


AN ABSTRACT OF THE
DISSERTATION OF

Brian E. Churchill for the degree of
Doctor of Philosophy in
Public Health presented
On March 17, 2004

Title: Perceptions of Community Hospital Physicians on Computerized Physician
Order Entry

Redacted for privacy

Abstract approved:



(Leonard H. Friedman _____

Objectives To identify the perceptions of community hospital physicians on computerized physician order entry.

Design Multi-method approach consisting of a mail survey of 659 community hospital physicians with active admitting privileges at three PeaceHealth, Inc., along with follow-up personal interviews with stratified random selection from completed survey.

Measurements Perceptions were assessed by means of a mail survey that asked physicians to rank themselves on a scale that represented the five adopter categories contained in the Diffusion of Innovation (DOI) change theory, along with several questions regarding computer use and attitudes toward potential effects of computers and CPOE on medicine and healthcare. Physicians representing four of the five adopter categories were interviewed to assess

general perceptions and perceived attributes of innovations, an another construct within the DOI theory.

Results The response rate was 41%. Medical specialty, years in practice, and gender were found not to influence attitudes toward use of computers or, more specifically CPOE in medicine and healthcare. However, more medical specialists favor CPOE implementation at PeaceHealth than expected.

Self-ranking on the DOI five adopter categories appears to influence attitudes toward use of computers in medicine and healthcare with positive trends in improving quality, rapport, and patient satisfaction mainly in the Innovator, Early Adopter, and Early Majority categories. A positive trend was seen in the relationship between CPOE's potential effects on improving patient care, not interfering with communication, and improving patient satisfaction with negative relationships with impact on physician workflow and enjoyment of medical practice. A relationship is seen between the five adopter categories and favoring CPOE implementation at PeaceHealth.

The perceived attributes of innovations of Ease of Use, Result Demonstrability, and Visibility were supported by interview responses. Relative Advantage seemed to be supported by other questions. The concept of Compatibility was also supported. No steps of the processes of change construct within the Transtheoretical Model were identified during the interviews.

Conclusions This study appears to refute the suggestion that there might be a difference between medical specialists and surgical specialists, age, or gender in

their support of computers and specifically CPOE. These data appear to support the Diffusion of Innovation theory is appropriate to consider in investigating CPOE and its diffusion among community hospital physicians.

Implementing CPOE according to adopter categories would provide the option for interested physicians to use CPOE, to use CPOE on certain hospital units or patients, and to expand its use before making mandatory.

Communication should be targeted toward the adopter categories rather than mass media and emphasize the perceived attributes of innovation.

©Copyright by Brian E. Churchill

March 17, 2004

All Rights Reserved

Perceptions of Community Hospital Physicians on Computerized
Physician Order Entry

By
Brian E. Churchill

A DISSERTATION

submitted to

Oregon State University

in partial fulfillment of
the requirements for the
Degree of

Doctor of Philosophy

Presented March 17, 2004
Commencement June, 2004

Doctor of Philosophy dissertation of Brian E. Churchill
Presented on March 17, 2004.

APPROVED:

Redacted for privacy

Leonard H. Friedman, representing Public Health

Redacted for privacy

Chair of the Department of Public Health

Redacted for privacy

Dean of the Graduate School

I understand that my dissertation will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my dissertation to any reader upon request.

Redacted for privacy,

Brian E. Churchill

ACKNOWLEDGEMENTS

The author expresses sincere appreciation for the patience and support of Dr. Leonard Friedman and the faculty of the Department of Public Health as well as my employer, PeaceHealth, Inc.

Special appreciation to my loving family: my wife Nancy, son Evan, daughter Ashley; sisters Joyce Churchill and Janet Shorr; and my in-laws Bob and Cecelia Dutra. Special thanks for the friendship and support of Ted Ficken, Ph.D., and the memory of Patrick and Olivia McCurdy.

TABLE OF CONTENTS

<u>CHAPTER</u>	<u>PAGE</u>
1.....	1
OVERVIEW OF THE RESEARCH PROBLEM.....	1
STATEMENT OF THE PROBLEM.....	1
RESEARCH QUESTIONS.....	3
PURPOSE OF THE STUDY.....	4
SIGNIFICANCE OF THE RESEARCH.....	4
2.....	7
REVIEW OF LITERATURE.....	7
COMPUTERIZED PHYSICIAN ORDER ENTRY.....	9
CHANGING PHYSICIAN BEHAVIOR.....	22
BEHAVIOR CHANGE THEORIES.....	28
DIFFUSION OF INNOVATIONS.....	29
PREVIOUS RESEARCH WITH DIFFUSION OF INNOVATIONS.....	32
TECHNOLOGY RELATED STUDIES USING DIFFUSION OF INNOVATIONS.....	33
TRANSTHEORETICAL MODEL OF CHANGE.....	36
PREVIOUS RESEARCH WITH TRANSTHEORETICAL MODEL.....	38
SUMMARY.....	40
3.....	42
RESEARCH DESIGN AND METHODS.....	42
PILOT ACTIVITIES ADDRESSING STUDY DESIGN.....	43
STATEMENT OF THE RESEARCH QUESTIONS.....	46
THE SAMPLE.....	46
STUDY PROCEDURE.....	49
DATA ANALYSIS METHODS.....	56
SUMMARY.....	58
4.....	59
RESULTS.....	59
SURVEY ANALYSIS.....	59
DESCRIPTIVE ANALYSIS.....	60
INFERENCEAL ANALYSIS.....	67
INTERVIEW ANALYSIS.....	110
SUMMARY OF INTERVIEW DATA.....	127

TABLE OF CONTENTS (CONTINUED)

<u>CHAPTER</u>	<u>PAGE</u>
5.....	133
DISCUSSION AND CONCLUSIONS	133
OVERALL CONCLUSIONS.....	133
DISCUSSION OF RESEARCH QUESTIONS	134
OTHER CONCLUSIONS.....	138
LIMITATIONS OF THE STUDY.....	138
SUMMARY	143
BIBLIOGRAPY	146
APPENDICES.....	153

TABLE OF FIGURES

<u>FIGURES</u>	<u>PAGE</u>
4.1 RECODED USUAL REACTION TO NEW TECHNOLOGY	62
4.2 TOTAL RESPONDENTS BY YEARS IN MEDICAL PRACTICE.....	64
4.3 TOTAL RESPONDENTS BY AGE.....	64

TABLE OF TABLE

<u>TABLE</u>	<u>PAGE</u>
4.1 SELF-REPORTED REACTION TO NEW TECHNOLOGY	62
4.2 TOTAL RESPONDENTS BY MEDICAL SPECIALTY.....	63
4.3 TOTAL RESPONDENTS BY GENDER	65
4.5 IN FAVOR OF IMPLEMENTING CPOE AT PEACEHEALTH, INC.....	66
4.6 SELF-REPORTED USUAL REACTION TO NEW TECHNOLOGY BY MEDICAL SPECIALTY	68
4.7 SELF-REPORTED USUAL REACTION TO NEW TECHNOLOGY BY MEDICAL SPECIALTY	69
4.9 ATTITUDES TOWARD COMPUTERS ON QUALITY BY MEDICAL SPECIALTY	70
4.10 ATTITUDES TOWARD COMPUTERS ON QUALITY BY MEDICAL SPECIALTY	71
4.11 ATTITUDES TOWARD COMPUTERS ON RAPPORT BY MEDICAL SPECIALTY	71
4.12 ATTITUDES TOWARD COMPUTERS ON RAPPORT BY MEDICAL SPECIALTY	72
4.13 ATTITUDES TOWARD COMPUTERS ON ENJOYMENT BY MEDICAL SPECIALTY	73
4.14 ATTITUDES TOWARD COMPUTERS ON ENJOYMENT BY MEDICAL SPECIALTY	73
4.15 ATTITUDES TOWARD COMPUTERS ON PATIENT SATISFACTION BY MEDICAL SPECIALTY	74
4.16 ATTITUDES TOWARD COMPUTERS ON PATIENT SATISFACTION BY MEDICAL SPECIALTY	75
4.17 ATTITUDES TOWARD COMPUTERS ON SELECTED STATEMENTS BY MEDICAL SPECIALTY	75
4.18 ATTITUDES TOWARD COMPUTERS ON SELECTED STATEMENTS BY MEDICAL SPECIALTY	76
4.19 ATTITUDES TOWARD CPOE ON PATIENT CARE BY MEDICAL SPECIALTY	77
4.20 ATTITUDES TOWARD CPOE ON PATIENT CARE BY MEDICAL SPECIALTY	78
4.21 ATTITUDES TOWARD CPOE ON PHYSICIAN WORKFLOW BY MEDICAL SPECIALTY	78
4.22 ATTITUDES TOWARD CPOE ON PHYSICIAN WORKFLOW BY MEDICAL SPECIALTY	79

TABLE OF TABLE (CONTINUED)

<u>TABLE</u>	<u>PAGE</u>
4.23 ATTITUDES TOWARD CPOE ON PHYSICIAN ENJOYMENT OF MEDICINE BY MEDICAL SPECIALTY	79
4.24 ATTITUDES TOWARD CPOE ON PHYSICIAN ENJOYMENT OF MEDICINE BY MEDICAL SPECIALTY	80
4.25 ATTITUDES TOWARD CPOE ON COMMUNICATION BETWEEN PHYSICIAN AND CAREGIVERS BY MEDICAL SPECIALTY	81
4.26 ATTITUDES TOWARD CPOE ON COMMUNICATION BETWEEN PHYSICIAN AND CAREGIVERS BY MEDICAL SPECIALTY	81
4.27 ATTITUDES TOWARD CPOE ON PATIENT SATISFACTION BY MEDICAL SPECIALTY	82
4.28 ATTITUDES TOWARD CPOE ON PATIENT SATISFACTION BY MEDICAL SPECIALTY	83
4.29 ATTITUDES TOWARD CPOE ON SELECTED STATEMENTS BY MEDICAL SPECIALTY	84
4.30 ATTITUDES TOWARD CPOE ON SELECTED STATEMENTS BY MEDICAL SPECIALTY	84
4.31 FAVORING IMPLEMENTING CPOE AT PEACEHEALTH BY MEDICAL SPECIALTY	86
4.32 FAVORING IMPLEMENTING CPOE AT PEACEHEALTH BY MEDICAL SPECIALTY	86
4.33 FAVORING IMPLEMENTING CPOE AT PEACEHEALTH BY GENDER.	87
4.34 FAVORING IMPLEMENTING CPOE AT PEACEHEALTH BY GENDER.	88
4.35 FAVORING CPOE IMPLEMENTATION BY MEAN YEARS OF MEDICAL PRACTICE	89
4.36 FAVORING CPOE IMPLEMENTATION BY MEANS YEARS OF MEDICAL PRACTICE	89
4.37 ATTITUDES TOWARD COMPUTERS IN HEALTHCARE ON QUALITY BY USUAL REACTION TO NEW TECHNOLOGY	92
4.38 ATTITUDES TOWARD COMPUTERS IN HEALTHCARE ON QUALITY BY USUAL REACTION TO NEW TECHNOLOGY	92
4.39 ATTITUDES TOWARD COMPUTERS IN HEALTHCARE ON ENJOYMENT OF PRACTICE OF MEDICINE BY USUAL REACTION TO NEW TECHNOLOGY	93
4.40 ATTITUDES TOWARD COMPUTERS IN HEALTHCARE ON ENJOYMENT OF PRACTICE OF MEDICINE BY USUAL REACTION TO NEW TECHNOLOGY	94
4.41 ATTITUDES TOWARD COMPUTERS IN HEALTHCARE ON RAPPORT BY USUAL REACTION TO NEW TECHNOLOGY	95

TABLE OF TABLE (CONTINUED)

<u>TABLE</u>	<u>PAGE</u>
4.42 ATTITUDES TOWARD COMPUTERS IN HEALTHCARE ON RAPPOR BY USUAL REACTION TO NEW TECHNOLOGY	95
4.43 ATTITUDES TOWARD COMPUTERS IN HEALTHCARE ON PATIENT SATISFACTION BY USUAL REACTION TO NEW TECHNOLOGY	96
4.44 ATTITUDES TOWARD COMPUTERS IN HEALTHCARE ON PATIENT SATISFACTION BY USUAL REACTION TO NEW TECHNOLOGY	97
4.45 ATTITUDES TOWARD COMPUTERS IN HEALTHCARE SELECTED STATEMENTS BY USUAL REACTION TO NEW TECHNOLOGY	98
4.46 ATTITUDES TOWARD COMPUTERS IN HEALTHCARE SELECTED STATEMENTS BY USUAL REACTION TO NEW TECHNOLOGY	98
4.47 ATTITUDES TOWARD CPOE ON PATIENT CARE BY USUAL REACTION TO NEW TECHNOLOGY	100
4.48 ATTITUDES TOWARD CPOE ON PATIENT CARE BY USUAL REACTION TO NEW TECHNOLOGY	100
4.49 ATTITUDES TOWARD CPOE ON PHYSICIAN WORKFLOW BY USUAL REACTION TO NEW TECHNOLOGY	101
4.50 ATTITUDES TOWARD CPOE ON PHYSICIAN WORKFLOW BY USUAL REACTION TO NEW TECHNOLOGY	102
4.51 ATTITUDES TOWARD CPOE ON ENJOYMENT BY USUAL REACTION TO NEW TECHNOLOGY	102
4.52 ATTITUDES TOWARD CPOE ON ENJOYMENT BY USUAL REACTION TO NEW TECHNOLOGY	103
4.53 ATTITUDES TOWARD CPOE ON COMMUNICATION BETWEEN PHYSICIAN AND CAREGIVERS BY USUAL REACTION TO NEW TECHNOLOGY	104
4.54 ATTITUDES TOWARD CPOE ON COMMUNICATION BETWEEN PHYSICIANS AND CAREGIVERS BY USUAL REACTION TO NEW TECHNOLOGY	104
4.55 ATTITUDES TOWARD CPOE ON PATIENT SATISFACTION BY USUAL REACTION TO NEW TECHNOLOGY	105
4.56 ATTITUDES TOWARD CPOE ON PATIENT SATISFACTION BY USUAL REACTION TO NEW TECHNOLOGY	106
4.57 ATTITUDES TOWARD CPOE IN HEALTHCARE SELECTED STATEMENTS BY USUAL REACTION TO NEW TECHNOLOGY	107
4.58 ATTITUDES TOWARD COMPUTERS IN HEALTHCARE SELECTED STATEMENTS BY USUAL REACTION TO NEW TECHNOLOGY	107

TABLE OF TABLE (CONTINUED)

<u>TABLE</u>	<u>PAGE</u>
4.59 IN FAVOR OF CPOE AND USUAL REACTION	109
4.60 IN FAVOR OF CPOE AND USUAL REACTION	109

TABLE OF APPENDICES

<u>APPENDICES</u>	<u>PAGE</u>
APPENDIX A: COVER LETTER.....	154
APPENDIX B: COMPUTERS IN MEDICAL CARE SURVEY, PEACEHEALTH, INC.	155
APPENDIX C: INTERVIEW COVER LETTER	160
APPENDIX D: INFORMED CONSENT	161
APPENDIX E: INTERVIEW QUESTIONS.....	162
APPENDIX F: INTERVIEW TRANSCRIPTS.....	164

Perceptions of Community Hospital Physicians on Computerized Physician Order Entry

CHAPTER 1

OVERVIEW OF THE RESEARCH PROBLEM

INTRODUCTION

The aim of this study is to investigate the perceptions of community hospital physicians on computerized physician order entry prior to its implementation. Having a better understanding of the perceptions of a sample of community hospital physicians, will aide in the development of an implementation planning process. It will provide a better understanding of the key barriers to success, as perceived by the physicians who will be asked to use this computer process, and investigate theoretical strategies to address these barriers based upon change behavior research.

STATEMENT OF THE PROBLEM

Computers have been used in the delivery of healthcare for over 20 years. Initially, computers were used for the financial and administrative functions of healthcare. Hospitals have been investing slowly to add clinical features to computer systems to the point where most hospitals and healthcare systems currently have an Electronic Medical Record (EMR) or Computerized Patient Record (CPR). These computer systems contain the demographic, financial, and other administrative information used to

deliver healthcare along with clinical information such as laboratory results, radiological reports, operative notes, and lists of medications.

The physician's medical orders for diagnostic and treatment services remain one of the last categories of information that is still written on paper order sheets and prescription pads. This includes orders such as medications, laboratory and other diagnostic tests, and so forth.

Computerized physician order entry is defined as "a process which allows a physician to use a computer to directly enter medical orders. At the critical point when an order is entered, the system can feed information back to the physician about drug interaction, cost of the item ordered, etc: in a 'just in time' manner." (Ash et al., 1998). The computer can compare the orders against standards for dosing, check for allergies or interactions with other medications and warn the physician about potential problems.

In its November, 1999 report "To Err is Human: Building a Safer Health System," the Institute of Medicine pointed out that 44,000 to 98,000 people die from medical errors in U.S. hospitals each year. As a result, the healthcare industry has been focusing on Computerized Physician Order Entry (CPOE) in hospitals as an important and underutilized tool for improving patient safety. (California Healthcare Foundation/First Consulting Group, September 2000).

Much of the immediate interest in CPOE is centered on medication order entry and its potential to reduce medication errors, reported to be the largest single cause of medical errors in hospitals. CPOE systems also have been shown to reduce costs through avoided adverse events, to reduce utilization and allow shorter lengths of stay, and to reduce unnecessary variations in care by encouraging recommended care practice.

CPOE offers these benefits because it goes well beyond merely replacing paper orders with electronic ones. It makes important information available at the time of ordering to help the physician make optimal ordering decisions.

However, in a 1998 survey sent to 1,000 U.S. hospitals, Ash et al., reported that of the "of the 32.1% [hospitals] that have [CPOE] completely or partially available, 4.9% require its use." They conclude that "complete availability throughout the hospital is rare, very few require its use, low percentages of physicians are actual users, and low percentages of orders are entered this way" (Ash et al., 1998). This low level of CPOE usage was also documented in a recent survey of 116 integrated delivery networks done by Ernst & Young, where only 13% of the respondents have CPOE implemented.

RESEARCH QUESTIONS

The following research questions will be addressed:

1. What are the perceptions of community hospital physicians on computerized physician order entry prior to implementation?
2. What are the perceived attributes of innovations that could be addressed to enhance the diffusion of CPOE in a community hospital setting?
3. What are the steps of the change process that are most important to physicians, so an implementation strategy for CPOE could address these issues at the most appropriate time?

PURPOSE OF THE STUDY

The purpose of this study is to identify the perceptions of community hospital physicians toward CPOE, who will be asked to implement CPOE within the next two years at three hospitals within PeaceHealth, Inc. The results of this study will help to design the implementation strategy and tailor communication to address the perceived barriers and benefits from an individual community hospital physician perspective.

SIGNIFICANCE OF THE RESEARCH

The research project will be conducted within the context of a community hospital planning to implement a CPOE system. Few hospitals have successfully implemented CPOE, especially in the community hospital

setting. There are major external and internal pressures to implement CPOE in the near future.

External Pressures to Implement CPOE

There are several institutions that are pressing for implementation of CPOE:

1. Institute of Medicine reports have highlighted the need to improve patient safety and have identified CPOE as an important means;
2. The Leapfrog Group, a major purchaser of commercial health insurance, has established incentives for hospitals to implement patient safety initiatives including CPOE;
3. Regulatory guidelines, such as California Senate Bill 1875, require health facilities to implement a formal plan like CPOE to reduce medication-related errors by 2005.

Internal Pressures to Implement CPOE

As a result of national attention to medication error rates, many healthcare organizations are examining patient safety and developing improvement strategies. This means that most U.S. hospitals are considering enhancing or adding to the clinical computer systems that support inpatient care and implementing tools such as CPOE successfully.

Isolating critical factors that will enhance the successful implementation of CPOE in the community hospital setting, and/or

identifying the perceived barriers could contribute greatly to improving patient safety and healthcare of the nation. The present study has as its aim to highlight these critical perceived factors.

CHAPTER 2
REVIEW OF LITERATURE
INTRODUCTION

Computerized Physician Order Entry (CPOE) has become a popular topic in many sorts of literature recently. It has been discussed in business, medical, as well as information technology literature. Some authors have opined on the importance of CPOE in reducing medical errors such as the Institute of Medicine publication *To Err is Human*, a landmark publication revealing that media had grasped, perhaps for the first time, the concept and importance of medical errors.

The Leapfrog Group, a consortium of Fortune 500 companies that claims to purchase 25 % of the commercial healthcare in the U.S., has selected CPOE as the basis for one of its premier safety standards. In addition, medical informatics researchers have been examining the effects of CPOE on medical care for over 30 years. Yet, less than 2% of U.S. hospitals have POE [CPOE] completely or partially available and require its use by physicians (Ash, et al., 1998). In a follow-up study completed in 2002, Ash, et al., reported, "computerized order entry was not available to physicians at 524 (83.7%) of 626 hospitals responding, while 60 (9.6%) reported complete availability and 41 (6.5%) reported partial availability." They concluded, "despite increasing consensus about the desirability of

CPOE use, these data indicate that only 9.6% of U.S. hospitals presently have CPOE completely available (Ash, et al., 2003).

In trying to answer the question of why CPOE is not more widely implemented, some have stated that "physicians' behavior seems to be resistant to change" (Poses, 1999). Others have suggested that different theories be examined regarding how organizations or individuals accept change or new technology. Some have suggested that changing physician behavior exemplifies the "contingency theory," implying that the appropriate way to initiate change in an organization is contingent upon the work and the people involved (Eisenberg and Williams, 1981).

Lee et al., in evaluating user satisfaction and self-reported usage patterns regarding physician order entry (POE) at a large urban academic medical center, observed that the users in their study placed more emphasis on POE characteristics related to efficiency as opposed to POE characteristics related to quality. They refer to Sviokla's "differentiation between 'efficiency technology,' which reinforces current ways of working and performing ongoing tasks, and a 'transformational technology,' which changes the nature of work." They concluded that POE is really a transformational technology but if a POE implementation is "framed" or perceived as an efficiency technology, it will only reinforce current processes and likely fail (Lee et al., 1996).

Finally, others have suggested that theories that focus on the factors for changing individual physician behavior, such as the Diffusion of Innovation (DOI) model or the Transtheoretical/Stages of Change model, may lead to understanding the barriers that institutions face in implementing CPOE (Ash, Lyman, et al., 2000), (Smith, 2000).

COMPUTERIZED PHYSICIAN ORDER ENTRY

CPOE or POE has been discussed as a way of improving communication within the healthcare process for over 30 years. "As early as 1970, when [Morris] Collen listed several of the general objectives of a medical information management system, he included 'to communicate patient data from professionals providing medical care (doctors, nurses, technicians, etc.) into the patient's computerized medical record to other professionals (e.g., dieticians), and to hospital services (e.g., radiology).' [Collen] specifically stated that 'physicians should enter medical orders directly into the computer' as a means of ensuring quality" (Sittig and Stead, 1994).

