
Total	79	42	4	3	0	128
Total percentage	61.72%	32.81%	3.13%	2.34%	0.00%	100.00%
Standard deviation	0.6747					

Table B4

Survey Question 2: XYZ Healthcare values feedback and continuous improvement.

Position	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Total
Physician/Provider	30	40	4	2	0	76
Administration/Director	25	8	0	0	0	33
Midlevel provider	7	12	0	0	0	19
Total	62	60	4	2	0	128
Total percentage	48.44%	46.88%	3.13%	1.56%	0.00%	100.00%
Standard deviation	0.6351					

Table B5

Survey Question 3: XYZ Healthcare has a history of collaboration between leadership

and clinicians.

Position	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Total
Physician/Provider	28	39	6	2	1	76
Administration/Director	16	16	1	0	0	33
Midlevel provider	3	12	4	0	0	19
Total	47	67	11	2	1	128
Total percentage	36.72%	52.34%	8.59%	1.56%	0.78%	100.00%
Standard deviation	0.7340					

Table B6

Survey Question 4: XYZ Healthcare is under pressure from JCAHO and/or competitors

to implement Computerized Physician Order Entry (CPOE).

Position	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Total
Physician/Provider	14	24	27	11	0	76
Administration/Director	8	12	7	3	3	33
Midlevel provider	1	11	6	1	0	19
Total	23	47	40	15	3	128
Total percentage	17.97%	36.72%	31.25%	11.72%	2.34%	100.00%
Standard deviation	0.9967					

Table B7

Survey Question 5: Entering an order into an electronic system should be done by the

person responsible for writing that order.

Position	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Total
Physician/Provider	18	24	20	12	1	75
Administration/Director	21	7	4	0	1	33
Midlevel provider	4	7	7	1	0	19
Total	43	38	31	13	2	127
Total percentage	33.86%	29.92%	24.41%	10.24%	1.57%	100.00%
Standard deviation	1.0573					

Table B8

Survey Question 6: Patient safety is a top priority for the leadership at XYZ Healthcare.

Position	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Total
Physician/Provider	58	18	0	0	0	76
Administration/Director	30	3	0	0	0	33
Midlevel provider	13	5	1	0	0	19
Total	101	26	1	0	0	128
Total percentage	78.91%	20.31%	0.78%	0.00%	0.00%	100.00%
Standard deviation	0.4336					

Table B9

Survey Question 7: XYZ Healthcare's leadership team clearly communicates what is

expected of me.

Position	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Total
Physician/Provider	21	36	15	3	1	76
Administration/Director	12	20	0	1	0	33
Midlevel provider	1	14	3	1	0	19
Total	34	70	18	5	1	128
Total percentage	26.56%	54.69%	14.06%	3.91%	0.78%	100.00%
Standard deviation	0.7983					

Table B10

Survey Question 8: I will have a voice in the CPOE implementation process.

Position	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Total
Physician/Provider	5	20	37	8	5	75
Administration/Director	6	14	9	3	1	33
Midlevel provider	0	8	6	4	1	19
Total	11	42	52	15	7	127
Total percentage	8.66%	33.07%	40.94%	11.81%	5.51%	100.00%
Standard deviation	0.9733					

Table B11

Survey Question 9: Over time, CPOE will make my work more efficient.

Position	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Total
Physician/Provider	12	32	24	6	0	74
Administration/Director	9	9	8	0	0	26
Midlevel provider	6	8	5	0	0	19
Total	27	49	37	6	0	119
Total percentage	22.69%	41.18%	31.09%	5.04%	0.00%	100.00%
Standard deviation	0.8434					

Table B12

Survey Question 10: I believe that standardization of care is valuable for improving

patient safety.

Position	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Total
Physician/Provider	37	34	4	1	0	76
Administration/Director	28	5	0	0	0	33
Midlevel provider	10	9	0	0	0	19
Total	75	48	4	1	0	128
Total percentage	58.59%	37.50%	3.13%	0.78%	0.00%	100.00%
Standard deviation	0.6006					

Table B13

Survey Question 11: I am willing to change the manner in which I document patient care.

Position	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Total
Physician/Provider	24	43	8	0	0	75
Administration/Director	15	6	4	0	0	25
Midlevel provider	7	10	2	0	0	19
Total	46	59	14	0	0	119
Total percentage	38.66%	49.58%	11.76%	0.00%	0.00%	100.00%
Standard deviation	0.6600					

Table B14

Survey Question 12: I am willing to change the manner in which I document patient care.

Position	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Total
Physician/Provider	8	9	44	8	6	75
Administration/Director	5	11	16	1	0	33
Midlevel provider	2	3	13	1	0	19
Total	15	23	73	10	6	127
Total percentage	11.81%	18.11%	57.48%	7.87%	4.72%	100.00%
Standard deviation	0.9319					

Table B15

Survey Question 13: XYZ Healthcare effectively applies technical solutions to improve

clinical care.

Position	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Total
Physician/Provider	8	39	23	4	2	76
Administration/Director	9	20	2	2	0	33
Midlevel provider	1	10	6	2	0	19
Total	18	69	31	8	2	128
Total percentage	14.06%	53.91%	24.22%	6.25%	1.56%	100.00%
Standard deviation	0.8391					

Table B16

Survey Question 14: I enjoy working with new technology.