Physicians have largely supported the use of computers in improving medical care. In 1981, Singer, et al surveyed 600 otolaryngologists and internists. The 296 completed questionnaires suggest that 90% thought that a computer database would improve their practice of medicine with "most physicians indicating significantly greater

preference for literature summary and patient registry features over probability estimation capabilities" (Singer, et al, 1983).

While the benefits of improved patient care quality seemed logical, many of the early attempts to implement POE systems failed. An early example of the challenges of a successful POE implementation can be found at the University of Virginia. Massaro listed "at least four factors that contributed to the widespread organizational stress that accompanied the implementation program: the alteration of established workflow patterns and practices; the strict, literal interpretation of rules by the computer (or conversely, an inability of the IT [information technology] system to identify intent); the ambiguity of governance policies; and the lack of a clear understanding within the physician community of the long-term strategic value of the MIS [medical information system] initiative (Massaro, 1993a).

Ultimately, Massaro suggested that the "lessons learned were to have a broad and committed attending physician involvement and direction prior to implementation; to understand the magnitude of the behavioral changes that would be required and the time that would be demanded; control expectations and solicit support for the short-term implementation effort and long-term success of the endeavor; and, to anticipate problems and organizational conflicts that are certain to accompany an undertaking

as complicated and as invasive as the introduction of an MIS into the patient care environment of an academic medical center” (Massaro, 1993b).

There are several well-researched reasons why physicians should adopt the use of CPOE. CPOE systems have been shown to improve patient safety and patient care by: reducing medical errors; in the use of electronic guidelines, alerts and reminders; positively affect user satisfaction; and, decrease the overall cost of providing medical care.

Patient safety and medical errors captured front-page headline status after the release of the Institute of Medicine (IOM) report *To Err is Human: Building a Safer Health System*, in November 1999. The public response to this report was surprising to most, since the report’s estimates of more than a million injuries to patients and the nearly 100,000 deaths attributable to medical errors each year were based upon figures published in 1991. Both government and the healthcare community have reacted to the report and patient safety is now a major initiative in most health care organizations. The IOM report made four major points: (a) the extent of harm that results from medical errors is great; (b) errors result from system failures, not people failures; (c) achieving acceptable levels of patient safety will require major system changes; and (d) a concerted national effort is needed to improve patient safety (Kohn et al., 2000).

However, errors in medicine have been reported for many years. Leape has published extensively on the prevalence of medical errors in the hospital setting. Leape (1994) quoted Schimmel as reporting in 1964 that "20% of patients admitted to a university hospital medical service suffered iatrogenic [a disease caused by or arising as a complication of medical or surgical intervention] injuries and that 20% of those injuries were serious or fatal." Leape also quoted Steel et al., as reporting in 1981 "that 36% of patients admitted to a university medical service in a teaching hospital suffered an iatrogenic event, of which 25% were serious or life threatening...and that more than half of the injuries were related to use of medicines." Leape further cited the Harvard Medical Practice study release in 1991 that was the results of a population-based study of iatrogenic injury in patients hospitalized in New York State in 1984. "Nearly 14% of those injuries were fatal. If these rates are typical of the United States, then 180,000 people die each year partly as a result of iatrogenic injury, the equivalent of three jumbo-jet crashes every 2 days."

Leape concluded "computerization of the medical record, for example, would greatly facilitate bedside display of patient information, including tests and medications (Leape, 1994).

Lesar et al., in a systematic evaluation of prescribing errors detected and averted by pharmacists in a 631-bed tertiary care teaching

hospital, found that "the most common groups of factors associated with errors were those related to knowledge and the application of knowledge regarding drug therapy (209 errors, 30%); knowledge and use of knowledge regarding patient factors that affect drug therapy (203 errors, 29.2%); use of calculations, decimal points, or unit and rate expression factors (122 errors, 17.5%); and nomenclature factors (incorrect drug name, dosage form, or abbreviation) (93 errors, 13.4%)" (Lesar et al., 1997).

Bates and his colleagues at Brigham and Women's Hospital in Boston and Harvard Medical School have published many articles that have evaluated the impact of the use of CPOE on reducing medication errors. Initially, they published their results of a pre-post comparison of two interventions for preventing nonintercepted serious medication errors. Medication errors were defined as those that either resulted in or had the potential to result in an adverse drug event (ADE) and were not intercepted before reaching the patient.

The two interventions investigated were a physician computer order entry (POE) system and a combination of POE plus a team intervention, which included changing the role of the pharmacists. All patients were admitted to a stratified random sample of six medical and surgical units in a tertiary care hospital over a 6-month period for the control period and

the same units plus two additional care units were studied for a 9-month period during the intervention phase. The study results revealed, "nonintercepted serious medication errors decreased 55%, from 10.7 events per 1000 patient-days to 4.86 events per 1000 ($P=.01$). When POE-only was compared with POE plus team intervention combined, the team intervention conferred no additional benefit over POE" (Bates et al., 1998).

The Bates group has continued to publish studies evaluating the impact of CPOE on decreasing medical errors with Bates et al. (1999) and Kuperman et al. (2001). Kuperman et al. has suggested that CPOE systems that currently prevent medical errors, can be categorized into structural features, enhanced workflow features, alerts and reminders, and adjunct features.

It also has been intimated that the majority of medical errors that occur in our current paper-based system can be categorized into either transcription errors or errors caused by not having access to the relevant patient information when making clinical decisions. Lee et al. refers to these as quality improvement measures as opposed to efficiency improvement measures. Transcription errors occur during misinterpretation of handwritten orders due to illegible or incomplete medical orders. Using a CPOE system ensures that medical orders are legible, the writer can be

identified, and that a number of checking systems such as drug allergy checking or order completeness can occur (Lee et al., 1996).

Further, access to relevant patient information can be enhanced with a CPOE system by making other data available to the physician through the use of electronic guidelines, alerts, and reminders at the time that patient care decisions are being made.

Clinical practice guidelines offer the opportunity to improve the quality of care by reducing practice variations and improving adherence to standards of good care. Woolf defined clinical practice guidelines as "systematically developed statements to assist practitioner decisions about appropriate healthcare for specific clinical circumstances" (Woolf, 1990). Chin and Wallace studied embedded guidelines in an outpatient setting. They claimed that "by including a guideline on the electronic requisition, the ordering clinician can be informed about the appropriate indications for a test, other tests that may be more appropriate for given indications, and other therapies that may be safely tried prior to the need to do a diagnostic work-up" (Chin and Wallace, 1999).

Oxman et al. define computer-generated reminders, as "any intervention (manual or computerized) that prompts the healthcare provider to perform clinical actions. Examples include concurrent or inter-visit reminders to professionals about desired actions such as screening or

other preventive service, enhanced laboratory reports or administrative support (e.g., follow-up appointment systems or stickers on charts)" (Oxman et al., 1995). Randomized controlled trials of computerized reminders to physicians to improve their compliance with specific standards of care were reported as early as 1976 by McDonald (1976).

Oxman et al. performed a search on the available literature from 1970 to 1993, to determine the effectiveness of different types of interventions in improving health professional performance and health outcomes. The authors reviewed 102 trials that were aimed at areas of behavior change of health professional performance and health outcomes. The authors concluded that "there are no 'magic bullets' for improving the quality of healthcare, but there are a wide range of interventions available that, if used appropriately, could lead to important improvements in professional practice and patient outcomes." Specifically, they concluded that "reminders are likely to be effective only if not having the right information at the right time is an important cause of suboptimal performance" (Oxman et al., 1995). On the same topic, Demakis et al. reported on improving physician residents' compliance with standards of ambulatory care at multiple Veterans Administration ambulatory care clinics using computerized reminders. The researchers examined a total of 275 resident physicians at 12 VA medical centers during a 17-month

period. "The residents cared for 12,989 unique patients for whom at least one of the studied standards of care (SOC) was applicable." They concluded that the "reminder systems installed at multiple sites can improve residents' compliance to multiple SOC. The benefits of such systems, however, appear to deteriorate over time" (Demakis et al., 2000).

Overhage et al., 1997 showed that computer-generated reminders about corollary orders "can reduce mistakes in physician's ordering practices, in particular reminders reduce errors of omission in outpatient settings." In this study, "during a 6-month trial, reminders about corollary orders were presented to 48 intervention physicians and withheld from 41 control physicians. Intervention physicians ordered the suggested corollary orders in 46.3% of instances when they received a reminder, compared with 21.9% compliance by control physicians ($p < 0.0001$)" (Overhage et al., 1997). Teich et al., also found that "computerized physician order entry is a powerful tool for improving physician prescribing practices" (Teich et al., 2000).

CPOE systems have been found to improve patient care in non-medication settings as well using clinical guidelines, alerts, and reminders to the clinician at the time when decisions about medical care are occurring. Heffner et al. found that "a computer-based system combined with a procedure-specific DNR [Do-not-resuscitate] order form improves

communication of patients' DNR status in critical care settings (Heffner et al., 1998). Schriger et al., found that the "use of a computer-based system for clinical guidelines for management of patients with occupational exposure to body fluids improved documentation, compliance with guidelines, and percentage of charges spent on indicated activities while decreasing overall charges" (Schriger, et al., 1997).

Computer-generated alerts have also been found to be effective in correcting physician ordering errors that might lead to adverse drug events (ADEs) and to detect ADEs before maximum injury occurs. Raschle et al. "developed a computer alert system that provides patient-specific information to clinicians, with the specific aim of correcting prescription errors that might lead to ADEs (primary prevention) and detecting ADEs before harm occurs (secondary prevention)." The researchers incorporated an alert for 37 drug-specific ADEs and fired the alert 1,116 times over a 6-month period at a 650-bed community teaching hospital. "The alerts identified opportunities to prevent patient injury secondary to ADEs at a rate of 64 per 100 admissions. A total of 44% of the true-positive alerts were unrecognized by the physician prior to alert notification" (Raschle et al., 1998).

Computer-generated alerts and reminders have been shown to improve physician performance in selecting antibiotics for infections (Evans

et al., 1994), in diagnostic imaging test ordering (Harpole et al., 1997), and in diagnostic imaging test ordering to evaluate abnormal liver function (Rothschild et al., 2001) as well as in improving patient outcomes by alerting physicians regarding patient's rising blood creatinine levels, thus preventing serious renal impairment (Rind et al., 1994) and (Chertow et al., 2001).

Despite these CPOE system benefits, many physicians have stated that they are reluctant to adopt CPOE due to the increased time that it takes over the current paper-based process. Bates et al., reported in 1994 a time-motion examination of both medical and surgical house officers. The results revealed that using the CPOE system "took about twice as long ($P < 0.001$)" compared with the paper system. However, they point out "medical house officers recovered about half this time because some administrative tasks (e.g. looking for charts) were made easier" (Bates et al., 1994). Lee et al. used a survey approach to evaluate user satisfaction, correlates of satisfaction, and self-reported usage patterns regarding physician order entry (POE) in a 720-bed academic teaching hospital. Both physicians and nurses completed the surveys. The results surprisingly revealed that the physicians were more satisfied than the nurses. "Satisfaction was highly correlated with perceptions about POE's effects on productivity, ease of use, and speed. POE features directed at improving

the quality of care were less strongly correlated with satisfaction." They concluded that "development efforts should focus on improving system speed, adding on-line help, and emphasizing quality benefits of POE" (Lee et al., 1996).

Since then, a randomized-controlled detailed time trial using time motion studies of physicians with a POE system in Ambulatory Primary Care Internal Medicine practices was reported by Overhage et al., (2001). They found that "physicians using a POE system spent 2.2 minutes more per patient overall, but when duplicative and administrative tasks were taken into account; physicians were found to have spent only 0.43 minutes more per patient." A survey was also administered revealed, "the physicians believed that the system improved their patient care and wanted [the system] to continue to be available in their practices." The authors concluded, "little time, if any, was required for physicians to use the POE system. With experience in its use, physicians may even save time while enjoying the many benefits of POE" (Overhage et al., 2001). It is apparent that CPOE systems vary in the demands on process time and that continued and iterative improvements can address efficiency.

Finally, some researchers have found that implementing a CPOE system will reduce patient care costs. An early study by Tierney et al. used a randomized controlled clinical trial to assess the effects of a

computer system for writing all inpatient orders at an internal medicine service of an urban public hospital on healthcare resource utilization. The study revealed total inpatient charges that were 12.7% lower per admission for the intervention teams compared with the control teams ($P=.02$). Reductions were seen in "bed charges, diagnostic test charges, and drug charges. Reductions of similar proportion and statistical significance were found for hospital costs. The mean length of stay was 0.89 day shorter for intervention resident teams ($P=.11$).” However, the CPOE system required more physician time than did the paper system (Tierney et al., 1993).

In summary, CPOE has been demonstrated to improve patient care by decreasing physician medication order errors, to improve physician diagnostic test ordering, and to improve patient care by presenting alerts and reminders so that ordering physicians can adhere to evidence-based medical guidelines. These improvements have led to better patient outcomes and have therefore decreased costs. Although early systems have identified an increase in the time that it takes for physicians to "process" medical orders using CPOE compared with a paper-based system, recent advancements in some computer systems have shown little to no difference. So, why aren't physicians demanding to have CPOE systems available to them?

CHANGING PHYSICIAN BEHAVIOR

Most behavioral techniques (social support, empowerment, and personal growth) are based on reducing restraints against change and promoting informed decision-making, rather than on requiring people to change (Glanz et al., 1997). Several behavior change theories have been mentioned in the literature in connection with changing physician behavior. In 1981 Eisenberg and Williams evaluated six different strategies to improve physicians' awareness of the costs of healthcare and to reduce medical expenditures (Eisenberg and Williams, 1981). They reviewed six different approaches to change physician behavior (education, peer review with feedback, administrative changes, participation, penalties, and have rewards). They offered two theories as being important when trying to get physicians to help hospitals identify potential savings. The first is a management theory that "suggests with a group of professionals such as physicians, who have highly uncertain tasks which require extensive problem-solving, member participation in making decisions is the most effective way of changing behavior." The second theory to consider is the "contingency theory, so-called because the appropriate way to initiate change in an organization is contingent on the work and the people involved." They concluded that by using the contingency theory "neither physicians nor other professionals would be expected to respond favorably

to forced change with which they did not agree" (Eisenberg and Williams, 1981).

Researchers have also examined specific interventions focused on changing physician behavior. Some have attempted to examine different theories of behavioral change that might help to explain why changing physician behavior is such a challenge. Brown et al. studied the effective communication between clinicians and patients, since this is one of the most important determinants of the quality of clinical care. They conducted a randomized trial to improve the communication skills of primary care and sub-specialist physicians. They concluded that although "participating clinicians believed the program had improved their communication skills, patients' assessments of clinicians in the intervention group and those in the control group showed no difference in degree of improvement" (Brown et al., 1999).

Another study that examined changing physician behavior that did not attempt to correlate to a specific theory was Poses, 1999. Poses critiqued the SUPPORT study; a controlled trial to improve care for seriously ill hospitalized patients (Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatment) (The SUPPORT Principle Investigators, 1995). Poses suggests, "understanding why the behavior should be changed and what caused it ... may make the process of

designing interventions more likely to be simple and successful." He further offered that "would-be behavior changers" answer three major questions before designing interventions.

1. Does the behavior (or decision making) need to be changed?

- (1a). Is there a logical, evidence-based argument that one decision alternative is preferable for a particular situation?

- (1b). Is there evidence that physicians are not choosing the preferred alternative when they should?

2. What is the problem with the decision-making?

3. How could the decision making best be changed?" (Poses, 1999).

Solomon et al. 1998 reviewed the published literature for 1966 to 1998 on interventions aimed at improving physicians' testing practices and reviewed the selected studies using the PRECEDE framework. PRECEDE-PROCEED is actually a planning model and not specifically a behavioral theory. Glanz et al. explained, "it does not attempt to predict or explain the relationship among factors, but rather it provides a structure for applying theories, so that the most appropriate intervention strategies can be identified and implemented" (Glanz et al., 1997). Solomon et al. identified a total of 102 articles that described the result of interventions aimed at changing physicians' testing practices, and for their analysis they included 49 studies that compared diagnostic testing practices in

intervention and control groups. They organized these studies using the PRECEDE behavioral factors: interventions that targeted predisposing factors (individual's knowledge, attitudes, beliefs, personal preferences, existing skills, and self-efficacy beliefs); interventions that targeted reinforcing factors (elements that provide continuing reward or incentive for the behavior to become persistent); or, interventions that targeted enabling factors (the environmental factors that affect behavior directly or indirectly such as programs, services, or resources necessary for behavioral and environmental outcomes to be realized) (Glanz et al., 1997). Solomon et al. also categorized interventions that targeted multiple factors since "multidimensional interventions appeared more successful than those aimed at one level. They concluded that the PRECEDE behavioral framework "appears to be useful in exploring interventions that are successful and can facilitate interpretation of intervention results" (Solomon et al., 1998).

Cabana et al. reviewed 5,658 articles to determine barriers to physician adherence to clinical practice guidelines, practice parameters, clinical policies, or national consensus statements. They used Field and Lohr's definition of clinical practice guidelines as "systemically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances." They stated the successful

implementation of clinical practice guidelines should "improve quality of care by decreasing inappropriate variation and expediting the application of effective advances to everyday practice." Cabana et al. selected 76 published studies that described at least one barrier to physician clinical adherence and which they classified them into common themes. "The barriers affected physician knowledge (lack of awareness or lack of familiarity), attitudes (lack of agreement, lack of self-efficacy, lack of outcome expectancy, or the inertia of previous practice), or behavior (external barriers)."

They further stated "before a practice guideline can affect patient outcomes, it first affects physician knowledge, then attitudes, and finally behavior." They claimed "although behavior can be modified without knowledge or attitude being affected, behavior change based on influencing knowledge and attitudes is probably more sustainable than indirect manipulation of behavior alone." And finally, they concluded "the effectiveness of interventions to improve adherence [to clinical practice guidelines] is dependent not only on the intervention itself, but also on the existence and intensity of baseline barriers" (Cabana et al., 1999).

In research that has tried to correlate specific behavior change theories and interventional approaches, Elder et al. analyzed the health behavior change of patients in the primary care setting. They evaluated

the Health Belief Model, Social Learning Theory, Self-Management Models, Social Support Theories, Theory of Reasoned Action, and finally the Transtheoretical Model. They concluded that, these theories might be appropriately applied to the examination of health behavior changes in patients and suggested different strategies in using each of these theories (Elder, Ayala, Harris, 1999).

Grol (2001) has recently opined that in order to change clinical practice in the adoption of evidence-based medicine, "it should be complemented by evidence based implementation." He points out that "different players in healthcare use different approaches to changing clinical practice; most of these approaches are more based on beliefs than on scientific evidence." He further states, "before a strategy to implement change is selected the obstacles to change should be identified." He then outlines seven approaches to changing clinical practice, subdivided between internal processes and external influences. Internal processes include the educational approach, which is based on the intrinsic motivation of professionals to strive for professional competence; the epidemiological approach, which is based on the belief that professionals will make better decisions when presented with summarized scientific literature and credible guidelines while making the information easily and conveniently available for busy practitioners; and the marketing approach,

which emphasizes the development of an attractive product or service that is targeted to meeting a groups needs and goals. Grol also focuses on four external influences. These include: behavioral approaches, which are based on classical theories of conditioning and control performance by providing incentives or sanctions related to specific actions; second, social interaction approaches, which assume that learning and changing are influenced by interaction with significant peers or role models; third, organizational approaches which focus on creating the necessary structural and organizational conditions to promote change and improve care rather than on individual performance. Finally, there are coercive approaches, which focus on pressure in the form of laws, regulations, utilization review, as well as complaint procedures. Coercive approaches may not seem to be valuable at face value; however, considering the fact that "many care providers are stuck in fixed habits and routines, some pressure from outside may be decisive in implementing and maintaining a desired change" (Grol, 2001).

BEHAVIOR CHANGE THEORIES

There are two behavior change theories have appeared in the literature that may be promising in describing physicians' change behavior in adopting new technologies such as computerized physician order entry. The Diffusion of Innovations (DOI) theory evolved from rural sociology and

some of the earliest applications included research directed at understanding how new agricultural techniques spread among farmers. Diffusion theory, as applied to health, has been used to study health behaviors and the uptake of new technologies by health professionals by Rogers (Rogers, 1983). The Transtheoretical Model (TTM) of change uses stages to integrate processes and principles of change from across major interventional theories. According to Rogers, "This model emerged from a comparative analysis of leading theories of psychotherapy and behavioral change." In 1982 DiClemente and Prochaska further assessed how frequently a group of self-changer smokers and a group of smokers taking professional treatment used each of the model's ten processes (Glanz et al., 1997).

DIFFUSION OF INNOVATIONS

Rogers defines diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system," and defines innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption." The perceived newness of the idea for the individual therefore determines his or her reaction to it; if the idea seems new to the individual, it is an innovation (Rogers, 1983). Rogers identified five general attributes of

innovations that a variety of diffusion studies have shown to consistently influence adoption. He defined them as:

Relative Advantage: degree to which an innovation is perceived as being better than the idea it supercedes;

Compatibility: degree to which an innovation is perceived as consistent with existing values, past experiences, and need for potential adopters;

Complexity: degree to which an innovation is perceived as relatively difficult to understand and use;

Trialability: degree to which an innovation may be experimented with on a limited basis; and,

Observability: degree to which the results of an innovation are visible to others. Results should be easily observed and communicated to others.

The diffusion process involves attending to the innovation as well as to the channels used to communicate the innovation and the characteristics of the systems or environment in which this process takes place (Glanz et al., 1997). Rogers states that the essence of the diffusion process is the information exchange through which one individual communicates a new idea to others. The communication is most effective when it occurs between two or more individuals with like characteristics; or

at least to the degree to which they share certain attributes, beliefs, education, and social status. Communication is further enhanced if the message comes from an opinion leader, an informal role that an individual learns and maintains through technical competence, social accessibility, or conformity to the system's norms. Ineffective communication frequently occurs when a change agent, someone that is perceived as more technically competent than his or her clients, shares the innovation. Rogers also refers to the time-ordered sequencing of the innovation adoption decision process. This includes: possessing knowledge about the innovation, forming an attitude toward the innovation, making the decision to either adopt or reject the innovation, implementing the new idea, and finally to confirming the decision.

Diffusion research has also studied the "people" differences in innovativeness, which has led to the categorization of characteristics of different adopters. These categories are:

Innovators: These venturesome individuals often launch the new idea within the system by importing the innovation from outside of the system's boundaries. Some have said that these individuals will try anything new.

Early Adopters: These individuals are usually the opinion leaders of the system. Potential adopters look to them for advice and information

about the innovation. They are respected by their peers and are the embodiment of the successful, discrete use of the new ideas. They often convey a subjective evaluation of the innovation to near-peers through interpersonal networks of communication.

Early Majority: These individuals adopt new ideas just before the average member of the system. They interact frequently with their peers; however, seldom are they considered opinion leaders. They often hold true to the Ralph Waldo Emerson quotation, "Be not the first by which the new is tried, Nor the last to lay the old aside."

Late Majority: These individuals approach innovations with a skeptical and cautious air. They do not adopt an innovation until most others in their system have done so, and pressure from peers is necessary to motivate adoption.

Laggards: These are traditionally the last in a social system to adopt an innovation. This group contains almost no opinion leaders and is suspicious of innovations and change agents (Rogers, 1983).

PREVIOUS RESEARCH WITH DIFFUSION OF INNOVATIONS

Diffusion theory has been applied to a variety of practices in health such as the efforts made to get smokers to quit, the uptake of behaviors like family planning, the uptake and adoption of safe sexual practice in the general population, and the reduction of unsafe sexual practice in gay

men. Additionally, diffusion theory has been used to study the use of new tests and technologies by health professionals and the uptake of new pharmaceutical agents (Glanz et al., 1997).

TECHNOLOGY RELATED STUDIES USING DIFFUSION OF INNOVATIONS

Moore and Benbasat (1991) used DOI as the basis for developing an instrument to measure the perceptions of adopting an information technology innovation. They ultimately developed and tested a 34-item instrument examining the adoption of the personal workstation in a business setting. However, they added three additional constructs to the Rogers model by adding Image, defined as "the degree to which use of an innovation is perceived to enhance one's image or status in one's social system." They also added the construct of Voluntariness of Use, which they defined as "the degree to which use of the innovation is perceived as being voluntary, or of free will." Additionally, in instrument development, they determined that the original Rogers construct of Observability was quite complex and since Rogers had mentioned the dimensions of visibility and communicability in describing Observability, they added Visibility as a separate construct. Moore and Benbasat make a key distinction between Rogers' original definitions and their own research, the concept of perception. They point out that Rogers' definitions were based on perceptions of the innovation itself, and not on perceptions of actually

using the innovation. Therefore, "it is not the potential adopters' perceptions of the innovation itself, but rather their perceptions of using the innovation that are key to whether the innovation diffuses" (Moore and Benbasat, 1991).

Hebert (1994) based her investigation into the factors that influence nurses' intent to use bedside terminals and which individuals might exert an influence on performing that behavior on Moore and Benbasat's work. She examined four constructs: attitudes, perceived Voluntariness, subjective norms, and behavioral intent. She operationalized the construct of attitude by examining beliefs about image, relative advantage, compatibility, ease of use, result demonstrability, and computer avoidance. In surveying nurses at a regional referral hospital, she found that "three attitude factors (compatibility, relative advantage, and result demonstrability) and one subjective norm factor (director of nursing) were the strongest predictors of behavioral intent—that is, the intent to use the point-of-care technology" (Hebert, 1994).

Ash used DOI and Organizational Change theory to examine the organizational factors that influence information technology diffusion in academic health sciences centers. She examined the diffusion of three innovations: end-user online literature searching, electronic mail, and computerized patient records within informatics professionals and library

workers. She concluded, "organizational attributes are important predictors for the spread of usage of information technology innovations within academic health sciences centers. Individual variables differ in their effect on each innovation, however" (Ash, 1997).

Southon et al. also used both the individual and organizational conceptual approaches in identifying impediments to the successful transfer and implementation of a packaged clinical information system into the state public health system in New South Wales, Australia. They considered the "innovation/diffusion theory ... with its central focus on the utility of the innovation to the individual consumer" as well as the "configurational theory of IT-organization fit framework ... with its wider organizational context." They concluded that the organizational structure needs to be considered and "fitted" to the implementation strategy of a large information technology system (Southon et al., 1997).

Weir et al. used the model of diffusion on information technology that was "developed by Fichman and expanded by Ash" in assessing how successfully a provider order entry system was being implemented at a Veterans Administration Healthcare System. They suggest that the implementation of information technology follows the pattern of all diffusion models. This model recommends measuring both infusion and the extent of diffusion by using three dimensions: breadth, the degree to

which the system is adopted across the organization; depth, the degree to which work processes have been adapted to using the computer; and, quality, the degree to which the system is used appropriately (Weir et al., 2000).

TRANSTHEORETICAL MODEL OF CHANGE

The Transtheoretical Model (TTM) uses stages of change to integrate processes and principles of change from across major theories. It integrates current behavioral status with a person's intention to maintain or change that person's pattern of behavior. The core constructs of the TTM are: stages of change, processes of change, decisional balance, and self-efficacy (Glanz et al., 1997).

There are five distinct stages in the change construct: precontemplation, contemplation, preparation, action, and maintenance. An individual has no intention of making any changes while in the precontemplation stage. An individual is considering making changes, usually in the next 6 months, when in the contemplation stage. In the preparation stage, an individual makes small changes or intends to take action within the next month. And when in the action stage, the individual is actively engaging in the new behavior. In maintenance phase, the individual is sustaining change over time. Finally, there is a termination

phase, in which an individual is not tempted to revert to the original action (Glanz et al., 1997).

"Processes of change are the covert and overt activities that people use to progress through the six stages [of change]" (Glanz et al., 1997). These strategies and techniques provide important guidelines to the individual's progression through the various stages. Ten processes have received the most support in literature.

Consciousness raising: increased awareness of new facts, ideas, or tips that support behavioral change;

Dramatic relief: increased emotional experiences or negative emotions that go along with the behavior to be changes;

Self-reevaluation: realizing that the behavioral change is an important part of one's identity;

Environmental reevaluation: awareness of the impact of change on one's proximal social and physical environment;

Self-liberation: both the belief that one can change and the commitment to act;

Helping relationships: seeking and using social support for the behavioral change;

Counterconditioning: substituting new actions for undesirable ones;

Contingency management: rewards and incentives for the new behavior and/or punishment for undesirable behaviors;

Stimulus control: adding reminders or cues to engage in the new behavior and/or removing reminders or cues to engage in the undesirable behavior;

Social liberation: realizing that the social norms are changing in the direction of supporting the behavioral change (Glanz et al., 1997).

The decisional balance or readiness to change construct refers to an individual's weighing the pros and cons of changing. And finally, the self-efficacy construct refers to both the confidence that individuals have in sustaining the new behavior and the temptation to revert to the old behavior.

PREVIOUS RESEARCH WITH TRANSTHEORETICAL MODEL

Research with TTM of change has been applied to smoking behavior, alcohol and substance abuse, anxiety and panic disorders, eating disorders and obesity, exercise behavior, adoption of mammography screening, and compliance with medication regimes (Glanz et al., 1997).

Prochaska et al., examined the relationship between stages of change and two scales from decisional balance measure across published studies of 12 problem behaviors: smoking cessation, quitting cocaine, weight control, following high-fat diets, adolescent delinquent behaviors,

safer sex, condom use, sunscreen use, radon gas exposure, exercise acquisition, mammography screening and physicians' preventive practices with smokers. They concluded "the results provide strong support for the generalizability of these Transtheoretical constructs across a variety of populations" (Prochaska et al., 1994).

Cohen et al. suggested that the readiness of the change organizational construct guide the design and implementation of interventions aimed at changing physician behavior to improve disease prevention (Cohen et al., 1994).

Prochaska et al., have recently posited that the Transtheoretical Model has the potential to be used for organizational change. "Conceptually the stages-of-change dimension can be applied by leaders to reduce resistance, increase participation, reduce dropout, and increase change progress among employees" (Prochaska et al., 2001).

Finally, in his review of meta-analyses and structured review of behavior change theories implicit in interventions to change physician performance, Smith opined that the Transtheoretical or Readiness-to-Change model might offer insight into the complexity of physician behavior change. "The approach that [TTM] may suggest would be successful among physicians is a multi-factorial, stage-appropriate intervention, tailored to each physician's readiness to change. For example, educational

strategies would be most appropriate for early-stage interventions, whereas enabling strategies such as reminders would be most appropriate for late-stage interventions" (Smith, 2000).

SUMMARY

The literature offers a well-documented view of the potential benefits to implementing computerized physician order entry. Computerized physician order entry (CPOE) can improve patient care by decreasing medication errors, as well as assist in physician adherence to clinical care guidelines and evidence-based medicine with the use of reminders and alerts. Some studies have actually shown improved satisfaction after the implementation of CPOE as well as the benefit of decreased costs of medical care. The literature is also rich in studies that show that changing physician behavior is difficult. Results of several research efforts have suggested that behavior change theories may offer guidelines to more successful physician change interventions, most specifically, Diffusion of Innovations (DOI) and Transtheoretical Model (TTM) of change. Little research has been published examining the implementation of CPOE based upon change theory frameworks. These published studies have performed post hoc evaluations of CPOE implementations primarily in academic medical centers at the organizational level. Research in community hospital settings prior to

CPOE implementation at the individual behavior change level has been absent from these efforts to identify critical factors and will be examined in the present study.

CHAPTER 3
RESEARCH DESIGN AND METHODS
INTRODUCTION

The purpose of this study is to investigate the perceptions of community hospital physicians on computerized physician order entry prior to implementation.

This chapter will discuss the pilot activity conducted to assist the study relative to design process, delineation of the research questions, description of the sample, procedures, performance of the instrumentation, and data analysis methodology.

The basic research design follows the multi-method approach used in previous studies addressing information technology use by physicians. Ostbye et al. used surveys and data gathered from the computer on usage, interviews, and limited observation in another evaluative study of CPOE, which included qualitative techniques (Ostbye et al., 1997).

Stablein, et al., used on-site interviews, walkarounds with direct observations, and document review to detect the presence of absence of indicators for a hospitals' readiness for CPOE. They developed a readiness assessment tool that included several different components: "external environment; organizational leadership, structure, and culture; care standardization; order management; access to information; information

technology composition; and infrastructure." They concluded that "organizations need to develop expertise at accomplishing and sustaining change; understanding and building CPOE readiness is an important first step (Stablein, et al., 2003).

PILOT ACTIVITIES ADDRESSING STUDY DESIGN

Prior to the design of this study, two community hospital physicians were interviewed. It is important to know the perceptions of physicians that support the use of computers in medical care as well as those who are opposed to it. To use Rogers' adopter categories of new technology at the individual level, one physician was chosen for his reputation as an innovator/early adopter and another physician was chosen for his reputation as being a late majority adopter. They also represented two different categories of "users" of the system, since one physician is a specialist and uses the computer system less frequently than the primary care physician or "hospitalist," who works exclusively in the hospital and may be following as many as twenty patients daily. Both physicians were also chosen because they had been known to share opinions about the use of computers in healthcare. The physicians were initially contacted by electronic mail and phone calls were made to finalize the interview times. Questions for the interview addressed some basic demographic information regarding how long these physicians had been in practice and their

medical specialty. A question was asked regarding whether or not they had been exposed to electronic medical records in their residency programs or more specifically, if they had used a computerized physician order entry system.

Lastly, several questions tried to reveal what physicians perceived were the benefits of CPOE and if they had opinions regarding how CPOE would affect their workflow and how they interacted with their patients while in the hospital.

Several themes were identified in analyzing the transcripts of these interviews. The physicians shared many of the themes; however, some differences were apparent. It is the intent of this study to validate these themes.

Previously Used Research Methods

Ash et al. (1999) used data from participant observation, focus groups, and both formal and informal interviews when they addressed the "Perceptions of house officers who use physician order entry." However, this study was done within a large academic center after a computerized physician order entry system had already been implemented. Ostbye et al. used surveys and data gathered from the computer on usage, interviews, and limited observation in another evaluative study of CPOE, which included qualitative techniques (Ostbye et al., 1997). This study focused

only on the ordering of laboratory tests and their results. And finally, Portney and Watkins defined qualitative research as a method that “seeks to describe the complex nature of humans and how individuals perceive their own experiences within a specific social setting (Portney and Watkins, 2000). Berg suggested that qualitative research methods are useful when “certain elements of symbolism, meaning, or understanding” requires consideration of the individual’s own perceptions and subjective apprehensions (Berg, 2001).

These studies have evolved a multi-method approach as well as a theoretical base for examining the adoption or use of information technology. However, these studies have been applied after the implementation of this technology and within large academic medical centers. Subjects from these studies include residents, interns, and clinical professors who may have particular incentives for adopting new information technology. The subjects for this study are community hospital physicians who may have different incentives for adopting and using new information technology, especially CPOE.

Penrod and Gadd examined the attitudes of academic-based and community-based physicians regarding use of an electronic medical record (EMR) in their 2001 study, in fact the survey used for the current study is a modification of the survey questionnaire used in their study. They

compared the "implementation of the same EMR in an academic-based to a community-based practice" (Penrod and Gadd, 2001).

STATEMENT OF THE RESEARCH QUESTIONS

The following research questions were addressed:

1. What are the perceptions of community hospital physicians on computerized physician order entry (CPOE) prior to implementation?
2. What are some of the attributes of innovations that could be addressed to enhance the diffusion of CPOE in a community hospital setting?
3. What are the steps of the change process that are most important to physicians, so that an implementation strategy for CPOE could address these issues at the most appropriate time?

THE SAMPLE

A written survey was sent to 659 physicians with "active admitting privileges at three PeaceHealth, Inc. hospitals. The goal in selecting this population to be surveyed was to investigate the perceptions of physicians that had been exposed to the same level of information technology using the same electronic medical record system. The population also had been exposed to the same level of local information regarding plans to implement CPOE at PeaceHealth.

Sample Size

The unit of analysis for the core study was the individual physician, practicing medicine in a community hospital setting. Lists of all physicians that had active admitting privileges at each of these hospitals was obtained from the medical staff offices, which are responsible for the medical staff functions of credentialing, determination of admitting status, and monitoring compliance. The active admitting privilege status was an important criterion for defining this study's population. Active admitting status would include physicians who have "admitted" a certain number of inpatients at each of the corresponding hospitals. This ensured that the physicians had the same relative exposure to PeaceHealth's inpatient electronic medical record system and would have been exposed to the same level of local information regarding PeaceHealth's plans to implement CPOE. Physicians excluded from this status are often located in geographically separate areas, have infrequent contact with the hospitals, or may have academic affiliations with the respective hospitals. Allied health professionals such as physician's assistants, nurse practitioners, and certified midwives were also excluded from the population due to their different use of the electronic medical record and exposure to local information regarding CPOE. It was also suspected that these

professionals would have access to a different level of national information and literature about CPOE.

Sampling Procedure

Names and addresses were requested and obtained from the three medical staff offices used for this research. St. John Medical Center is a 193-bed acute care hospital and Level III Trauma Center providing emergency and acute healthcare services in Longview, Washington. Sacred Heart Medical Center is a 450-bed tertiary regional medical center located in Eugene, Oregon. Peace Harbor Hospital is a full-service, 21-bed acute care facility and Level IV Trauma Center located in Florence, Oregon. These community hospitals have as much as 20 years experience in hospital information systems. All three institutions implemented their current information system between 1997 and 1998, a system that encourages physicians to review patient information in the computer. It is mandatory that physicians use the computer system for signing of dictated medical transcriptions and for the viewing of certain clinical data. However, physicians are not currently entering any data directly into the computer. There is functionality within this commercially available clinical computer system to support CPOE. In fact, three academic medical centers as well as one community hospital in the U.S. are currently using this same product for CPOE.

After submitting and receiving approval from the Oregon State University and PeaceHealth, Inc. Investigational Review Boards, specific requests were submitted to gain access to this information from the three hospital staffs. The written surveys were mailed via U.S. Postal service or distributed via hospital mailboxes at each of the three facilities.

A question on the written survey asked the respondents to self-rank themselves on a 5-point scale that represented the five adopter categories of Rogers' Diffusion of Innovation theory. Another question asked physicians to respond to their willingness to participate further in the research with a 1-hour personal interview.

Once an adequate number of completed surveys were returned, as determined by the author, identification numbers were sorted into the five categories. From these categories, a random sample was identified for an interview.

STUDY PROCEDURE

Protection of Human Subjects

Oregon State University and PeaceHealth, Inc.'s Institutional Review Boards approved study procedures for the Protection of Human Subjects.

The cover letter included with the survey instrument explained to respondents the purpose of the study and that participation was not required. A copy of the letter is included in Appendix A. One copy of the

address labels was printed for each hospital's database of active admitting physicians. A unique identification code was assigned to each physician and placed on the tracking sheet and listed on the survey. Self-addressed envelopes were included in the mailing. Respondents were requested to return the survey in that envelope only. As the surveys were returned, the code numbers were circled on the printed lists so that respondents did not receive follow-up. The envelopes and any other identifying information were separated from the surveys. Follow-up reminder cards as part of a second mailing to non-respondents were tracked in this same manner. The cover letter also offered a copy of the results. Several physicians indicated their requests and this was tracked separately from the identification information.

Interview data was taped and transcribed. An alphabetic coding system was assigned to each interviewee and was used to identify transcribed copies of the interviews and field notes. Tapes were erased with field notes and tracking lists destroyed at the conclusion of this study.

Design of Survey Instrument

The validated survey was initially developed by Cork, et al. (Cork et al, 1998) and based upon the original research performed by Teach and Shortliffe (Teach and Shortliffe, 1981). Penrod and Gadd further adapted this instrument in their study of physician attitudes regarding EMR use

(Penrod and Gadd, 2001). In the original study, Cork et al. divided the survey into five attributes of physicians' attitudes toward computers in medical care: computer use, self-reported computer knowledge, demand for computer functionality, demand for computer usability, and computer optimism. Attributes of computer use, computer knowledge, and computer optimism scales were tested for reliability with Cronbach's alpha coefficients of 0.79, 0.91, and 0.86, respectively. The "Computers in Medical Care Survey, PeaceHealth, Inc." (CIMC) was modified by eliminating a section about computer knowledge and updating several of the questions in the section of applications of computers in medicine to be more specific to CPOE and to the current hospital information system capabilities at PeaceHealth, Inc.

For the purposes of this study, sections for computer use and computer optimism were maintained and modified to reference the specific computer applications that are available to PeaceHealth physicians at this time. For instance, handheld device use was rated along with the specific EMR functions within PeaceHealth's hospital information system.

The section that addressed computer optimism in the original survey was divided into two subsections for this study. The first subsection used an eight-item question listing potential effects of computers on medicine and healthcare. The other subsection used a

seven-item question listing potential effects of CPOE on medicine and healthcare. Respondents were asked to indicate on a 5-point response scale the beneficial or detrimental effects of each item. Each question was assigned either a positive or negative stem based upon suggestions from Salant and Dillman and the "Survey Center" at Oregon State University. The Likert scale was modified from Penrod and Gadd's scale of Highly detrimental to Highly beneficial to a scale of Agree to Disagree to the positively or negatively worded statements. Cronbach's alpha coefficients were 0.81 (N=264) and 0.87 (N=258) after unidirectional recoding for these subsections respectively. A copy of the "Computers in Medical Care Survey, PeaceHealth, Inc." is included as Appendix B).

The author addressed content validity for the survey by establishing a six-member group experienced in medical informatics and evaluation/measurement techniques. Two physicians not included in the sample, also reviewed the survey for content.

Design of Interview Questions

The interview questions used the first seven questions used in the pilot study. Additional questions were designed to address the eight perceived attributes of innovations. These attributes were initially identified by Rogers (Rogers, 1983) and expanded upon by Rogers and Shoemaker (Rogers and Shoemaker, 1971). Moore and Benbasat used

them with information technology by (Moore and Benbasat 1991).

These attributes were also further used by Ash (Ash, 1997) in her study of three specific information technology innovations. One question each was designed to address: Relative Advantage, Voluntariness, Ease of Use, Trialability, Compatibility, Image, Result Demonstrability, and Visibility. The author addressed content validity of these interview questions by using the six-member group experienced in medical informatics and evaluation/measurement techniques.

Survey Methods

The survey method followed the Total Design Method (TDM) recommended by Dillman (Dillman, 1978). The cover letter was designed to provide some background information regarding CPOE: the purpose, research, and practical usefulness of the study; to emphasize the importance of the individual's response; to describe the confidentiality safeguards; to offer to provide a summary of results; and the contact information for questions. The letter was reproduced on Oregon State University, Department of Public Health letterhead and was signed with the department chair and the candidate's professional title.

Following Dillman's TDM, the survey was reproduced in booklet format and was included in the mailing with a self-addressed business

reply envelope. Each return envelope was addressed to the candidate at Oregon State University, Department of Public Health.

The packet was either mailed using the U.S. Postal service or hand delivered into mailboxes provided at the hospital medical staff offices at Sacred Heart Medical Center and St. John Medical Center on March 14, 2003. A reminder card was either mailed or hand delivered into mailboxes to non-responders on April 7, 2003. An additional packet consisting of a slightly modified cover letter, survey, and business reply envelope was mailed or hand delivered to further non-respondents on April 21, 2003.

An incentive of pairs of tickets to an Oregon State University Football game, 2003 season, was offered to the two randomly selected individuals who returned their surveys by April 15, 2003. These tickets were purchased by the author and distributed on September 12, 2003.

Response Rate

The response rate was 41% overall, determined by dividing the total number of returned completed surveys by the number sent out, with a 35% response rate from the physicians at Peace Harbor Hospital, a 42% response rate from St. John Medical Center, and a 41% response rate for Sacred Heart Medical Center. Responses to the first and second mailings was tracked and it was interesting to note that approximately equal

numbers of completed surveys were returned in the first as well as in the second mailings to Peace Harbor Hospital and St. John Medical Center. This contrasts with twice as many responses being returned in the first mailing to Sacred Heart Medical Center as in the second mailing.

The physicians were asked to respond to a question in the survey about their willingness to participate further in this research by being available for a 1-hour interview. The completed surveys were divided into one of five adopter categories based upon their response to the question that asked them to self-rank themselves based upon the five attitude categories in Roger's Diffusion of Innovation scale (Innovators, Early Adopters, Early Majority Adopters, Later Majority Adopters, and Laggards). Unfortunately, no respondents that rated themselves as "Laggards" were willing to participate in the personal interview. The Innovator category had only three respondents who were willing to participate in interviews; therefore, a random selection of three respondents for the other three categories was identified. These 12 physicians were all contacted by mail on September 12, 2003. Additionally some were contacted via electronic mail, and phone calls were used to schedule and confirm interview times. One physician did not respond after several attempts and was replaced by random selection from within that category. An additional cover letter (Appendix C) along with an Informed Consent form along with a copy of

the interview questions was mailed to the interviewees prior to the scheduled interview session.

The interview sessions occurred in offices, conference rooms, a hospital cafeteria, or break rooms depending upon the preference of the physician. Interviews lasted from 30 to 60 minutes. At the beginning of the interview, the interviewer reviewed the Informed Consent form (Appendix D) for signature and asked for any additional questions. Each interviewee was instructed that the information provided would be treated anonymously, a paper copy of the transcribed interview could be made available to them, and that a paper copy of the results could be made available to them. All interviewees asked for a paper copy of the results only. The interview followed the questions as outlined in Appendix E. The interview was audio-taped and the interviewer took field notes.

Upon completion of the interviews, a professional transcriptionist transcribed the results (Appendices F). The transcriptionist returned all paper copies and tapes to the researcher. The interview results were grouped by interview question and patterns or trends of responses were identified.