Position	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Total
Physician/Provider	23	34	15	4	0	76
Administration/Director	15	16	1	1	0	33
Midlevel provider	5	10	0	4	0	19
Total	43	60	16	9	0	128
Total percentage	33.59%	46.88%	12.50%	7.03%	0.00%	100.00%
Standard deviation	0.8620					

Table B17

Survey Question 15: XYZ Healthcare values continuous learning.

Position	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Total
Physician/Provider	38	37	1	0	0	76
Administration/Director	26	7	0	0	0	33
Midlevel provider	9	8	2	0	0	19
Total	73	52	3	0	0	128
Total percentage	57.03%	40.63%	2.34%	0.00%	0.00%	100.00%
Standard deviation	0.5450					

APPENDIX C: Standard Deviation by Question

Overall Standard Deviation for Each Question	
Entering an order into an electronic system should be done by the person responsible for writing that order.	1.0573
XYZ is under pressure from JCAHO and/or competitors to implement Computerized Physician Order Entry (CPOE).	0.9967
I will have a voice in the CPOE implementation process.	0.9733
CPOE will cause a favorable redistribution of work.	0.9319
I enjoy working with new technology.	0.8620
Over time, CPOE will make my work more efficient.	0.8434
XYZ effectively applies technical solutions to improve clinical care.	0.8391
XYZ's leadership team clearly communicates what is expected of me.	0.7983
XYZ has a history of collaboration between leadership and clinicians.	0.7340
XYZ strives to be a leader in healthcare delivery, service and technology.	0.6747
I am willing to change the manner in which I document patient care.	0.6600
XYZ values feedback and continuous improvement.	0.6351
I believe that standardization of care is valuable for improving patient safety.	0.6006
XYZ values continuous learning.	0.5450
Patient safety is a top priority for the leadership at XYX.	0.4336

APPENDIX D: Participant Comments

- Administration is too often imposing solutions on providers.

- Have used another order entry system before, and think this type of system works well.

- Just one more time consuming task we will be expected to do - Makes my day longer. Being on salary, the more hours I work, the less I get paid per hour.

- CPOE won't directly impact my work but may provide efficiency indirectly.

- I find the money for continuing education isn't nearly enough to cover the multiple educational needs of mid-level providers. Continuing education money should be doubled for mid-levels, we wear many hats in our departments.

- ASM now is confusing and time consuming. I'm hoping that the EMR will make this more user-friendly.

- Cerner needs to make order entry easy. Standardizing order sets is a must.

- Difficult to answer some questions, because I have no knowledge of what CPOE entails.

- Eliminates finding a person to order labs, x-rays, etc, and paper shuffle. Previous job: Tied it with electronic charge tickets. Before you could order future tests/consults etc, the physician had to charge for today's visit. Also, really made the physicians reduce the number of rules for scheduling. I've never seen so many silos for scheduling. Only the department can schedule their own department. Very inefficient system in place and multiple telephone calls between receptionists to book appointments.

- From a nursing perspective, it is hoped that CPOE will provide a more efficient mechanism for the delivery of orders for patient care to multiple disciplines.

- I am new to the staff. I came from a hospital that implemented CPOE. Implementation was slow, physician cooperation somewhat variable. Much improved radiology and pharmacy accuracy. Need: adequate training and support, fail-safe computer system (can't go back to paper). Most important: Need physician-specific order sets, ability to easily co-sign orders.

- I am supportive of CPOE, having used it with success in the past. It will save time in the end.

- I am willing to change the documentation process, but not if it is less efficient and/or takes more physician time than what currently is done.

- I do feel that the electronic chart/order system is very valuable!

- I do not know that much about CPOE, so most of my answers are guesses on what it might be like.

- I don't think XYZ has fully taken advantage of the technology available, but the cautious approach is far better in terms of cost.

- I look forward to the advantages of CPOE.

- I think CPOE will not only reduce errors, but will be more time efficient for physicians: no pages/phone calls about order clarification.

- I think initially this will be a difficult process, but once new processes are in place and providers/staff are comfortable, this should be wonderful.

- I think the flow process in one area will determine who can best do the actual order entry. I suspect that it would usually be the MD, but there may be times it is more appropriate for someone else to do the actual order entry.

- I would like to see more time taken to help front-line supervisors & providers with optimizing their care processes and being effective leaders of their staff (evidence-based management).

- I would like to see all providers benefit from every nurse being trained to utilize the labtalk [sic] system and make things run more smoothly for the departments. Now only a few benefit from this worthwhile system.

- K.I.S.S. - if simple & user friendly it will work. If set up like the new EEG System it will be chaos.

- Like all technical solutions quality of implementation, integration, ergonomics will determine physician satisfaction.

- MD's could also dispense and administer meds, but that isn't required (yet).

- We must do this...Can't have an EMR without CPOE!

- No sense in using a highly paid person to do a clerical task, but to increase safety or reduce chance of error, an efficient system outweighs that concern.

- Patient Registry - Where are we at with having one?

- Some physician "lip service", depending on the audience, is still present. Some MD's don't see communication as a patient safety issue and concern.

- Standardization will help things immensely. The learning curve will be big. It will vary a lot between physicians.

- Standardizing to the science can still allow for variation in implementation.

- Up to this point there has been little information dispersed regarding CPOE from leadership to the general patient care physician/staff. It is unknown at the patient care level how this initiative will impact the provider or the efficiency of patient care.

- Would like each MD to have own wirelessly connected tablet PC and be able to enter orders, view x-rays, review labs anywhere. Alternative is to have a screen in each patient room and doctor's office.