DATA ANALYSIS METHODS

Data analysis for this study was approached through two different methods. The descriptive analysis reviewed the distribution of the

variables between and among the "Computers in Medical Care Survey, PeaceHealth, Inc." Secondly, the results of the interviews used an approach to identify patterns and trends in each interview question within the interview transcripts. The major patterns and trends were compared to the perceived attributes of innovations of Diffusion of Innovation and the processes of change construct of the Trans-theoretical Model of change.

The results of the survey were entered into SPSS (Statistical Package for the Social Sciences) v.11.01. Data for each of the questions was entered with coded numbers. Eight of the returned responses contained so little data that they were removed from the analysis. A few surveys contained missing elements for some of the questions and were considered in the analysis of those variables.

Selected variables were analyzed in SPSS using tables, histograms, and descriptive statistics. Cronbach's alpha coefficient was computed on the two scaled questions of interest. Chi-square was computed to test the relationship between dichotomous or variables with up to five levels. Independent groups t-test was computed to compare means on continuous scale variables.

SUMMARY

A pilot study was conducted to help plan for this study. A review of previously used research methods was conducted to identify methods that would be appropriate for studies examining physicians' attitudes toward computer use in healthcare, using change theories to examine physician change behavior and to conduct multi-method research. The procedure, which included careful attention to the protection of human subjects, involved the evaluation and modification of the survey instrument, the development of the interview questions and the mailing and follow-up processes. And finally, this chapter provided a brief description of the methods used for data analysis.

CHAPTER 4

RESULTS

INTRODUCTION

Data analysis for the present study is divided into survey data and interview data analysis. Survey data analysis focuses on descriptive analysis and inferential analysis of several research questions. The descriptive analysis reviews the distribution of the variables between and among the "Computers in Medical Care Survey, PeaceHealth, Inc. (CIMC)." Inferential data analysis will examine the relationship between some of these variables using independent groups t-tests, chi-square, and correlation tests.

Interview responses will be grouped by interview question with emerging themes within each question identified.

This chapter is organized with survey analysis following the major research questions. Interview responses are also listed by question.

SURVEY ANALYSIS

Analysis of "Computers in Medical Care Survey, PeaceHealth, Inc. (CIMC) is divided into descriptive analysis of the variables and investigation of the main research questions. The research questions are:

1. Does medical specialty influence attitudes toward use of computers in medicine and healthcare, attitudes toward use

of CPOE on medicine and healthcare, or favoring CPOE implementation at PeaceHealth?

2. Does years in medical practice influence response on favor of implementing CPOE at PeaceHealth?
3. Does self-ranking response on usual reaction to new technology influence attitudes toward use of computers in medicine and healthcare, attitudes toward use of CPOE on medicine and healthcare, or favoring CPOE implementation at PeaceHealth?

DESCRIPTIVE ANALYSIS

This descriptive analysis includes review of the independent and dependent variables and their distributions. Histograms and tables show the number of respondents (N), means, standard deviations, along with minimum, maximum and skewness for interval variables.

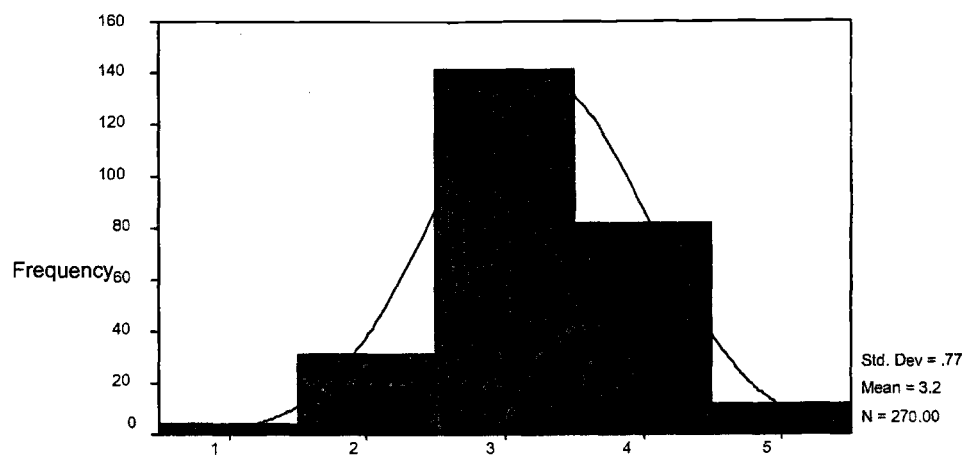
Independent and Dependent Variables

For data analysis, respondents self-ranked themselves on the interval scale of 1-5 to represent their usual reaction to new technology, which is used both as an independent and dependent variable. These five levels represent the Diffusion of Innovation theory's adopter categories. Underlines were used on the survey for emphasis. "I am usually the first physician in my area to try new technology" represented Innovators; "I am

usually one of the first few physicians in my area to try new technology” represented Early Adopters; “I usually try new technology once I have seen other physicians use it successfully” represented Early Majority; “I will only try new technology once I have seen many other physicians in my area use it successfully” represented Late Majority; and, “I am usually one of the last physicians in my area to use new technology” represented the Laggard category. For data analysis, responses were recoded so that Innovators had the highest score with the value of 5. This was done to match direction comparisons with the other variables. A total of 270 responded to this question with 10 missing cases (Table 4.1). Responses revealed 12 or 4.4% Innovators, 82 or 30.4% Early Adopters, 141 or 52.2% Early Majority, 31 or 11.5% Late Majority, and 4 or 1.5% Laggards with a mean of 3.2 and a standard deviation of 0.77. This normal distribution was slightly negatively skewed, meaning that slightly more respondents perceived themselves as more readily adopting new technology (Figure 4.1).

Table 4.1 Self-reported reaction to new technology

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Innovator	12	4.3	4.4	4.4
	Early Adopter	82	29.3	30.4	34.8
	Early Majority	141	50.4	52.2	87.0
	Majority	31	11.1	11.5	98.5
	Laggard	4	1.4	1.5	100.0
	Total	270	96.4	100.0	
Missing	System	10	3.6		
Total		280	100.0		



*Recoded

1=Laggards, 2=Late Majority, 3=Early Majority, 4=Early Adopters, 5=Innovators

Figure 4.1 Recoded usual reaction to new technology

Independent Variables

The respondents were asked to choose one of 29 medical practice specialties. An additional item, "Other," allowed the respondents to write

in different specialties. An additional 14 specialties were listed. Family Practice had been inadvertently omitted from the initial survey and several respondents added comments to this effect. For data analysis, responses were recoded into a dichotomous variable of Medical and Surgical specialties. Of the 277 respondents, 223 or 79.3% were Medical and 54 or 19.3% were Surgical (Table 4.2).

Table 4.2 Total respondents by medical specialty

Medical Specialty		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Medical	223	79.6	80.5	80.5
	Surgical	54	19.3	19.5	100.0
	Total	277	98.9	100.0	
Missing	System	3	1.1		
Total		280	100.0		

An open-ended question asked the respondents to identify the number of years they had been practicing at their area of medicine as identified. A total of 275 responded to this question with a range from .5 to 43 years, a mean of 16.0 years with a standard deviation of 9.33 years. The distribution is bi-modal 18.5% from 10 to 13 years and 10.2% at 20 years. The distribution is slightly negatively skewed, meaning that fewer respondents have been practicing at the longer end of the scale. Figure 4.2 shows a histogram representing these data.

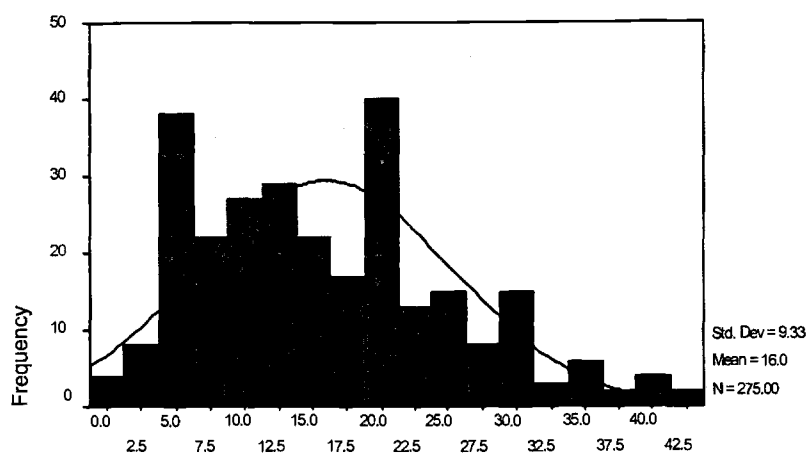


Figure 4.2 Total respondents by years in medical practice

Another open-ended question asked respondents to list their age. A total of 271 answered this question with a mean of 47.3 years, a standard deviation of 9.32 years. This continuous ratio variable revealed a slightly positively skewed normal distribution (Figure 4.3).

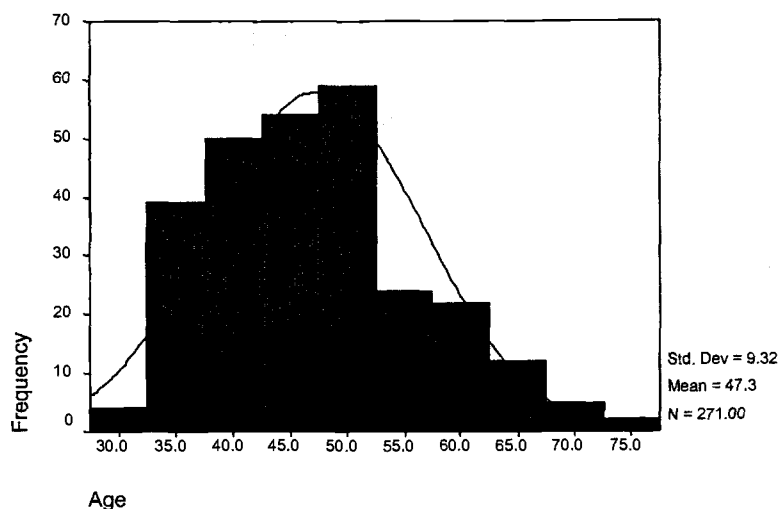


Figure 4.3 Total respondents by age

Gender was derived from respondents circling one level of this dichotomous variable. A total of 272 answered with 202 or 74.3% male respondents and 70 or 25.7% female respondents (Table 4.3).

Table 4.3 Total respondents by gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	70	25.0	25.7	25.7
	Male	202	72.1	74.3	100.0
	Total	272	97.1	100.0	
Missing	System	8	2.9		
Total		280	100.0		

Dependent Variables

Respondents were asked to rank agreement to eight statements along a 5-point Likert interval scale. Respondents could choose from Agree, Somewhat Agree, Neither Agree nor Disagree, Somewhat Disagree, or Disagree to each statement on some potential effects that computers might have on medicine and healthcare. This was to specifically represent their individual attitudes toward computers in medicine and healthcare. Each of the eight statements contained either a positive or negative pole. For data analysis, responses were recoded so that positive responses had the highest value. Neutral responses were removed and those responses that Disagreed and Somewhat Disagreed were compared to responses that Somewhat Agreed and Agreed to each of the eight statements.

Attitudes toward computerized physician order entry (CPOE) were similarly structured. Respondents were asked to choose from the same 5-

point Likert interval scale of Agree, Somewhat Agree, Neither Agree nor Disagree, Somewhat Disagree, or Disagree to each of seven statements on some potential effects that CPOE might have on medicine and healthcare. Each of the seven statements contained either a positive or negative pole. For data analysis, responses were recoded so that positive responses had the highest value. Neutral responses were removed and those responses that Disagreed and Somewhat Disagreed were compared to responses that Somewhat Agreed and Agreed to each of the seven statements.

Respondents were asked if they favored implementing CPOE at PeaceHealth on a nominal scale with three levels: No, Yes, or Would like more information. A total of 272 respondents answered this question with 120 or 44.1% in favor, and 53 or 19.5% not in favor of implementing CPOE at PeaceHealth. Additionally, 99 or 36.4% indicated that they would need more information before making a decision (Table 4.5).

Table 4.5 In favor of implementing CPOE at PeaceHealth, Inc.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	53	18.9	19.5	19.5
	Yes	120	42.9	44.1	63.6
	Would like information	99	35.4	36.4	100.0
	Total	272	97.1	100.0	
Missing	System	8	2.9		
Total		280	100.0		

INFERENCE ANALYSIS

Research question # 1: Does medical specialty influence attitudes toward use of computers in medicine and healthcare, attitudes toward use of CPOE on medicine and healthcare, or favoring CPOE implementation at PeaceHealth?

To more fully examine whether medical specialty influences attitudes toward use of computers in medicine and healthcare, attitudes toward use of CPOE on medicine and healthcare, or favoring CPOE implementation at PeaceHealth, four specific questions are investigated:

- a) Does respondent's self-ranking on usual reaction to new technology (DV) differ by medical specialty (IV)?
 - b) Does respondent's attitude of potential effects of computers on medicine and healthcare (DV) differ by medical specialty?
 - c) Does respondent's attitude of potential effects of computerized physician order entry (CPOE) on medicine and healthcare (DV) differ by medical specialty (IV)?
 - d) Does response of in favor of implementing CPOE at PeaceHealth (DV) differ by medical specialty (IV)?
- a). Does respondent's self-ranking on usual reaction to new technology (DV) differ by medical specialty (IV)?

The self-reported response on usual reaction to new technology was recoded so that "Innovators" were equal to a 5 on the 1-5 scale. Therefore, Innovators = 5; Early Adopters=4; Early Majority=3, Late Majority=2; and, Laggards=1. Main practice specialty responses were recoded as either a Medical or a Surgical Specialty. A cross tabulation shows similar distribution across four categories among the medical and surgical specialties, with the only four Laggards as medical specialists. A total of 217 medical specialists and 52 surgical specialists responded to this question by ranking themselves across the five categories. A chi-square analysis revealed no difference between medical and surgical specialists among the categories (Tables 4.6 and 4.7).

Table 4.6 Self-reported usual reaction to new technology by medical specialty (Cross tabulation)

Usual Reaction	Specialty		Total
	Medical	Surgical	
5.00	10	2	12
4.00	65	17	82
3.00	112	28	140
2.00	26	5	31
1.00	4		4
Total	217	52	269

Table 4.7 Self-reported usual reaction to new technology by medical specialty

(Chi-square)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.360 ^a	4	.851
Likelihood Ratio	2.130	4	.712
Linear-by-Linear Association	.370	1	.543
N of Valid Cases	269		

a. 3 cells (30.0%) have expected count less than 5. The minimum expected count is .77.

b). Does respondent' attitude of potential effects of computers on medicine and healthcare (DV) differ by medical specialty?

The survey question for potential effects of computers in medicine and healthcare had eight statements that had either positive or negative stems. Respondents were asked to rate their responses along the 5-point Likert scale. Statements 13a, 13c, 13i, and 13j were recoded so that all positive responses were equal to a value of 5. For data analysis, neutral responses were removed. Disagree and Somewhat Disagree responses were compared to Somewhat Agree and Agree responses. This resulted in a different sample size for each question. Based upon common literature and pilot activity, statements on the potential effects of computers in medicine and healthcare were examined. Statements were compared for the following: quality of healthcare improves, enjoyment of the practice of

medicine decreases, the rapport between clinicians and patients decreases, and patients' satisfaction with the quality of care they receive increases.

There are some interesting trends revealed with more responses, especially from the medical specialties, who agreed that computers improve quality and rapport; however, this was not statistically significant (Tables 4.9 through 4.12).

Table 4.9 Attitudes toward computers on quality by medical specialty (Cross Tabulation)

Specialty		Quality		Total
		Disagree	Agree	
Surgical	Count	7	32	39
	Expected	4.9	34.1	39.0
	% within Spec	17.9%	82.1%	100.0%
	% within Qual	25.0%	16.6%	17.6%
	% of Total	3.2%	14.5%	17.6%
Medical	Count	21	161	182
	Expected	23.1	158.9	182.0
	% within Spec	11.5%	88.5%	100.0%
	% within Qual	75.0%	83.4%	82.4%
	% of Total	9.5%	72.9%	82.4%
Total	Count	28	193	221
	Expected	28.0	193.0	221.0
	% within Spec	12.7%	87.3%	100.0%
	% within Qual	100.0%	100.0%	100.0%
	% of Total	12.7%	87.3%	100.0%

**Table 4.10 Attitudes toward computers on quality by medical specialty
(Chi-Square Tests)**

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.193 ^b	1	.275		
Continuity Correction ^a	.684	1	.408		
Likelihood Ratio	1.102	1	.294		
Fisher's Exact Test				.291	.200
Linear-by-Linear Association	1.187	1	.276		
N of Valid Cases	221				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.94.

**Table 4.11 Attitudes toward computers on rapport by medical specialty
(Cross Tabulation)**

Specialty		Rapport		Total
		.Disagree	Agree	
Surgical	Count	10	22	32
	Expected Count	8.8	23.2	32.0
	% within Spec	31.3%	68.8%	100.0%
	% within Rapport	19.6%	16.3%	17.2%
	% of Total	5.4%	11.8%	17.2%
Medical	Count	41	113	154
	Expected Count	42.2	111.8	154.0
	% within Spec	26.6%	73.4%	100.0%
	% within Rapport	80.4%	83.7%	82.8%
	% of Total	22.0%	60.8%	82.8%
Total	Count	51	135	186
	Expected Count	51.0	135.0	186.0
	% within Spec	27.4%	72.6%	100.0%
	% within Rapport	100.0%	100.0%	100.0%
	% of Total	27.4%	72.6%	100.0%

**Table 4.12 Attitudes toward computers on rapport by medical specialty
(Chi-Square Tests)**

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.285 ^b	1	.593		
Continuity Correction ^a	.100	1	.752		
Likelihood Ratio	.279	1	.597		
Fisher's Exact Test				.664	.369
Linear-by-Linear Association	.283	1	.594		
N of Valid Cases	186				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.77.

A significant relationship does exist between agreeing that computers increase enjoyment of practice of medicine and medical specialty $\chi^2 (1, N = 180) = 9.45, p = 0.002$, using an alpha level of 0.05 (Tables 4.13 and 4.14). Reviewing the frequency cells reveals that significantly more medical specialties agree that computers do not decrease enjoyment of practice of medicine than are expected.

**Table 4.13 Attitudes toward computers on enjoyment by medical specialty
(Cross Tabulation)**

Specialty		Enjoyment		Total
		Disagree	Agree	
Surgical	Count	20	19	39
	Expected	12.1	26.9	39.0
	% within Spec	51.3%	48.7%	100.0%
	% within Enjoymt	35.7%	15.3%	21.7%
	% of Total	11.1%	10.6%	21.7%
Medical	Count	36	105	141
	Expected	43.9	97.1	141.0
	% within Spec	25.5%	74.5%	100.0%
	% within Enjoymt	64.3%	84.7%	78.3%
	% of Total	20.0%	58.3%	78.3%
Total	Count	56	124	180
	Expected	56.0	124.0	180.0
	% within Spec	31.1%	68.9%	100.0%
	% within Enjoymt	100.0%	100.0%	100.0%
	% of Total	31.1%	68.9%	100.0%

**Table 4.14 Attitudes toward computers on enjoyment by medical specialty
(Chi-Square Tests)**

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	9.452 ^b	1	.002		
Continuity Correction ^a	8.288	1	.004		
Likelihood Ratio	8.950	1	.003		
Fisher's Exact Test				.003	.002
Linear-by-Linear Association	9.399	1	.002		
N of Valid Cases	180				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 12.13.

A significant relationship was also revealed among those agreeing that patient satisfaction is increased from computer use, $\chi^2(1, N = 144) = 4.59, p = 0.03$, using an alpha level of 0.05 (Tables 4.15 and 4.16).

Table 4.15 Attitudes toward computers on patient satisfaction by medical specialty

(Cross Tabulation)

Specialty		Patient Satisfaction		Total
		.Disagree	Agree	
Surgical	Count	16	11	27
	Expected	11.1	15.9	27.0
	% within Spec	59.3%	40.7%	100.0%
	% within Pat.Sat.	27.1%	12.9%	18.8%
	% of Total	11.1%	7.6%	18.8%
Medical	Count	43	74	117
	Expected	47.9	69.1	117.0
	% within Spec	36.8%	63.2%	100.0%
	% within Pat.Sat.	72.9%	87.1%	81.3%
	% of Total	29.9%	51.4%	81.3%
Total	Count	59	85	144
	Expected	59.0	85.0	144.0
	% within Spec	41.0%	59.0%	100.0%
	% within Pat.Sat.	100.0%	100.0%	100.0%
	% of Total	41.0%	59.0%	100.0%

Table 4.16 Attitudes toward computers on patient satisfaction by medical specialty**(Chi-Square Tests)**

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.595 ^b	1	.032		
Continuity Correction ^a	3.711	1	.054		
Likelihood Ratio	4.524	1	.033		
Fisher's Exact Test				.049	.028
Linear-by-Linear Association	4.563	1	.033		
N of Valid Cases	144				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.06.

A compilation of these four statements was also calculated by summing the count of each statement by medical specialty. There is no relationship between attitudes toward selected potential effects of computers on healthcare by medical specialty (Tables 4.17 and 4.18).

Table 4.17 Attitudes toward computers on selected statements by medical specialty**(Cross Tabulation)**

		Medical		Total
		Disagree	Agree	
Surgical		141	594	
Disagree	53	1		1
Agree	84		1	1
Total		1	1	2

Table 4.18 Attitudes toward computers on selected statements by medical specialty**(Chi-Square Tests)**

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.000 ^b	1	.157		
Continuity Correction ^a	.000	1	1.000		
Likelihood Ratio	2.773	1	.096		
Fisher's Exact Test				1.000	.500
Linear-by-Linear Association	1.000	1	.317		
N of Valid Cases	2				

a. Computed only for a 2x2 table

b. 4 cells (100.0%) have expected count less than 5. The minimum expected count is .50.

c). Does respondent's attitude of potential effects of computerized physician order entry (CPOE) on medicine and healthcare (DV) differ by medical specialty (IV)?

The survey question for potential effects of CPOE on medicine and healthcare had seven statements that had either a positive or negative stem. Respondents were asked to rate their responses along the 5-point Likert scale. Statements 18a, 18c, 18d, and 18g were recoded so that all positive responses were equal to a value of 5. For data analysis, neutral responses were removed. Disagree and Somewhat Disagree responses were compared to Somewhat Agree and Agree responses. Based upon common literature and pilot study activities, statements on the potential

effects of CPOE in medicine and healthcare were examined. Statements were compared for the following: patient care will be improved, physician workflow will be negatively impacted, enjoyment of the practice of medicine will be negatively impacted, communication between physicians and caregivers will be negatively impacted, and patients' satisfaction with the quality of care they receive will improve. There are some interesting trends revealed by more responses, especially from the medical specialties, who agreed that CPOE improves patient care; however, this was not statistically significant (Tables 4.19 and 4.20).

Table 4.19 Attitudes toward CPOE on patient care by medical specialty
(Cross Tabulation)

Specialty		Patient Care		Total
		Disagree	Agree	
Surgical	Count	9	21	30
	Expected	6.4	23.6	30.0
	% within Spec	30.0%	70.0%	100.0%
	% within Pat.Care	22.5%	14.2%	16.0%
	% of Total	4.8%	11.2%	16.0%
Medical	Count	31	127	158
	Expected	33.6	124.4	158.0
	% within Spec	19.6%	80.4%	100.0%
	% within Pat.Care	77.5%	85.8%	84.0%
	% of Total	16.5%	67.6%	84.0%
Total	Count	40	148	188
	Expected	40.0	148.0	188.0
	% within Spec	21.3%	78.7%	100.0%
	% within Pat.Care	100.0%	100.0%	100.0%
	% of Total	21.3%	78.7%	100.0%

**Table 4.20 Attitudes toward CPOE on patient care by medical specialty
(Chi-Square Tests)**

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.622 ^b	1	.203		
Continuity Correction ^a	1.061	1	.303		
Likelihood Ratio	1.516	1	.218		
Fisher's Exact Test				.226	.151
Linear-by-Linear Association	1.613	1	.204		
N of Valid Cases	188				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.38.

Another interesting trend revealed that physician workflow and enjoyment of the practice of medicine would be negatively impacted by CPOE (Tables 4.21 through 4.24).

**Table 4.21 Attitudes toward CPOE on physician workflow by medical specialty
(Cross Tabulation)**

Specialty		Physician Workflow		Total
		Disagree	Agree	
Surgical	Count	34	9	43
	Expected	31.6	11.4	43.0
	% within Spec	79.1%	20.9%	100.0
	% within Workflow	23.6%	17.3%	21.9%
	% of Total	17.3%	4.6%	21.9%
Medical	Count	110	43	153
	Expected	112.4	40.6	153.0
	% within Spec	71.9%	28.1%	100.0%
	% within Workflow	76.4%	82.7%	78.1%
	% of Total	56.1%	21.9%	78.1%
Total	Count	144	52	196
	Expected	144.0	52.0	196.0
	% within Spec	73.5%	26.5%	100.0%
	% within Workflow	100.0%	100.0%	100.0%
	% of Total	73.5%	26.5%	100.0%

Table 4.22 Attitudes toward CPOE on physician workflow by medical specialty

(Chi-Square Tests)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.32 ^a	4	.02
Likelihood Ratio	11.08	4	.02
Linear-by-Linear Association	9.47	1	.00
N of Valid	194		

a. 3 cells (30.0%) have expected count less than 5.
minimum expected count is .54.

Table 4.23 Attitudes toward CPOE on physician enjoyment of medicine by medical specialty

(Cross Tabulation)

Specialty		Enjoyment		Total
		Disagree	Agree	
Surgical	Count	26	10	36
	Expected Count	21.6	14.4	36.0
	% within Spec	72.2%	27.8%	100.0%
	% within Enjoymt	29.2%	16.9%	24.3%
	% of Total	17.6%	6.8%	24.3%
Medical	Count	63	49	112
	Expected Count	67.4	44.6	112.0
	% within Spec	56.3%	43.8%	100.0%
	% within Enjoymt	70.8%	83.1%	75.7%
	% of Total	42.6%	33.1%	75.7%
Total	Count	89	59	148
	Expected Count	89.0	59.0	148.0
	% within Spec	60.1%	39.9%	100.0%
	% within Enjoymt	100.0%	100.0%	100.0%
	% of Total	60.1%	39.9%	100.0%

Table 4.24 Attitudes toward CPOE on physician enjoyment of medicine by medical specialty

(Chi-Square Tests)

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.899 ^b	1	.089		
Continuity Correction ^a	2.271	1	.132		
Likelihood Ratio	2.997	1	.083		
Fisher's Exact Test				.117	.064
Linear-by-Linear Association	2.880	1	.090		
N of Valid Cases	148				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.35.

A significant relationship does exist between those agreeing that CPOE would not negatively impact communication between physician and caregivers, with surgical specialists tending to disagree but medical specialists significantly agreeing $\chi^2(1, N = 145) = 5.17, p = 0.023$, using an alpha level of 0.05 (Tables 4.25 and 4.26).

**Table 4.25 Attitudes toward CPOE on communication between physician and caregivers by medical specialty
(Cross Tabulation)**

Specialty		Communication		Total
		Disagree	Agree	
Surgical	Count	20	15	35
	Expected	14.2	20.8	35.0
	% within Spec	57.1%	42.9%	100.0%
	% within Comm	33.9%	17.4%	24.1%
	% of Total	13.8%	10.3%	24.1%
Medical	Count	39	71	110
	Expected	44.8	65.2	110.0
	% within Spec	35.5%	64.5%	100.0%
	% within Comm	66.1%	82.6%	75.9%
	% of Total	26.9%	49.0%	75.9%
Total	Count	59	86	145
	Expected	59.0	86.0	145.0
	% within Spec	40.7%	59.3%	100.0%
	% within Comm	100.0%	100.0%	100.0%
	% of Total	40.7%	59.3%	100.0%

**Table 4.26 Attitudes toward CPOE on communication between physician and caregivers by medical specialty
(Chi-Square Tests)**

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.175 ^b	1	.023		
Continuity Correction ^a	4.316	1	.038		
Likelihood Ratio	5.105	1	.024		
Fisher's Exact Test				.030	.019
Linear-by-Linear Association	5.140	1	.023		
N of Valid Cases	145				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.24.

And finally, no significant relationship was revealed when comparing medical practice and attitudes toward CPOE's impact on patient satisfaction (Tables 4.27 and 4.28).

Table 4.27 Attitudes toward CPOE on patient satisfaction by medical specialty (Cross Tabulation)

Specialty		Patient Satisfaction		Total
		.Disagree	Agree	
Surgical	Count	14	14	28
	Expected	12.8	15.2	28.0
	% within Spec	50.0%	50.0%	100.0%
	% within Pat.Sat.	24.1%	20.3%	22.0%
	% of Total	11.0%	11.0%	22.0%
Medical	Count	44	55	99
	Expected	45.2	53.8	99.0
	% within Spec	44.4%	55.6%	100.0%
	% within Pat.Sat.	75.9%	79.7%	78.0%
	% of Total	34.6%	43.3%	78.0%
Total	Count	58	69	127
	Expected	58.0	69.0	127.0
	% within Spec	45.7%	54.3%	100.0%
	% within Pat.Sat.	100.0%	100.0%	100.0%
	% of Total	45.7%	54.3%	100.0%

Table 4.28 Attitudes toward CPOE on patient satisfaction by medical specialty**(Chi-Square Tests)**

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.272 ^b	1	.602		
Continuity Correction ^a	.094	1	.759		
Likelihood Ratio	.271	1	.603		
Fisher's Exact Test				.670	.379
Linear-by-Linear Association	.269	1	.604		
N of Valid Cases	127				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 12.79.

A compilation of these five statements was also calculated by summing the count of each statement by medical specialty. A total of 803 responses were examined for this statement. A total of 103 surgical specialists disagreed with these statements and 69 agreed. However, among medical specialists, 344 agreed and 287 disagreed. There is no relationship between attitudes toward selected potential effects of CPOE on healthcare and medical specialty. However, a trend is noted here with more surgical specialists disagreeing and more medical specialists agreeing that CPOE would offer positive benefits for healthcare (Tables 4.29 and 4.30).

**Table 4.29 Attitudes toward CPOE on selected statements by medical specialty
(Cross Tabulation)**

Surgical		Medical		Total
		Disagree	Agree	
		287	344	
Agree	69		1	1
Disagree	103	1		1
Total		1	1	2

**Table 4.30 Attitudes toward CPOE on selected statements by medical specialty
(Chi-Square Tests)**

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.000 ^b	1	.157		
Continuity Correction ^a	.000	1	1.000		
Likelihood Ratio	2.773	1	.096		
Fisher's Exact Test				1.000	.500
Linear-by-Linear Association	1.000	1	.317		
N of Valid Cases	2				

a. Computed only for a 2x2 table

b. 4 cells (100.0%) have expected count less than 5. The minimum expected count is .50.

d). Does response of in favor of implementing CPOE at PeaceHealth (DV)
differ by medical specialty (IV)?

Respondents were asked if they favored implementing CPOE at PeaceHealth on a nominal scale with three levels; No, Yes, or, Need more information. For the purposes of this analysis, respondents "Needing more

information" were excluded. Again, main practice specialty responses were recoded into either medical or surgical specialty. A 2x2 cross tabulation was computed between the two-level favor variable and the two-level medical specialty variable. A total of 103 or 86.6% of medical specialists and 16 or 13.6% of surgical specialists were in favor of implementing CPOE, with a total of 172 respondents for both variables. A chi-square test was applied to the relationship between respondents favoring CPOE implementation at PeaceHealth by medical and surgical specialties. This relationship was found to be statistically significant, $\chi^2 (1, N = 172) = 9.732, p = 0.002$, using an alpha level of 0.05. Reviewing the frequency cells reveals that significantly more medical specialties were observed in favor of implementing CPOE at PeaceHealth than expected (Tables 4.31 and 4.32).

Table 4.31 Favoring implementing CPOE at PeaceHealth by medical specialty**(Cross Tabulation)**

Specialty		In favor of implementing CPOE at PeaceHealth		Total
		No	Yes	
Medical	Count	35	103	138
	% within In favor of implementing CPOE at PeaceHealth	66.0%	86.6%	80.2%
Surgical	Count	18	16	34
	% within In favor of implementing CPOE at PeaceHealth	34.0%	13.4%	19.8%
Total	Count	53	119	172
	% within In favor of implementing CPOE at PeaceHealth	100.0%	100.0%	100.0%

Table 4.32 Favoring implementing CPOE at PeaceHealth by medical specialty (Chi-square test)

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Continuity	9.732 ^b	1	.002		
Likelihood	8.482	1	.004		
Fisher's Exact	9.146	1	.002	.003	.002
Linear-by-Association	9.676	1	.002		
N of Valid	172				

a. Computed only for a 2x2

b. 0 cells (.0%) have expected count less than 5. The minimum 10.48.

An additional question was investigated. Does favoring implementation of CPOE at PeaceHealth (DV) differ by gender (IV)?

As for this analysis, respondents "Needing more information" were excluded. This two-level variable was compared to the dichotomous gender variable in a 2x2 cross tabulation. Results revealed similar percentages by gender favoring and not favoring CPOE. Additionally, a chi-square test was applied to the relationship.. The result was not different than expected therefore, it appears that the response of favoring implementing CPOE at PeaceHealth does not differ by gender (Tables 4.33 and 4.34).

**Table 4.33 Favoring implementing CPOE at PeaceHealth by gender
(Cross Tabulation)**

			In favor of implementing CPOE at PeaceHealth		Total
			No	Yes	
Gender	Female	Count	11	28	39
		% within In favor of implementing CPOE at PeaceHealth	20.8%	23.3%	22.5%
	Male	Count	42	92	134
		% within In favor of implementing CPOE at PeaceHealth	79.2%	76.7%	77.5%
Total		Count	53	120	173
		% within In favor of implementing CPOE at PeaceHealth	100.0%	100.0%	100.0%

**Table 4.34 Favoring implementing CPOE at PeaceHealth by gender
(Chi-square test)**

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Continuity ^a	.140 ^b	1	.708		
Likelihood	.031	1	.860		
Fisher's Exact	.142	1	.707	.844	.435
Linear-by-Association	.139	1	.709		
N of Valid	173				

a. Computed only for a 2x2

b. 0 cells (.0%) have expected count less than 5. The minimum
11.95.

Research question # 2: Does response favoring implementing CPOE at PeaceHealth (DV) differ by years in medical practice (IV)?

Respondents' results on whether they favored implementing CPOE at PeaceHealth on a nominal scale with three levels; No, Yes, or, Need more information were analyzed. For the purposes of this analysis, respondents "Needing more information" were excluded. Respondents provided continuous variable to the open-ended question: How many years have you practiced? An independent groups t-test was used to compare mean years in practice for Yes and No responses. A total of 172 respondents were used for this comparison. The 53 that did not favor implementing CPOE had a mean of 15.49 years in medical practice with a standard deviation of 8.20 years. The 119 that were in favor had a mean of 16.29 years in medical practice with a standard deviation of 9.60 years.

An independent t-test was performed comparing the mean number of years in medical practice with response to favor implementing CPOE at PeaceHealth. This test was found to be not statistically significant, $t(-5.26)$ $p=0.599$, indicating that there is no difference in favor of implementing CPOE at PeaceHealth across years of medical practice. In fact, there was a slight trend for those that have been in practice longer to favor implementing CPOE (Tables 4.35 and 4.36).

Table 4.35 Favoring CPOE implementation by mean years of medical practice (Descriptives)

In favor of implementing CPOE at PeaceHealth	N	Mean	Std. Deviation	Std. Error Mean
Years practice medicine No	53	15.4906	8.20324	1.12680
Yes	119	16.2899	9.60038	.88007

Table 4.36 Favoring CPOE implementation by means years of medical practice (Independent groups t-test)

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Years practice medicine	Equal variances assumed	1.841	.177	-.526	170	.599	-.7993	1.519	-3.7970	2.1983
	Equal variances not assumed			-.559	116	.577	-.7993	1.430	-3.6312	2.0325

Research question # 3: Does self-ranking response on usual reaction to new technology influence attitudes toward use of computers in medicine

and healthcare, attitudes toward use of CPOE on medicine and healthcare, or favoring CPOE implementation at PeaceHealth?

To more fully examine whether usual reaction to new technology influences attitudes toward use of computers in medicine and healthcare, attitudes toward use of CPOE on medicine and healthcare, or favoring CPOE implementation at PeaceHealth, three specific questions were investigated:

- a) Are attitudes on potential effects of computers in medical care (DV) influenced by self-reported response on usual reaction to new technology (IV)?
- b) Are attitudes on potential effects of CPOE (DV) influenced by self-reported response on usual reaction to new technology (IV)?
- c) Is response favoring implementing CPOE at PeaceHealth (DV) influenced by self-reported response on usual reaction to new technology (IV)?

a). Are attitudes on potential effects of computers in medical care (DV) influenced by self-reported response on usual reaction to new technology (IV)?

In order to do this analysis, some recoding was necessary. Since the survey question for potential effects of computers in medicine had statements with either positive or negative stems, results statements 13a,

13c, 13i, and 13j were recoded so that all positive responses were equal to a value of 5. The self-reported response on usual reaction to new technology was recoded so that "Innovators" were equal to a value of 5 on the 1-5 scale. For data analysis, neutral responses were again removed. Disagree and Somewhat Disagree responses were compared to Somewhat Agree and Agree responses. Based upon common literature and pilot activity, four statements on the potential effects of computers in medicine and healthcare were examined. Statements were compared for the following: quality of healthcare improves, enjoyment of the practice of medicine decreases, the rapport between clinicians and patients decreases, and patients' satisfaction with the quality of care they receive increases. Although not statistically significant, there is a trend of more respondents agreeing that computers would improve quality of healthcare especially from the 5-Innovators, 4-Early Adopters, and 3-Early Majority categories. A strong positive trend is revealed in the relationship between agreement that computers improve quality of healthcare and usual reaction to new technology. More Innovators, Early Adopters, and Early Majority respondents agree to the positive effects of computers (Tables 4.37 and 4.38).

Table 4.37 Attitudes toward computers in healthcare on quality by usual reaction to new technology**(Cross Tabulation)**

Usual reaction to new technology		Quality		Total
		Disagree	Agree	
5.00	Count	3	7	10
	% within	30.0%	70.0%	100.0%
	% of Total	1.4%	3.2%	4.6%
4.00	Count	7	66	73
	% within	9.6%	90.4%	100.0%
	% of Total	3.2%	30.1%	33.3%
3.00	Count	12	97	109
	% within	11.0%	89.0%	100.0%
	% of Total	5.5%	44.3%	49.8%
2.00	Count	4	19	23
	% within	17.4%	82.6%	100.0%
	% of Total	1.8%	8.7%	10.5%
1.00	Count	2	2	4
	% within	50.0%	50.0%	100.0%
	% of Total	.9%	.9%	1.8%
Total	Count	28	191	219
	% within	12.8%	87.2%	100.0%
	% of Total	12.8%	87.2%	100.0%

Table 4.38 Attitudes toward computers in healthcare on quality by usual reaction to new technology**(Chi-Square Tests)**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.040 ^a	4	.060
Likelihood Ratio	6.713	4	.152
Linear-by-Linear Association	.569	1	.451
N of Valid Cases	219		

a. 4 cells (40.0%) have expected count less than 5. The minimum expected count is .51.

There is a statistically significant relationship between respondents agreeing that computers would not decrease enjoyment of medical practice and usual reaction to new technology $\chi^2(4, N = 181) = 14.45, p = 0.006$, using an alpha level of 0.05 with more Innovator, Early Adopter, and Early Majority respondents agreeing. It is interesting to note that more Late Majority respondents disagreed with the statement (Tables 4.39 and 4.40).

Table 4.39 Attitudes toward computers in healthcare on enjoyment of practice of medicine by usual reaction to new technology (Cross Tabulation)

Usual reaction to new technology		Enjoyment		Total
		.Disagree	Agree	
5.00	Count	2	7	9
	% within	22.2%	77.8%	100.0%
	% of Total	1.1%	3.9%	5.0%
4.00	Count	11	48	59
	% within	18.6%	81.4%	100.0%
	% of Total	6.1%	26.5%	32.6%
3.00	Count	29	59	88
	% within	33.0%	67.0%	100.0%
	% of Total	16.0%	32.6%	48.6%
2.00	Count	13	9	22
	% within	59.1%	40.9%	100.0%
	% of Total	7.2%	5.0%	12.2%
1.00	Count	2	1	3
	% within	66.7%	33.3%	100.0%
	% of Total	1.1%	.6%	1.7%
Total	Count	57	124	181
	% within	31.5%	68.5%	100.0%
	% of Total	31.5%	68.5%	100.0%

**Table 4.40 Attitudes toward computers in healthcare on enjoyment of practice of medicine by usual reaction to new technology
(Chi-Square Tests)**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.448 ^a	4	.006
Likelihood Ratio	14.078	4	.007
Linear-by-Linear Association	12.101	1	.001
N of Valid Cases	181		

a. 3 cells (30.0%) have expected count less than 5. The minimum expected count is .94.

Another trend is seen in those agreeing that computers would not decrease their rapport with patients, again with more agreeing in all categories except Laggards (Tables 4.41 and 4.42).

Table 4.41 Attitudes toward computers in healthcare on rapport by usual reaction to new technology**(Cross Tabulation)**

Usual reaction to new technology		Rapport		Total
		Disagree	Agree	
5.00	Count	2	7	9
	% within	22.2%	77.8%	100.0%
	% of Total	1.1%	3.8%	4.9%
4.00	Count	15	46	61
	% within	24.6%	75.4%	100.0%
	% of Total	8.1%	24.9%	33.0%
3.00	Count	24	69	93
	% within	25.8%	74.2%	100.0%
	% of Total	13.0%	37.3%	50.3%
2.00	Count	8	12	20
	% within	40.0%	60.0%	100.0%
	% of Total	4.3%	6.5%	10.8%
1.00	Count	1	1	2
	% within	50.0%	50.0%	100.0%
	% of Total	.5%	.5%	1.1%
Total	Count	50	135	185
	% within	27.0%	73.0%	100.0%
	% of Total	27.0%	73.0%	100.0%

Table 4.42 Attitudes toward computers in healthcare on rapport by usual reaction to new technology**(Chi-Square Tests)**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.601 ^a	4	.627
Likelihood Ratio	2.417	4	.660
Linear-by-Association	1.597	1	.206
N of Valid	185		

a. 3 cells (30.0%) have expected count less than minimum expected count is

And finally, a notable trend was revealed in the cross tabulation of the relationship between the computer's potential effects on patient satisfaction with a slight trend toward respondents agreeing that patient satisfaction would increase in the Innovator, Early Adopter, and Early Majority categories. Slightly more disagreed in the Late Majority category, with only one Laggard respondent (Tables 4.43 and 4.44).

**Table 4.43 Attitudes toward computers in healthcare on patient satisfaction by usual reaction to new technology
(Cross Tabulation)**

Usual reaction to new technology		Patient Satisfaction		Total
		Disagree	Agree	
5.00	Count	4	5	9
	% within	44.4%	55.6%	100.0%
	% of Total	2.8%	3.5%	6.3%
4.00	Count	15	36	51
	% within	29.4%	70.6%	100.0%
	% of Total	10.5%	25.2%	35.7%
3.00	Count	28	36	64
	% within	43.8%	56.3%	100.0%
	% of Total	19.6%	25.2%	44.8%
2.00	Count	11	7	18
	% within	61.1%	38.9%	100.0%
	% of Total	7.7%	4.9%	12.6%
1.00	Count	1		1
	% within	100.0%		100.0%
	% of Total	.7%		.7%
Total	Count	59	84	143
	% within	41.3%	58.7%	100.0%
	% of Total	41.3%	58.7%	100.0%

**Table 4.44 Attitudes toward computers in healthcare on patient satisfaction by usual reaction to new technology
(Chi-Square Tests)**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.506 ^a	4	.111
Likelihood Ratio	7.913	4	.095
Linear-by-Association	4.638	1	.031
N of Valid	143		

a. 3 cells (30.0%) have expected count less than minimum expected count is

A composite of these four statements was also calculated by summing the count of each statement. There is no statistically significant relationship between attitudes toward selected potential effect of computers on healthcare by usual reaction to new technology. However, the same trend in the individual statements is apparent in the compiled data with Innovators, Early Adopters, and Early Majority respondents agreeing that computers would have a positive or beneficial effect. More Late Majority and Laggards disagree than agree that computers would have a beneficial effect on healthcare (Tables 4.45 and 4.46).

**Table 4.45 Attitudes toward computers in healthcare selected statements by usual reaction to new technology
(Cross Tabulation)**

		Agree with computers benefits by Reaction					Total
		Lagg (4)	Inn (26)	Late Maj (47)	Early Ad (196)	Early Maj (261)	
Disagre with computer benefits by usual Reaction	Early Maj (93)					1	1
	Early Ad (48)				1		1
	Late Maj (36)			1			1
	Inn (11)		1				1
	Lagg (6)	1					1
Total		1	1	1	1	1	5

**Table 4.46 Attitudes toward computers in healthcare selected statements by usual reaction to new technology
(Chi-Square Tests)**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	20.000 ^a	16	.220
Likelihood Ratio	16.094	16	.446
Linear-by-Linear Association	3.503	1	.061
N of Valid Cases	5		

a. 25 cells (100.0%) have expected count less than 5. The minimum expected count is .20.

b). Are attitudes on potential effects of CPOE (DV) influenced by self-reported response on usual reaction to new technology (IV)?

The survey question for potential effects of CPOE in medicine had seven statements with either a positive or negative stem. Results statements 18a, 18c, 18d, and 18g were recoded so that all positive responses were equal to a value of 5. For data analysis, neutral responses were removed. Disagree and Somewhat Disagree responses were compared to Somewhat Agree and Agree responses. Based upon common literature and pilot study activities, five statements on the potential effects of CPOE in medicine and healthcare were examined. Statements were compared for the following: patient care will be improved, physician workflow will be negatively impacted, enjoyment of the practice of medicine will be negatively impacted, communication between physicians and caregivers will be negatively impacted, and patients' satisfaction with the quality of care they receive will improve. A positive trend is seen in all categories but Laggards in the relationship between usual reaction to new technology and effects that CPOE would improve patient care (Tables 4.47 and 4.48).

Table 4.47 Attitudes toward CPOE on patient care by usual reaction to new technology**(Cross Tabulation)**

Usual reaction to new technology		Patient Care		Total
		Disagree	Agree	
5.00	Count	3	8	11
	Expected	2.4	8.6	11.0
	% within	27.3%	72.7%	100.0%
4.00	Count	8	48	56
	Expected	12.1	43.9	56.0
	% within	14.3%	85.7%	100.0%
3.00	Count	21	74	95
	Expected	20.5	74.5	95.0
	% within	22.1%	77.9%	100.0%
2.00	Count	6	13	19
	Expected	4.1	14.9	19.0
	% within	31.6%	68.4%	100.0%
1.00	Count	2	2	4
	Expected	.9	3.1	4.0
	% within	50.0%	50.0%	100.0%
Total	Count	40	145	185
	Expected	40.0	145.0	185.0
	% within	21.6%	78.4%	100.0%

Table 4.48 Attitudes toward CPOE on patient care by usual reaction to new technology**(Chi-Square Tests)**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.011 ^a	4	.286
Likelihood Ratio	4.735	4	.316
Linear-by-Linear Association	2.396	1	.122
N of Valid Cases	185		

a. 4 cells (40.0%) have expected count less than 5. The minimum expected count is .86.

However, respondents agreed that CPOE would negatively affect both physician workflow and enjoyment of medical practice. This analysis revealed statistically significant relationships between the adopter levels and CPOE having a negative impact both on workflow $\chi^2(4, N = 194) = 11.33, p = 0.023$, and also t on enjoyment $\chi^2(4, N = 145) = 14.03, p = 0.007$, using an alpha level of 0.05 (Tables 4.49 through 4.52).

Table 4.49 Attitudes toward CPOE on physician workflow by usual reaction to new technology

(Cross Tabulation)

Usual reaction to new technology		Physician Workflow		Total
		Disagree	Agree	
5.00	Count	4	6	10
	Expected	7.3	2.7	10.0
	% within	40.0%	60.0%	100.0%
4.00	Count	38	21	59
	Expected	43.2	15.8	59.0
	% within	64.4%	35.6%	100.0%
3.00	Count	81	21	102
	Expected	74.7	27.3	102.0
	% within	79.4%	20.6%	100.0%
2.00	Count	17	4	21
	Expected	15.4	5.6	21.0
	% within	81.0%	19.0%	100.0%
1.00	Count	2	0	2
	Expected	1.5	.5	2.0
	% within	100.0%	.0%	100.0%
Total	Count	142	52	194
	Expected	142.0	52.0	194.0
	% within	73.2%	26.8%	100.0%

Table 4.50 Attitudes toward CPOE on physician workflow by usual reaction to new technology

(Chi-Square Tests)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.325 ^a	4	.023
Likelihood Ratio	11.087	4	.026
Linear-by-Linear Association	9.471	1	.002
N of Valid Cases	194		

a. 3 cells (30.0%) have expected count less than 5. The minimum expected count is .54.

Table 4.51 Attitudes toward CPOE on enjoyment by usual reaction to new technology

(Cross Tabulation)

Usual reaction to new technology		Enjoyment		Total
		Disagree	Agree	
5.00	Count	3	5	8
	Expected	4.8	3.2	8.0
	% within	37.5%	62.5%	100.0%
4.00	Count	19	26	45
	Expected	27.0	18.0	45.0
	% within	42.2%	57.8%	100.0%
3.00	Count	49	24	73
	Expected	43.8	29.2	73.0
	% within	67.1%	32.9%	100.0%
2.00	Count	14	3	17
	Expected	10.2	6.8	17.0
	% within	82.4%	17.6%	100.0%
1.00	Count	2	0	2
	Expected	1.2	.8	2.0
	% within	100.0%	.0%	100.0%
Total	Count	87	58	145
	Expected	87.0	58.0	145.0
	% within	60.0%	40.0%	100.0%

Table 4.52 Attitudes toward CPOE on enjoyment by usual reaction to new technology**(Chi-Square Tests)**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.029 ^a	4	.007
Likelihood Ratio	14.992	4	.005
Linear-by-Linear Association	13.146	1	.000
N of Valid Cases	145		

a. 4 cells (40.0%) have expected count less than 5. The minimum expected count is .80.

A positive trend is seen in the relationship between the adopter categories of Innovator, Early Adopter, and Early Majority and those agreeing that communication between physicians and caregivers would not be negatively impacted (Tables 4.53 and 4.54).

**Table 4.53 Attitudes toward CPOE on communication between physician and caregivers by usual reaction to new technology
(Cross Tabulation)**

Usual reaction to new technology		Communication		Total
		Disagree	Agree	
5.00	Count	3	6	9
	Expected	3.7	5.3	9.0
	% within	33.3%	66.7%	100.0%
4.00	Count	20	28	48
	Expected	19.6	28.4	48.0
	% within	41.7%	58.3%	100.0%
3.00	Count	27	45	72
	Expected	29.4	42.6	72.0
	% within	37.5%	62.5%	100.0%
2.00	Count	7	5	12
	Expected	4.9	7.1	12.0
	% within	58.3%	41.7%	100.0%
1.00	Count	1	0	1
	Expected	.4	.6	1.0
	% within	100.0%	.0%	100.0%
Total	Count	58	84	142
	Expected	58.0	84.0	142.0
	% within	40.8%	59.2%	100.0%

**Table 4.54 Attitudes toward CPOE on communication between physicians and caregivers by usual reaction to new technology
(Chi-Square Tests)**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.524 ^a	4	.474
Likelihood Ratio	3.841	4	.428
Linear-by-Linear Association	.912	1	.339
N of Valid Cases	142		

a. 4 cells (40.0%) have expected count less than 5. The minimum expected count is .41.

The relationship between usual reaction to new technology and CPOE's impact on improving patient care was essentially neutral. A slight positive trend can be seen in the Early Adopter category with more agreeing that patient satisfaction would be improved with CPOE (Table 4.55 and 4.56).

Table 4.55 Attitudes toward CPOE on patient satisfaction by usual reaction to new technology

(Cross Tabulation)

Usual reaction to new technology		Patient Satisfaction		Total
		Disagree	Agree	
5.00	Count	4	4	8
	Expected	3.7	4.3	8.0
	% within	50.0%	50.0%	100.0%
4.00	Count	15	30	45
	Expected	20.6	24.4	45.0
	% within	33.3%	66.7%	100.0%
3.00	Count	31	32	63
	Expected	28.8	34.2	63.0
	% within	49.2%	50.8%	100.0%
2.00	Count	7	3	10
	Expected	4.6	5.4	10.0
	% within	70.0%	30.0%	100.0%
1.00	Count	1	0	1
	Expected	.5	.5	1.0
	% within	100.0%	.0%	100.0%
Total	Count	58	69	127
	Expected	58.0	69.0	127.0
	% within	45.7%	54.3%	100.0%

Table 4.56 Attitudes toward CPOE on patient satisfaction by usual reaction to new technology

(Chi-Square Tests)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.713 ^a	4	.152
Likelihood Ratio	7.191	4	.126
Linear-by-Linear Association	3.893	1	.048
N of Valid Cases	127		

a. 5 cells (50.0%) have expected count less than 5. The minimum expected count is .46.

A composite of these five statements was also calculated by summing the count of each statement. There is no statistically significant relationship between attitudes toward selected potential effects of CPOE by usual reaction to new technology. Only in the compilation with Innovators and Early Adopters, however, is a similar positive trend seen. A negative trend is seen with more Early Majority, Late Majority, and Laggards respondents agreeing that CPOE would have a negative effect on the five compiled statements (Tables 4.57 and 4.58).

**Table 4.57 Attitudes toward CPOE in healthcare selected statements by usual reaction to new technology
(Cross Tabulation)**

		CPOE beneficial attitudes Agree by usual Reaction					Total
		Lagg (2)	Late Maj (28)	Inn (29)	Early Adopt (153)	Early Maj (196)	
CPOE beneficial attitudes Disagree by usual Reactio	Lagg (8)	1					1
	Inn (17)			1			1
	Late Maj (51)		1				1
	Early Adopt (100)				1		1
	Early Maj (209)					1	1
Total		1	1	1	1	1	5

**Table 4.58 Attitudes toward computers in healthcare selected statements by usual reaction to new technology
(Chi-Square Tests)**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	20.000 ^a	16	.220
Likelihood Ratio	16.094	16	.446
Linear-by-Linear Association	3.525	1	.060
N of Valid Cases	5		

a. 25 cells (100.0%) have expected count less than 5. The minimum expected count is .20.

c). Is response favoring implementing CPOE at PeaceHealth (DV) influenced by self-reported response on usual reaction to new technology (IV)?

Yes and No responses to whether physicians favored PeaceHealth's plans to implement CPOE were compared with the self-reported response on usual reaction to new technology. "Need more information" was excluded from this analysis. Again, usual reaction to new technology was recoded so that "Innovators" were equal to a 5 on the 1-5 scale. A 5X2 cross tabulation was computed and a chi-square test was applied. Of the 169 respondents who replied to both of these questions, 118 were in favor and 51 were not in favor of implementing CPOE at PeaceHealth. A statistically significant relation was discovered between usual reaction to new technology and favoring implementing CPOE $\chi^2 (1, N = 169) = 9.43, p = 0.051$, using an alpha level of 0.05 (Tables 4.59 and 4.60).

**Table 4.59 In favor of CPOE and usual reaction
(Cross Tabulation)**

Usual reaction to new technology	In favor of implementing CPOE at PeaceHealth		Total
	No	Yes	
5.00	2	9	11
4.00	11	49	60
3.00	29	49	78
2.00	7	10	17
1.00	2	1	3
Total	51	118	169

**Table 4.60 In favor of CPOE and usual reaction
(Chi-Square Tests)**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.433 ^a	4	.051
Likelihood Ratio	9.579	4	.048
Linear-by-Association	7.999	1	.005
N of Valid	169		

a. 3 cells (30.0%) have expected count less than minimum expected count is

The implications of these results and the conclusions that can be drawn will be discussed in Chapters 5.

INTERVIEW ANALYSIS

Twelve physicians were interviewed for this study. The interviewees represented four of the five categories within the Diffusion of Innovation change theory. Drs. D, R, and H represented the "Innovators;" Drs. A, J, and K represented the "Early Adopters;" Drs. C, E, and I represented the "Early Majority;" and finally, Drs. B, G, and L represented the "Late Majority" category. As stated in the previous section, no "Laggards" responded their willingness to be interviewed. The interview questions are listed along with a summary of responses with supporting quotations. Patterns, when present, are identified. The interview transcripts are attached as Appendix F.

Have you heard about PeaceHealth's plans to implement CPOE?

Only Dr. F had not heard of PeaceHealth's plans to implement Computerized Physician Order Entry, with three physicians hearing "quite a bit" since they had been involved either in PeaceHealth's information technology planning or had attended more than one meeting where the subject had been discussed. The remaining seven physicians had either heard rumors, replied that "it's going to happen whether we like it or not," and had heard that there is quite a bit of "anxiety about it." Finally Dr. L stated that she had only heard "just what they sent to me in the brochure ... so I don't have a whole lot of information about it."

How do you feel about the plans to implement CPOE? Why do you feel that way?

Nine of the physicians felt that implementing CPOE was a "good thing" and were also able to outline reasons for its implementation. Pattern of responses also revealed that physicians thought the implementation was moving too slowly. Drs. D and H (both Innovators) "think we are doing it too slowly," and would like PeaceHealth to "move more aggressively in that direction." However, Drs. B and L (Late Majority category) were not supportive, with Dr. B responding, "[I feel] about how I felt about all computer things for the past 15 years it's seductive in its potential and fraught with problems in its implementation." Also, Dr. J was "quite anxious" citing that "my concern is not having a physician or several physicians involved in the entire process, because I think it is one thing to design a system, it is another to use the system on a daily basis."

How do you think that CPOE would affect your workflow?

All 12 physicians identified ways that CPOE would positively affect patient care citing common examples of order accuracy, legibility of doctor's handwriting, order standardization, and improvement of patient safety.

Dr. C cited:

When somebody wrote Lanoxin and you saw the 'L' and you saw something else in there and the person thought it was Lasix, which

wasn't much of a problem because the numbers just don't make any sense ... the amount of milligrams doesn't make any sense. There was another obvious one that happened to me where an inexperienced nurse ... I had written the order correctly, but she omitted the decimal point ... so, it made a big difference in this medication, where it basically knocked out the patient....It was a sedative type of medication ... where it basically really zoned out the patient.

However, in addition, Dr. H was concerned that it "has the potential to introduce some errors." Drs. K and L were concerned that it would be too complex, with Dr. K stating that "it could have a negative impact on patient care just because if the system is too complex to write a simple order, you just don't do it." And, Dr. L stated that it would "eventually [be good but] that at first, I think we will sort of [be] overwhelmed."

Six physicians responded that they thought that CPOE would slow their workflow, representing all four adoption categories. Three responded that they thought CPOE would improve their workflow, with Dr. E stating "that it would increase efficiency instead of now, when you go to the ward clerk who has to call me on the phone, come back ..." and, Dr. J citing that "I don't need to walk across the department to put an order in, to tell somebody. I think it will simplify; I would hope to make the whole process more efficient." Drs. K and L responded that workflow effects would depend upon the access of computer terminals, with Dr. K concerned that "if you don't have a computer terminal in every patient's room, it becomes

the whole issue of finding one ... one ends up searching out for a computer terminal." Dr. L responded, "It would have [to be] really easy access."

How do you think that CPOE would affect the productivity of other hospital personnel?

Eleven physicians responded that CPOE would affect the productivity of other hospital personnel positively and one responded that it would negatively affect others' workflow. Legibility and standardization of orders, decreased phone calls for order clarification, as well as decreased work for other staff were identified as positives. As Dr. A said, "if I'm entering the orders in the computer ... that means they don't have to enter them in the computer and that improves workflow." However, negative effects were identified due to too much concern for dealing with the computer instead of with patients.

Dr. B was concerned that:

It slows them down with comments about potential for increase errors. I find it a little unnerving to have no record on the paper chart in front of me, when the patient is on medications. Luckily we still have a Kardex system, which isn't part of the permanent medical record, which details what medications they are actually getting.

Dr. C anticipates[s]:

They will decrease their amount of time because of the legibility factor, and I assume it is probably in sort of template form and so it is the same way every time whereas some physicians have a tendency to write certain ways. They write over the lines, they write at angles, they write all sorts of different things and if you have a template so that it is always in the same place ... and not [having] to find the different information I think would be very helpful.

Drs. E and F think that it would minimize phone calls, and Dr. G stated that "I'm sure the nurse would wildly be enthusiastic with this and I don't know about the pharmacists."

Dr. L stated:

I think it would help them because it would all be in the same chart, in the same area and they would be able to access it more easily. I've always worried , people who are not very good typists and are not computer literate ... sometimes you get so involved with making sure that you've checked everything off, that they really don't have as much time for patient care and, I almost thought they would need more ward clerks, and the people who could data entry. They could just do the routine data entry and let the nurses take care of the patients ... you know, that's what they're good at. They didn't go into nursing for data entry ... I didn't go into medicine for data entry.

One reason that hospitals implement CPOE is because it is supposed to reduce medical errors. Do you think it might help here?

All 12 physicians commented that they thought that CPOE would help reduce medical errors. Common examples included: illegible

handwriting, legibility of dosing, access to pharmacy with interaction and systematic cross checks, reducing transcription errors, reducing hand-offs, and helping with orders outside of the norm. Dr. H did comment that it "has the potential to introduce some [new kinds] of errors that have to be carefully watched." However, Dr. H also said, "I think it will enhance patient care and hopefully get people in and out faster and at [a] lower cost."

Do you have any personal experiences with a CPOE system and what happened?

When asked if they had had any personal experience with a CPOE system, only four physicians stated that they had. Example responses to this question pointed out the difficulty of the particular systems, making the physician tied to the computer rather than to the patient, and an important reminder to make sure that all systems were interfaced with menu lists that are simple and flexible.

Dr. B stated:

That I had worked with several different computer systems before coming here. I found them very useful for pharmacy ... get pharmacy details and very good for labs... [however], there were exhaustive pick lists, tedious to wade through and without much flexibility in those instances where something doesn't quite fit, so you can spend a lot of time going through multiple choice lists and not quite find what you want is kind of frustrating.

Dr. J stated:

There [were] obviously things that I liked about it. Obviously it had some faults and frustrations and ... my biggest concern about the whole process is feeling that I'm tied to my computer, rather than my patient.

And finally, Dr. K replied:

The medical record was in for a long time, but order entry was abandoned. I think part of it was because people not doing it well and not using it right ... part of it also was that they didn't have an interface with everything ... the computerized order entry ... resulted in the paper order being printed up, that became nothing more than kind of a word processor.

We are all used to the current paper method. Do you think CPOE will be an improvement over it? Why or why not?

Five physicians expressed that they thought CPOE would be an improvement over the current paper method and six gave reserved answers. Examples for CPOE as an improvement were: completeness, organization, papers are not lost, no paper that could be copied and lead to diversion of drugs, and better access. Dr. B replied, "when you can have paper in front of you and can see everything there is to be seen ... it is more helpful like with the flowchart paper."

Dr. C expressed, "the down side also of that is that the computer, while theoretically more organized, you have to be able to hunt for stuff and that takes, unfortunately, sometimes just as much time." Dr. I also

mentioned gaining access to all the information and that "the problem that I have with it ... changes that happen fairly frequently over time, it makes it difficult to keep up with ... the changes in it because I don't use it very much." And finally, Dr. L said, "I feel like it is sort of half and half ... it would be helpful to have it all in one place ... but now, I feel like it is split."

Some hospitals require use of CPOE and others make it optional or strongly encourage it. What do you think would be best for this hospital?

Six physicians supported making CPOE mandatory. These responses on voluntariness of the system came from all four adopter categories. Common responses for making CPOE mandatory were: no benefit from two worlds, not everyone will use the system if it's not mandatory, and not having a single system can create errors.

Dr. C replied:

My feeling is that it should be either required or don't do it ... and the reason is ... with this current system that I have, some people are deciding not to do it because it takes more time ... if you don't have a current medication list, you don't know what the patient is taking.

Dr. I said, "I think that if you are going to do it, you should just do it all the way and that keeps it from getting too complicated for everybody." Several physicians suggested having a pilot first.

Dr. A stated:

I think it needs to be phased in ... start with a few groups and get the things figured out ... but once you've worked out the bugs, that at some point you need to make it mandatory.... [Otherwise] some of the people that might need [to use the computer] from a legibility standpoint ... are some of the ones who don't want to use the computer.

Dr. F replied, "I would make it optional for a period of time and then ... I would tell you to make it required." Dr. L made a reference to making it mandatory for physicians that had been in "practice for less than seven years...if you're young you better be using it."

How important do you think it is that CPOE be easy to use at this hospital?

All 12 physicians replied that the Ease of Use or Complexity attribute was important, extremely important, or critical. Dr. B replied, "and it's ironic because the paper chart isn't easy to use ... there's a human nature factor ... you struggle to learn each system ... you are reluctant to abandon it for something else that is difficult to learn." And, Dr. A said, "especially since you...are talking about such a wide group of people that some [are] not very computer savvy and they're the ones that you really need to convince and they need a really handy system."

How important is it that you have the ability to try out the system before implementation?

Six physicians stated that this example of Trialability would be important. They represented Innovators, Early Adopters, and a Late Majority. An example was being able to try out the system for about a month; however, only if it made a difference in implementation. Dr. F said, "I think a demo for a day, then hey, listen try it out for a month, to see what you think." When asked when physicians should have access to try out the system, Dr. D replied, "as early as possible ... I think you open it up as early as possible to show the doctors because there's nothing like word of mouth to help move projects along."

When replying as to why a trial period was not important, Dr. E stated, "I think we sort of react instead of going to see things and so I think when it comes, we are sort of used to like adapting to whatever it is."

Dr. H said:

On an individual physician basis, I don't think it is important. I mean I don't think Dr. X should necessarily have a tryout period, but I think as a group, certainly things like this should be piloted and used by small groups and improved until it can sort of be readied for prime time.

Dr. I also suggested that a physician be involved in a trial, "somebody who has had the experience before, or is more experienced, probably can give you more information."

Dr. L did not think that a trial was important "I don't think that's important, because you just have to trust that you are going to do this stuff ... but there will be a trial with somebody."

And finally, Dr. C stated:

... only if it would make a difference in the implementation of the system. We were the first site that had a computer and so at the end of the 6 months ... we unanimously said, it's a great first step, but this is not the way you implement to the rest of the system. We have a long list of suggestions ... but, the problem is now we can't really spend that kind of money to fix the problem.

Most people feel that there needs to be a balance between adapting the system to your workflow and adapting your workflow to the system. What are your thoughts on this?

Seven responded that it needed to be a little of both, while five responded that the system should adapt to the physician's workflow in this example of Modifiability. The responses favoring physician workflow represented Innovators, Early Adopters, and Early Majority categories. Examples included: some things that physicians currently do are not very efficient, meld the things that physicians currently do well with those that the computer does well, change current process if it's bad, if current

workflow is good then mimic it electronically, and physicians have different workflows.

Dr. A mentioned, "meld the things [physicians] do well with the things the computer does well and somewhere in between is a better answer than just doing everything the way I used to do it...because I've done it for about 20 years".

Dr. H replied:

I think it depends on the individual process. I think that...it's an opportunity to look at the processes that you are currently using...[which] doesn't mean that they are necessarily good" There may be clearly situations in which the current process is bad for one or more people affected by it and then the process should be adapted so the workflow should be changed. I think at other times, if the workflow as it exists is pretty good, we need to try to mimic that in the electronic process.

Dr. D, in explaining that the system should adapt to the physician workflow stated:

I think the most important thing is the adapting the hardware as much as possible to establish processes that the physicians have. In other words, having devices in each room, or near each room, because that is how the physician is used to doing work on that patient and then moving to the next patient.

Dr. I replied, "I prefer to have it adapt to me than me try to adapt all over again to something ... a different system." In response to the challenge of physicians and surgeons doing things differently, the response

was, "find out the common things, and stick with those and you usually do pretty well...the little things we can all change."

And finally, Dr. K replied:

I think the system needs to adapt to the workflow, and the problem is, all doctors have different ways they work that is based on what makes it efficient and how they feel they can best care for their patients ... some doctors ...kind of batch ... they go see all their patients and then they go look at all the vital signs and ... labs. Other doctors ... want to see one patient and have all the data on them and then take care of everything at once and then move onto the next patient.

If CPOE were to be phased in, would you like to be one of the first to use it?

Eight responded that they would like to be one of the first. Of the four that would not want to be first, there was one Early Adopter, one Early Majority, and two Late Majority categories represented. The examples given to be first were the desire to try new things and that physicians need to all agree to use the system. Reasons not to be first were extra time and impact on workflow.

Dr. E stated, "I love all the neat stuff." Dr. I said, "I would definitely want to kind of get used to it and see what is going on." Dr. J replied, "Obviously it is a company-wide or department-wide decision and I think we all need to...all of the physicians need to be on board and agree to use the system."

Dr. C would not want to be first:

With the other one ... I found out that because of the time necessary to do the thing, my productivity went down. And, now I'm going to be paid on production, therefore, my income went down to serve the good of the company and that creates hard feelings. The company is requiring me to do this, but on the other hand, they are saying, "Oh, we want you to do all this work, but on the other hand, we are not going to pay you for doing this work.".... We are going to actually cut your income ... that doesn't feel good ... I will not do it again.

Dr. K would not want to be first. "My suspicion is that it would be an impediment to my workflow."

How hard would it be for you to explain the plusses and minuses of CPOE to your colleagues?

All but one physician replied that they thought it would be easy to explain. Dr. L stated, "I guess if I understood it, I probably could explain it." However, even though the other physicians could explain the CPOE, there were some interesting themes.

Dr. A stated:

I can certainly explain the benefits and I think I can be quite an advocate for it, but I think the problem that I've found in the past with other parts of the computer system is that it's easy to explain that to the people that want to listen, but there are the people who are very convinced it isn't going to be good and it is very hard to talk to them.

Dr. C replied, "I think the explanation could be easy ... the problem is the buy in from the other side ... How easy would it be for me to

convince another doctor to do this plan ... I would say it might be impossible to do."

How important would it be for physicians to have an opportunity to see a demonstration of the system? At what point in the process?

All 12 physicians replied that they thought that it would be important to see a demonstration of the system or Visibility. Common responses were: physicians are visual, some physician feel a need to be involved, there should be a short time between the demo (or more than one) and the implementation of the system, and specific suggestions that certain physicians be identified to be involved from the beginning.

Dr. A stated:

A demo helps...its part of the whole process...the best thing is to do it several times. I in addition a pilot of the system be completed and then bring it back at the end of the pilot and say, "this is what we found" and do it a third time ... where it's easing them into that it's going to happen. Doctors are really hard to change and if you just drop something on them all at once, they bow their back, but it hits them two or three times, eventually they sort of get this idea, well, it's going to happen and I guess I'd better get on board.

Dr. B replied that the timing of a demo should be "at the point where it is inevitable ... if they are going to have to apply it themselves soon ... I'm not interested when it is a theoretical concern."

Dr. C supported a demo because:

It would be important for physicians ... we have to see it ... we are very visual people. That's why we go into medicine. It is not a

theoretical science; it's a hands-on, blood and guts kind of an occupation. Let me do it. Not just show me this, but we are all very; show me one and I will do it.

Dr. D thought that a demo for the majority of the physicians was not as important as for "others ... who want to be kept up to date ... and also to be able to have input into the design and the process." Dr. F suggested that you get physicians involved "who are the guys that will be using it a lot and who are the leaders."

Dr. G stated:

A demo [is] pretty key if you want them to not complain and feel involved, so maybe like a month, or a couple of months before this is going to come online, if you have some sort of meeting time, and some way of making things available to physicians at a time that they feel is convenient to them ... with food and coffee ... [like the] drug reps do it.

Dr. I replied, "It depends on which physicians you are talking about ... frequent users, I think the sooner they get in and take a look at it, probably the better for everybody ... although, you've got to be careful not to get the physician who is a computer nerd physician ... because that is not very many of us, you know."

Dr. J replied:

A demo would be all part of the implementation process, a demonstration and practice time ... I would ideally like to know about the plans of the future as soon as it is available ... as a group,

I think there would be an individual or someone from our group that would want to be more involved in the process.

And finally, Dr. K said:

We should see ... a demonstration of the system before the decision is made as to what system [is selected] ... I think it is hard for people who spend a lot of time sitting in front of a computer to recognize that people who don't sit in front of the computer all the time have a very, very different workflow and that is the subtlety that is missed in a lot of design of electronic medical record systems.

The last question asked for additional comments. Common responses were: PeaceHealth is moving too slowly to implement CPOE, that order sets are valuable, to make changes to the system only when necessary, and that CPOE will be helpful in the future. There was also a suggestion that implementation move forward with a combined paper and computer solution.

Dr. A said, "I think that in our fear ... of offending physicians, we get too slow on these processes and we spend too much time getting to where we are making them live as opposed to just a concept.... I think that a lot of times we just have to sort of do it and eventually they will come."

Dr. D stated, "I think they are doing this too slowly, but I can understand that there [are] cost issues involved here ... I think it is going to improve in the way it reduces errors, so if you know you have something that will reduce errors, I would think you would want to implement it ASAP."

Dr. B suggested that "order sets ... [are] one way it might become more attractive, pretty attractive to physicians, although they are already using them on paper." Dr. I suggested "I know you are always going to have changes [to the system], but to keep the changes down to the minimum and only if they actually need to be changed." Dr. L stated, "I think it will be helpful in the future for everybody ... you have all that information ... because patients obviously get frustrated that we don't have the results ... [to be able to] pull up the x-rays or lab results...that really helps us so that we don't have to call the other physician's office to find out what that result was."

Dr. K suggested:

[You have] a model where you still have paper, just like we have electronic medical record for H&Ps (history and physicals) but we have paper for progress notes, you still have paper to write orders on, or you can put it in the computer and all that happened with the paper orders is that somebody else transcribes it into the computer ... that would be potentially no impediment to workflow for the physician.

SUMMARY OF INTERVIEW DATA

Results of the interview data have been separated into two groupings. The first group of questions related to the overall perceptions of the 12 physicians, representing four of the Rogers' adoption categories (Rogers, 1983). The second group of questions related specifically to the

perceived attributes of innovations, most recently used by Ash (Ash, 1997). The patterns of responses are listed for each question.

Perception of CPOE questions were: how the physicians felt about plans to implement CPOE, how they thought CPOE would affect patient care, how CPOE might affect their workflow, how CPOE might affect other hospital personnel's workflow, if they thought that CPOE would help reduce medical errors, and if they had any personal experience with CPOE. No patterns of responses along the lines of the adoption categories for any of the perception questions were apparent.

Nine of the physicians supported the plans to implement CPOE at PeaceHealth with two mentioning that the plans were moving too slowly. Many were able to list benefits of CPOE.

All 12 physicians listed ways that CPOE would positively affect patient care. Themes were order accuracy, legibility of doctor's handwriting, order standardization, decreased error rates, and patient safety.

Six physicians stated that CPOE would negatively impact their workflow, while three stated that it would improve efficiency. No pattern of responses across adopter categories was noted.

All but one physician responded that CPOE would positively affect other hospital personnel's workflow with legibility factors, standardization,

and minimizing phone calls cited. The one response that workflow would be negatively impacted cited that using the computer was a concern.

All 12 physicians responded that they thought that CPOE would help reduce medical errors. Themes were: illegible handwriting, legibility of medication dosing, access to pharmacy system interaction and systemic cross checks, reduction of transcription errors, reducing hand-offs, and helping with orders that were outside the norm. One physician did caution about introducing new errors with CPOE.

Only four had used a CPOE system before with one response stating that they felt tied to the computer instead of to the patient and another recommendation to make sure all functions are interfaced.

Perceived attributes of innovations investigated were: Relative Advantage, Voluntariness, Ease of Use, Trialability, Compatibility, Image, Result Demonstrability, and Visibility.

Relative advantage was evaluated with the question as to whether CPOE would be an improvement over the current paper method. Seven thought that CPOE would be an improvement citing completeness, organization, no paper to lose, the absence of paper copies and potential diversion of drugs, and better access. The remaining five responded with mixed opinion with both positive and negative examples offered. Being

able to see flowchart data on paper was cited as a negative of using computers.

Voluntariness was elicited in the question asking physicians to comment on requiring the use of CPOE. Six felt that it should be mandatory, citing that it would not benefit to have two systems as not everyone would use it unless it was mandatory, and having two systems could create additional errors. Several physicians supported the implementation strategy of pilots until issues are resolved and then making CPOE mandatory.

Ease of use was represented by the question asking how important it would be to have CPOE be easy to use. All 12 physicians supported this concept. Specifics cited were that physicians represent a wide range of people and that many are not computer savvy, with a suggestion that those who are not, may need CPOE the most.

Trialability was represented by the question of how important it is for physicians to have the ability to try out the system before implementation. Six physicians thought that this was important, with five responding that they did not think it was important and one maybe. Themes within these responses were that it might be nice to try it out for about a month, but only if it would impact the implementation strategy; a trial is important for someone, although perhaps not for all physicians.

Compatibility was investigated with the question pertaining to a balance between adapting the system to physician workflow versus adapting workflow to the system. Seven thought this balance required a little of both, suggesting that the computer could replace inefficient workflow processes as well as d mimic efficient ones through the electronic process. Those that wanted the system to adapt to the physician workflow cited access and different patient "rounding" styles as important.

Image was addressed when the physicians were asked if they would like to be one of the first to use CPOE. Interestingly, four replied that they would not like to be one of the first to try CPOE, with representation from three of the adoption categories (1-Early Adopter, 1-Early Majority, and 2-Late Majority). Perceived impact on time and workflow were expressed as reasons not to be first. A desire to try new things and the inevitability aspects were mentioned for reasons to be first.

Result demonstrability was investigated when physicians were asked if they could explain the plusses and minuses of CPOE to colleagues. All but one agreed that they could. However, a distinction was made between explaining and getting buy-in or actually convincing a colleague to use CPOE.

Finally, Visibility was represented by the question concerning how important it was for physicians to see a demonstration of the system. All

12 responded that they thought this was important. Themes within these responses included the observation that physicians are visual people and that some physicians have a need to be involved.

There were also some specific suggestions to identify those that are particularly interested, those that would use the system the most, those who would serve as the leaders, and how to get them identified and involved at the beginning of the process. The beginning of the process was defined as either the purchase or the design phase. Further suggestions mentioned repeating demonstrations several times and timing them close to when the actual implementation is scheduled.

CHAPTER 5

DISCUSSION AND CONCLUSIONS

INTRODUCTION

This chapter includes a discussion of the results of the present study in light of previous research as well as the study's unique context. First, overall conclusions will be offered, followed by a discussion of each research question. Next, the limitations of the study will be presented. Finally, the implications of the results for theory, practice, and research will be discussed.

OVERALL CONCLUSIONS

Major overall conclusions are:

1. Medical specialty does not influence attitudes toward use of computers in medicine and healthcare, nor does it influence attitudes toward use of CPOE on medicine and healthcare. Neither was gender found to influence favoring CPOE implementation at PeaceHealth. However, more medical specialists, as opposed to surgical specialists, favor CPOE implementation at PeaceHealth than expected.
2. Years in medical practice does not influence response favoring implementing CPOE at PeaceHealth.
3. Self-ranking response on usual reaction to new technology

does influence attitudes toward use of computers in medicine and healthcare, attitudes toward use of CPOE on medicine and healthcare, or favoring CPOE implementation at PeaceHealth.

4. The perceived attributes of innovations of Ease of Use, Result Demonstrability, and Visibility were strongly supported by interview responses. Relative Advantage, although not thoroughly supported by the specific interview question, seemed to be supported by other questions. Voluntariness, Trialability, and Image were not consistently supported. It appeared that the concept of Compatibility was supported, even though the question did not allow for a yes or no response.

5. No patterns emerged within any of these attributes between the Diffusion of Innovation Theory adopter categories that were represented by the interviewees.

6. No steps of the processes of change construct within the Transtheoretical Model were identified during the interviews.

DISCUSSION OF RESEARCH QUESTIONS

Discussion of Question 1

What are the perceptions of community hospital physicians on computerized physician order entry prior to implementation?

There were several perceptions that were identified either via survey or interview. Over 80% had previously heard about CPOE and over

nearly 75% had heard of PeaceHealth's plans to implement CPOE.

This may have led to how easily physicians identified benefits of CPOE during the interview. They listed order accuracy, legibility of physician's handwriting, order standardization, decrease error rates, and patient safety as positives. They also listed impact on physician time and workflow as negatives. All of these have been published nationally in many different professional journals.

This study appears to refute the suggestion in the literature, that there might be a difference between medical specialists and surgical specialists in their support of CPOE. Although there was not a difference between medical and surgical specialists concerning the benefits of the use of computers or CPOE in medicine and healthcare, there were more medical specialists that favor CPOE implementation.

Literature has also suggested that younger physicians, who had more exposure to computers in medical school, may favor CPOE more. This was not supported by these data. Nor was there a difference in favoring CPOE by gender.

There was a strong correlation between the adopter categories within the Diffusion of Innovation Theory and benefits of computers and CPOE in medicine and healthcare and also in their favoring implementing CPOE at PeaceHealth.

These data appear to support Moore and Benbasat and Ash and Hebert in concluding that the Diffusion of Innovation theory is appropriate to consider in investigating information technology innovations and their diffusion within the healthcare setting among physicians. These data have highlighted that there is a normal distribution of the five adopter categories across this physician sample. The focus of Rogers' Diffusion of Innovation theory is on the individual factor; however, there are organizational and environmental components (Rogers, 1983). Ash concluded that the organization factors may be better predictors of innovation diffusion. These data suggest that the individual factor is an important aspect to consider in strategies for implementing CPOE (Ash, 1997).

Discussion of Question 2

What are some of the perceived attributes of innovations that could be addressed to enhance the diffusion of CPOE in a community hospital setting?

Even though all eight perceived attributes of innovations were not specifically supported by the interview responses, it is important to note that Ease of Use, Result Demonstrability, and Visibility were strongly supported. Additionally, concepts of Relative Advantage, Voluntariness, and Compatibility appeared to be generally supported within the

responses. However, Trialability and Image were surprisingly not supported by the responses.

Hebert (1994) based her investigation into the factors that influence nurses' intent to use bedside terminals and concluded that three attitude factors (compatibility, relative advantage, and result demonstrability) were the strongest predictors of behavioral intent—that is, the intent to use the point-of-care technology" (Hebert, 1994).

Discussion of Question 3

What are the steps of the change process that are most important to physicians, so an implementation strategy for CPOE could address these issues at the most appropriate time?

No specific questions within the survey or the interview questions related specifically to any of the activities within the processes of change contained in the Transtheoretical Model (TTM). Additionally, no responses appeared to relate to any of the concepts; therefore, it appears that this model may not be as useful as the Diffusion of Innovations in designing more successful CPOE implementation strategies. The lack of evidence appears to refute Smith's suggestion that the TTM "would be successful among physicians is a multi-factorial, stage-appropriate intervention, tailored to each physician's readiness to change" (Smith, 2000). The Readiness to Change construct within the TTM theory was not measured

within this study; however, it would be interesting to correlate "readiness to change" to the five adopter categories within the Diffusion of Innovation theory.

OTHER CONCLUSIONS

Another important component within Rogers' theory refers to communication channels. Rogers viewed communication about innovations as a two-way process rather than an attempt to persuade a target audience to take action. The two-way flow of communication, in which "opinion leaders" emphasize the value of social interaction over and above mass media, is important for innovation adoption decisions (Rogers, 1983). Equally as important as the channels of communication is the context of the message. Green, Gottlieb, and Parcels (1987) suggest that a "cognitively oriented intervention might be most appropriate for early adopters, a motivational emphasis might be most appropriate for the majority adopters, and later adopters might require efforts to overcome barriers" (Glanz et al., 1997).

LIMITATIONS OF THE STUDY

Instruments

Reliability. The survey had been validated previously and used in a modified manner with physicians. Cronbach's alpha consistency reliability had been applied to specific sections of interest on the survey.

Construct validity. Threats to internal validity include various aspects of the quality of the survey instrument. Although most of the scales had been deemed reliable in previous studies, specific statements within the constructs were changed to address the specifics of PeaceHealth's current electronic medical record and CPOE. Statements for these questions were intentionally mixed with positive and negative stems; however, this may have been confusing to the respondents. Unique statements were developed to address the adopter categories for this survey. Although content validity was accomplished by a two-member expert panel, no further testing was done on this construct.

Study Design

Statistical power. A convenience sample was used for distributing the survey instrument. Only the community hospital physicians at the three PeaceHealth hospitals with active admitting privileges were selected. An alpha level of 0.05 was used for the level of significance with this study limiting the probability of Type I error or, inappropriately rejecting a null hypothesis. With sample sizes of $N > 140$, using an moderate effect size of 0.30 resulted in a power of 94% for the chi-square tests with 1 degree of freedom. The t-test analysis used an $N > 100$ and therefore, resulted in a power of 56% with an effect size of 0.30. This level of statistical power

limits the risk of Type II errors or, failure to reject a null hypothesis when it is false.

Representatives of the sample: It is difficult to determine the characteristics of non-respondents and, therefore, there may have been some sampling bias in this present study. One possible cause may have been the omission of Family Practice as a specific medical practice choice. As mentioned earlier, the author received some surveys with comments regarding the refusal to complete the survey due to this omission. Another possible cause may have been that those less comfortable with computers were reluctant to complete and return the survey. A final cause may be the environmental or political factors in the three geographical areas. An anti-trust lawsuit had been publicized during this time as well as controversial plans to build a new hospital in the Eugene, Oregon area.

External validity: External validity refers to the ability to generalize from the statements from the sample to the population. The author feels confident about applying the conclusions to the physicians within PeaceHealth, However, due to the different environmental factors at other hospitals, generalizing to all physicians may be difficult.

Data analysis: The answer scales were considered ordinal for this analysis and therefore, chi-square tests were used to examine the relationship between variables. Physician's attitudes toward computers'

and CPOE's potential effects on medicine and healthcare were investigated at the individual statement level. A composite was used on several of the statements for analysis by adding the number of disagrees and agrees. These manipulations may weaken conclusions drawn from these data. Numeric values were assigned to these scales and used for inferential analysis. Several of the scales were recoded for variable comparisons.

Implications for Practice

The results of this study have implications for the CPOE implementation strategy at PeaceHealth. The Diffusion of Innovation theory should be used in developing this strategy. Communication should not be totally mass media, but messages should be targeted to the different adopter categories. The content of the messages should include information such as relative advantage (reduction of medical errors), ease of use (but try to minimize impacts on time and workflow), voluntariness (use will be optional initially), compatibility (the system will be adapted to physician workflow as much as possible), provide several demonstrations of the system (result demonstrability), and visibility (let the message come from peers). Physicians who would be using the system frequently, those who are interested or want to be involved, and those who are leaders should be involved in the planning stages of the implementation. The pilot

system should allow physicians to volunteer until all of the "bugs" are worked out and only at that point should they consider making it mandatory.

Community hospitals that are developing strategies to implement CPOE should use the Diffusion of Innovation theory in their approach to investigate whether the individual change theory approach is more successful than the currently proposed organizational change theory approach. The organization change theory approach relies upon mass communication rather than targeted communication to adopter categories. Current approaches also focus on implementing by medical floor, requiring all physicians who admit or care for patients to that particular unit to use CPOE. Implementing according to adopter categories would provide the option for interested physicians to use CPOE, to use CPOE on certain hospital units or patients, and to expand its use accordingly. Based upon the suggestions from physician interviews in this study, at some point it should be made mandatory.

An additional concept, that would be interesting to evaluate either in practice or research, is Rogers' (Rogers 1991) need for a "critical mass" of users for particular innovations. The critical mass is the point at which enough individuals have adopted an innovation so that rate of adoption becomes self-sustaining. Once this certain level of diffusion has been

reached, less interested and less innovative individuals are more willing to consider adopting the new innovation. This may also relate to the point where the "cognitively oriented intervention" that Green, Gottlieb, and Parcels (1987) suggest, becomes a motivational emphasis (Glanz et al., 1997). Voluntary adoption of CPOE should be investigated to determine at what point diffusion expands beyond earlier adopters giving empirical data and practical application to verify this concept.

Implications for Future Research

Due to the unique compilation of variables in this study, there are several directions for future research. First, it would be interesting to replicate this study after CPOE has been implemented at PeaceHealth to investigate whether conclusions and recommendations were carried out and if they are effective in a pre-post fashion. The Computers in Medical Care survey should be further used by to investigate community hospital physicians and academic centers that are about to implement CPOE. This could help to validate the use of the individual emphasis of the Diffusion of Innovation theory in adoption of healthcare information systems.

SUMMARY

This study used a multi-method approach to investigate the perceptions of community hospital physicians on computerized physician order entry (CPOE). Perceptions were assess by means of a mail survey to

659 physicians at three hospitals within PeaceHealth, Inc., located in either Oregon or Washington. The survey asked physicians to self-rank themselves on a scale that represented the five adopter categories contained in the Diffusion of Innovation (DOI) change theory. In addition, physicians representing four of the five adopter categories were interviewed to assess general perceptions as well as responses to questions that represented another construct within the DOI theory.

Research questions included:

1. What are the perceptions of community hospital physicians on computerized physician order entry prior to implementation?
2. What are the perceived attributes of innovations that could be addressed to enhance the diffusion of CPOE in a community hospital setting?
3. What are the steps of the change process that are most important to physicians, so an implementation strategy for CPOE could address these issues at the most appropriate time?

The response rate to the mail survey was 41%. The survey data were analyzed using bivariate techniques. The results indicated that there is a relationship between the adopter categories of the DOI theory and physicians' attitudes toward the potential effects of computers and CPOE on medicine and healthcare. The results further revealed that there is a

relationship between the adopter categories and favoring implementing CPOE at PeaceHealth. Additionally, interview data supported the importance of the perceived attributes of innovation within the DOI theory.

The results of the study suggest that the use of the DOI theory to design implementation strategies for CPOE may increase its success.

BIBLIOGRAPY

- Ash J. 1997. Organizational factors that influence information technology diffusion in academic health sciences centers. Journal of American Informatics Association 4(2):102-111.
- Ash JS, Gorman PN, Hersh WR. 1998. Physician Order Entry in U.S. Hospitals. Proceedings / American Medical Informatics Association 235-239.
- Ash JS, Gorman PN, Hersh WR, Poulsen SP. 1999. Perceptions of house officers who use physician order entry. Proceedings / American Medical Informatics Association 471-475.
- Ash JS, Gorman PN, Lavelle M, Lyman J. 2000. Multiple Perspectives on Physician Order Entry. Journal of American Informatics Association, Submitted.
- Ash JS, Gorman PN, Seshadri V, Hersh WR. 2003. Computerized Physician Order Entry in U.S. Hospitals: Results of a 2002 Survey. Journal of American Informatics Association PrePrint. 10.1197/JAMIA.M1427. 1-18.
- Ash JS, Lyman J, et al. 2000. A Diffusion of Innovations Model of Physician Order Entry. Proceedings American Medical Informatics Association 22-26.
- Bates DW, Cohen M, Leape LL, Overhage M, Shabot MM, Sheridan T. 2001. Reducing the Frequency of Errors in Medicine Using Information Technology. Journal of American Informatics Association 8:299-308.
- Bates DW, Kuperman G, Teich JM. 1994. Computerized physician order entry and quality of care. Quality Management in Health Care 2(4):18-27.
- Bates DW, Leape LL, Cullen DJ, Laird N, Petersen LA, Teich JM, et al. 1998. Effect of computerized physician order entry and a team intervention on prevention of serious medication errors. Journal of American Medical Association 280(15):1311-1316.

- Bates DW, Teich JM, Lee J, Seger D, Kuperman GJ, Ma'Luf N, et al. 1999. The impact of computerized physician order entry on medication Error prevention. Journal of American Informatics Association 6(4):313-321.
- Berg BL. 2001. Qualitative Research Methods for the Social Sciences. 4th ed. Needham Heights, Massachusetts. Allyn & Bacon.
- Brown JB, Boles M, Mullooly JP, Levinson W. 1999. Effect of clinician communication skills training on patient satisfaction. A randomized, controlled trial. Annals of Internal Medicine 131(11):822-829.
- Cabana MD, Rand CS, Powe NR, Wu AW, Wilson MG, Abbound PAC, Rubin HR. 1999. Why Don't Physicians Follow Clinical Practice Guidelines? A Framework for Improvement. Journal of American Medical Association 282(15):1458-1465.
- California HealthCare Foundation/First Consulting Group, 2000. A Primer on Physician Order Entry 3.
- Chertow GM, Lee J, Kuperman, GJ, et al. 2001. Guided Medication Dosing for Inpatients with Renal Insufficiency Journal of American Medical Association 286(22):2839-2844.
- Chin HL, Wallace P. 1999. Embedding guidelines into direct physician order entry: simple methods, powerful results. Proceedings / American Medical Informatics Association Annual Symposium 221-225.
- Cohen SJ, Halvorson HW, Gosselink CA. 1994. Changing physician behavior to Improve disease prevention. Preventive Medicine 23(3):284-291.
- Cork RD, Detmer WM, Friedman CP. 1998. Development and Initial Validation of an Instrument to Measure Physicians' Use of, Knowledge about, and Attitudes Toward Computers. Journal of the American Medical Informatics Association 5(2):164-176.
- Demakis JG, Beauchamp D, Cull WL, et al. 2000. Improving Residents' Compliance With Standards of Ambulatory Care Journal of American Medical Association 284(11):1411-1416.

- Eisenberg JM, Williams SV. 1981. Cost Containment and Changing Physicians' Practice Behavior. Journal of American Medical Association 246(19):2195-2201.
- Elder JP, Ayala GX, Harris S. 1999. Theories and intervention approaches to health-behavior change in primary care. American Journal of Preventive Medicine 17(4):275-284.
- Evans RS, Classen DC, Pestotnik SL, Lundsgaarde HP, Burke JP. 1994. Improving empiric antibiotic selection using computer decision support. Archives of Internal Medicine 154(8):878-884.
- Glanz K; Lewis FM; Rimer BK. 1997. *Health Behavior and Health Education: Theory, Research, and Practice*. San Francisco, CA: Jossey-Bass Inc.
- Grol R. 1997. Personal paper: Beliefs and evidence in changing clinical practice. British Medical Journal 315(7105):418-421.
- Harpole LH, Khorasani R, Fiskio J, Kuperman GJ, Bates DW. 1997. Automated Evidence-based Critiquing of Orders for Abdominal Radiographs: Impact on Utilization and Appropriateness. Journal of American Medical Informatics Association 4(6):511-521.
- Hebert M. Adopting Information Technology in Hospitals: The Relationship Between Attitudes/Expectations and Behavior. Hospital and Health Services Administration 39(3):369-383.
- Heffner JE. 2001. Altering physician behavior to improve clinical performance. Topics in Health Information Management 22(2):1-9.
- Heffner JE, Barbieri C, Fracica P, Brown LK. 1998. Communicating do-not-resuscitate orders with a computer-based system. Archives of Internal Medicine 158(10):1090-5.
- Kohn LT, Corrigan JM, Donaldson MS (eds): 1999. *To Err is Human: Building a Safer Health System: a report from the Committee on Quality of Healthcare in America*, Institute of Medicine, National Academy of Sciences. Washington, DC National Academy Press.

- Kuperman GJ, Cooley T, Tremblay J, Teich JM, Churchill W. 1998. Decision support for medication use in an inpatient physician order entry application and a pharmacy application. Medinfo 9(Pt 1):467-471.
- Kuperman GJ, Teich JM, Gandhi TK, Bates DW. 2001. Patient Safety and Computerized Medication Ordering at Brigham and Women's Hospital. Journal on Quality Improvement 27(10):509-521.
- Leape LL. 1994. Error in medicine. Journal of American Medical Association. 272(23):1851-7.
- Lee F, Teich JM, Spurr CD, Bates DW. 1996. Implementation of physician order entry: user satisfaction and self-reported usage patterns. Journal of the American Medical Informatics Association 3(1):42-55.
- Lesar TS, Briceland L, Stein DS. 1997. Factors related to errors in Medication prescribing. Journal of American Medical Association 277(4):312-317.
- Massaro TA. 1993a. Introducing physician order entry at a major academic medical center: I. Impact on organizational culture and behavior. Academic Medicine 68(1):20-25.
- Massaro TA. 1993b. Introducing physician order entry at a major academic medical center: II. Impact on medical education. Academic Medicine 68(1):25-30.
- McDonald, CJ. 1976. Protocol-Based Computer reminders, The Quality of Care and the Non-Perfectibility of Man. New England Journal of Medicine 295(24)1351-1355.
- Metzber J, Turisco F. 2001. *Computerized Physician Order Entry: A Look at the Vendor Marketplace and Getting Started*. California. The Leapfrog Group/First Consulting Group
- Moore GC, Benbasat I. 1991. Development of an Instrument to Measure the Perceptions of Adopting an Information Technology. Innovation Information Systems Research 2:192-222

- Ostbye T, Moen A, Erikssen G, Hurlen P. 1997. Introducing a Module for Laboratory Test Order Entry and Reporting of Results at a Hospital Ward: An Evaluation Study using a Multi-Method Approach. Journal of Medical Systems 21(2):107-117.
- Overhage JM, Perkins S, Tierney WM, McDonald CJ. 2001. Controlled Trial of Direct Physician Order Entry: Effects on Physicians' Time Utilization in Ambulatory Primary Care Internal Medicine Practices. Journal of the American Medical Informatics Association 8(4):361-71.
- Overhage JM, Tierney WM, Zhou XHA, McDonald CJ. 1997. A Randomized Trial of "Corollary Orders" to Prevent Errors of Omission. Journal of the American Medical Informatics Association 4(5):364-375.
- Oxman AD, Thomson MA, Davis DA, Haynes RB. 1995. No magic bullets: a systematic review of 102 trials of interventions to improve professional practice. Canadian Medical Association Journal 153(10):1423-1431.
- Penrod LE, Gadd GS. 2001. Attitudes of Academic-based and Community-based Physicians Regarding EMR Use During Outpatient Encounters. Proceedings American Medical Informatics Association 528-532.
- Portney LG, Watkins MP. 2000. Foundations of Clinical Research: Applications to Practice. 2nd ed. New Jersey. Prentice Hall Health.
- Poses RM. 1999. One Size does not fit all: questions to answer before intervening to change physician behavior. Joint Commission Journal on Quality Improvement 25(9):486-95.
- Prochaska JM, Prochaska JO, Levesque DA. 2001. A transtheoretical approach to changing organizations. Administration and Policy in Mental Health 28(4): 247-261.
- Prochaska JO, Velicer WF, Rossi JS, Goldstein MG, et al. 1994. Stages of Change and Decisional Balance for 12 Problem Behaviors. Health Psychology 13(1):39-46.

- Raschke RA, Gollihare B, Wunderlich TA, Guidry JR, Leibowitz AI, Peirce JC, et al. 1998 A Computer Alert System to Prevent Injury from Adverse Drug Events. Journal of American Medical Association 280(15):1317-20.
- Rind DM, Safran C, Phillips RS, Wang Q, Calkins DR, Delbanco TL, et al. 1994. Effect of computer-based alerts on the treatment and outcomes of hospitalized patients. Archives of Internal Medicine 154(13):1511-1517.
- Rogers EM. 1983. Diffusion of innovations. 3rd ed. New York. Free Press.
- Rogers EM, Shoemaker, FF. 1971. Communication of Innovations 2nd ed. New York. Free Press.
- Rothschild JM, Khorasani R, Silverman SG, Hanson RW, Fiskio JM, Bates DW. 2001. Abdominal cross-sectional imaging for inpatients with abnormal liver function test results: yield and usefulness. Archives of Internal Medicine 161(4):583-588.
- Salant P, Dillman DA. 1994. How to Conduct Your Own Survey. 1st ed. Indiana. John Wiley & Sons, Inc.
- Schriger DL, Baraff LJ, Rogers WH, Cretin S. 1997. Implementation of clinical guidelines using a computer charting system. Effect on the initial care of health care workers exposed to body fluids. Journal of American Medical Association. 278(19):1585-90.
- Singer J, Sacks HS, Lucente F, Chalmers TC. 1983. Physician attitudes toward applications of computer data base systems. Journal of American Medical Association 249(12):1610-1614.
- Sittig DF, Stead WW. 1994. Computer-based physician order entry: the state of the art. Journal of the American Medical Informatics Association. 1(2):108-123.
- Smith WR. 2000. Evidence for the Effectiveness of Techniques to Change Physician Behavior. Chest 118(90020)8S-17S.
- Solomon DH, Shmerling RH, Schur PH, Lew R, Fiskio J, Bates DW. 1999. A computer based intervention to reduce unnecessary serologic testing. Journal of Rheumatology 26(12):2578-2584.

- Southon FCG, Sauer C, Dampney CNG. 1997. Information Technology in Complex Health Services: Organizational Impediments to Successful Technology Transfer and Diffusion. Journal of the American Informatics Association 4(2):112-124.
- Stablein DS, Wlebob E, Johnson E, Metzger J, Burgess R, Classen DC. 2003. Understanding Hospital Readiness for Computerized Physician Order Entry. Joint Commission Journal on Quality and Safety 29 (7):336-344.
- Teich JM, Merchia PR, Schmiz JL, Kuperman GJ, Spurr CD, Bates DW. 2000. Effects of computerized physician order entry on prescribing practices. Archives of Internal Medicine 160(18):2741-2747.
- The SUPPORT Principal Investigators. 1995. A controlled trial to improve care for seriously ill hospitalized patients. The study to understand prognoses and preferences for outcomes and risk of treatments (SUPPORT). Journal of American Medical Association 274(20):1591-1598
- Tierney WM, Miller ME, Overhage JM, McDonald CJ. 1993. Physician inpatient order writing on microcomputer workstations. Effects on resource utilization. Journal of American Medical Association 269(3):379-83.
- Weiner M, Gress T, Thiemann DR, Jenckes M, Reel SL, Mandell SF, et al. 1999. Contrasting views of physicians and nurses about an inpatient computer-based provider order-entry system., Journal of the American Medical Informatics Association 6(3):234-244.
- Weir C, McCarthy C, Gohlinghorst S, Crockett R. 2000. Assessing the Implementation process. Proceedings / American Medical Informatics Association Annual Symposium 908-912.
- Woolf SH. 1990. Practice guidelines: a new reality in medicine. I. Recent developments. Archives of Internal Medicine 150(9):1811-1818.

APPENDICES

APPENDIX A: Cover Letter

March 14, 2003.

Dear Doctor:

Computerized Physician Order Entry (CPOE) is a process that allows physicians to enter medical orders directly into a clinical computer system instead of handwriting the orders and having hospital personnel transcribe these orders into the computer. CPOE has been shown to decrease medication errors as well as decrease duplicate and costly tests. PeaceHealth including (Sacred Heart Medical Center, St. John Medical Center, and Peace Harbor Hospital) have plans to implement CPOE in the near future. It is important to discover how community hospital physicians view the impending implementation of computerized physician order entry to be able to better adapt the implementation process and communication. Additionally, this will add to the body of knowledge regarding physicians' perceptions regarding computerized physician order entry since research to date has been in academic medical centers.

This will be one of the first opportunities to implement computerized physician order entry in a community hospital setting, and therefore, important to identify physicians' perceptions prior to implementation. In order that the results will truly represent the thinking of the physicians at these three hospitals, it is important that each questionnaire be completed and returned in the enclosed self-addressed stamped envelope. In addition to completing this voluntary questionnaire, please consider volunteering to be one of twenty-five physicians that will be chosen to participate in a one-hour face-to-face interview by completing the final question.

You may be assured of complete confidentiality. The questionnaire has an identification number for mailing purposes only. This is so that we may check your name off the mailing list when your questionnaire is returned. Your name will never be placed on the questionnaire.

The results of this research will be used to satisfy doctoral dissertation requirements at Oregon State University. Therefore, the results will be in the write-up of this study and possible future documents. Additionally, it may be used to adapt an implementation process for CPOE at PeaceHealth. You may receive a summary of results by writing "copy of results requested" on the back of the return envelope, and printing your name and address below it. Please do not put this information on the questionnaire itself.

If you have questions about the project, please contact Dr. Leonard Friedman at Leonard.Friedman@oregonstate.edu or call (541) 737-2323 or Brian E. Churchill at Bchurchill@peacehealth.org or call (541) 984-4012. If you have questions about your rights as a participant in this research project, please contact the Oregon State University Institutional Review Board (IRB) Human Protections Administrator at IRB@oregonstate.edu or call (541) 737-3437.

Sincerely,

Leonard Friedman, PhD.

Brian E. Churchill, MS, RN

APPENDIX B: Computers in Medical Care Survey, PeaceHealth, Inc.

Computers in Medical Care Survey PeaceHealth, Inc.

Q1. Which of the following best describes your current main practice specialty? (Circle one number)?

- | | | | |
|---------------------------|-----------------------|---------------------------------------|---------------------|
| 01 Allergy & immunology | 10 Internal Medicine | 19 Oral & maxiofacial surgery | 27 Radiology |
| 02 Anesthesiology | 11 Infectious disease | 20 Orthopaedic surgery | 28 Surgery |
| 03 Cardiology | 12 Nephrology | 21 Otolaryngology | 29 Thoracic surgery |
| 04 Cardiothoracic surgery | 13 Neurology | 22 Pathology | 30 Urology |
| 05 Dermatology | 14 Neurosurgery | 23 Pediatrics | 31 Other: _____ |
| 06 Emergency Medicine | 15 Nuclear Medicine | 24 Physical medicine & Rehabilitation | |
| 07 Endocrinology | 16 OB/GYN | 25 Plastic Surgery | |
| 08 Family Practice | 17 Oncology | 26 Psychiatry | |
| 09 Gastroenterology | 18 Ophthalmology | | |

Q2. How many years have you practiced the area of medicine you indicated in Q1?
_____ YEARS

Q3. Please circle the number of the statement that best describes your usual reaction to new technology:

1. I am usually the first physician in my area to try new technology.
2. I am usually one of the first few physicians in my area to try new technology.
3. I usually try new technology once I have seen other physicians use it successfully.
4. I will only try new technology once I have seen many other physicians in my area use it successfully.
5. I am usually one of the last physicians in my area to use new technology.

Q4. In the following table, please first indicate whether or not you currently use a Computer at each location listed. For each location that you do use a computer, please indicate what kind of computer you use most often. (Circle the appropriate corresponding number):

	Use?		If yes, what kind?			
	NO	YES	MACINTOSH	PC OR COMPATIBLE	HANDHELD DEVICE	TERMINAL CONNECTION TO MAINFRAME
a. At work.....	1	2 →	1	2	3	4
b. At your office..	1	2 →	1	2	3	4
c. At home.....	1	2 →	1	2	3	4

IF YOU DO NOT USE A COMPUTER AT ANY LOCATION LISTED IN THE TABLE ABOVE PLEASE SKIP NOW TO QUESTION 9.

Q5. To what extent do you personally use a computer for each of the following professional tasks? Please respond based on your personal actions versus what someone else does for you. If you never perform this task (either with or without a computer) respond in the shaded area. (Circle one number for each task)

I perform this task and in its performance, I use a computer:

1. *Never*
2. *Sometimes*
3. *Often*
4. *Always*

	1	2	3	4
a. Documenting patient information (e.g., history & physicals, progress notes)	1	2	3	4
b. Accessing clinical data (e.g., laboratory data, EKGs, radiology reports)	1	2	3	4
c. Communicating with colleagues (e.g., email)	1	2	3	4
d. Obtaining advice on a specific patient's diagnosis or therapy (e.g., internet, other electronic sources)	1	2	3	4
e. Scheduling patient appointments	1	2	3	4
f. Writing (e.g., grants, papers, teaching material)	1	2	3	4
g. Preparing presentation slides or overheads	1	2	3	4
h. Searching Internet-based clinical information (e.g., MEDLINE)	1	2	3	4

5. I NEVER PERFORM THIS TASK (either with or without a computer.)
5
5
5
5
5
5
5
5

Q6. Do you personally use email? (circle)

- 1 NO → GO TO Question 7
2 YES

Q6A. If yes, how frequently do you check your email? (circle your answer)

- 1 2-3 TIMES PER DAY
2 DAILY
3 3-4 TIMES PER WEEK
4 WEEKLY
5 MONTHLY

Q6B. If yes, with whom do you communicate using email? (Circle one number for each)

	YES	NO
1. CLINICAL COLLEAGUES.....	1	2
2. PATIENTS.....	1	2
3. FRIENDS.....	1	2
4. OTHER (please specify: _____)		

Q7. Do you use the Internet (i.e., World Wide Web, WWW)? (Circle one number)

- 1 NO → GO TO Question 8
2 YES

Q7A. If yes, how frequently do you access the Internet? (Circle one number)

- 1 DAILY
2 3-4 TIMES PER WEEK
3 WEEKLY
4 MONTHLY

Q7B. If yes, which Internet websites and services do you use regularly? (Circle one number for each kind)

	YES	NO
1. CLINICAL CARE INFORMATION WEBSITES (e.g., MDConsult, PDR).....	1	2
2. PROFESSIONAL SOCIETIES' WEBSITES (e.g., AMA, ACP).....	1	2
3. GOVERNMENT ORGANIZATIONS' WEBSITES: (e.g., NIH Centers, MEDLINE/PubMED).....	1	2
4. INTERNET SEARCH ENGINES (e.g., YAHOO).....	1	2
5. NEWSGROUPS OR LISTSERVES.....	1	2
6. SOFTWARE, UPGRADES, OR TECHNICAL SUPPORT WEBSITES.....	1	2
7. OTHER (please specify: _____)		

Q8. Do you use the PeaceHealth LastWord computer system? (circle your answer)

- 1 NO → GO TO Question 9
2 YES

Q8A. If yes, how frequently do you use the PeaceHealth LastWord computer system?

- 1 HOURLY
2 2-3 TIMES PER DAY
3 DAILY
4 3-4 TIMES PER WEEK
5 WEEKLY
6 MONTHLY

Q9. Do you access the PeaceHealth LastWord computer system remotely from your home? (Circle one number)

- 1 NO → GO TO Question 10
2 YES

Q9A. If yes, how frequently do you access the PeaceHealth LastWord computer system remotely from your home? (Circle one number)

- 1 DAILY
2 3-4 TIMES A WEEK
3 3-4 TIMES A MONTH
4 MONTHLY OR LESS

Q10. Was a hospital computer system available during your medical training? (Circle one number)

1 NO → GO TO Question 11

2 YES

→ **Q10A. If yes, was its use Mandatory? (Circle one number)**

1 NO

2 YES

Q11. What training or experience with computers have you had, if any? (Circle one number for each)

	YES	NO
1 FORMAL COURSE (S) IN COMPUTER SCIENCE OR RELATED FIELD	1	2
2 FORMAL MEDICAL SCHOOL TRAINING IN COMPUTERS	1	2
3 FORMAL RESIDENCY OR FELLOWSHIP TRAINING IN COMPUTERS.....	1	2
4 WORKSHOPS OR CONFERENCES ON COMPUTERS.....	1	2
5 SELF-GUIDED LEARNING ABOUT COMPUTERS	1	2
5 ON-THE-JOB TRAINING	1	2
7 NONE.....	1	2

Q12. On the whole, how sophisticated a computer user do you consider yourself? (Circle one number)

- 1 SOPHISTICATED
- 2 SOMEWHAT SOPHISTICATED
- 3 NEITHER SOPHISTICATED NOR UNSOPHISTICATED
- 4 SOMEWHAT UNSOPHISTICATED
- 5 UNSOPHISTICATED

Q13. Given below are some potential effects that computers may have on medicine and Healthcare. For each, indicate whether you agree or disagree with the statement using the scale below: (Circle the appropriate corresponding number)

Potential effect of computers:	Agree	Somewhat Agree	Neither Agree nor Disagree	Somewhat Disagree	Disagree
a. Costs of healthcare <u>decrease</u>	1	2	3	4	5
b. Clinician autonomy <u>decreases</u>	1	2	3	4	5
c. Quality of healthcare <u>improves</u>	1	2	3	4	5
d. Interactions within the health care team <u>diminish</u>	1	2	3	4	5
e. Enjoyment of the practice of medicine <u>decreases</u>	1	2	3	4	5
h. The rapport between clinicians and patients will <u>decrease</u>	1	2	3	4	5
i. Personal and professional privacy is <u>improved</u>	1	2	3	4	5
j. Patients' satisfaction with the quality of care they receive <u>increases</u>	1	2	3	4	5

Q14. Have you heard about Computerized Physician Order Entry (CPOE)? (circle your answer)

- 1 NO
- 2 YES
- 3 WOULD LIKE MORE INFORMATION

Q15. Have you heard of PeaceHealth's plan to implement Computerized Physician Order Entry (CPOE)? (circle your answer)

- 1 NO
- 2 YES
- 3 WOULD LIKE MORE INFORMATION

Q16. Are you in favor of implementing Computerized Physician Order Entry (CPOE) at PeaceHealth? (circle your answer)

- 1 NO
- 2 YES
- 3 NEED MORE INFORMATION

Q17. Was a Computerized Physician Order Entry (CPOE) system available during your medical training? (circle your answer)

- 1 NO → GO TO Question 18
2 YES

Q17A. If yes, was it's use Mandatory? (circle your answer)

- 1 NO
2 YES

Q18. Below are some Potential Effects that Computerized Physician Order Entry (CPOE) may have on medicine and healthcare. For each, indicate whether you AGREE or DISAGREE with the statement using the scale below: (Please circle the appropriate corresponding number)

Potential effect of CPOE:	Agree	Somewhat Agree	Neither Agree nor Disagree	Somewhat Disagree	Disagree
a. Patient care will be <u>improved</u>	1	2	3	4	5
b. Physician workflow will be <u>negatively impacted</u>	1	2	3	4	5
c. Nurse workflow will be <u>improved</u>	1	2	3	4	5
d. Pharmacist workflow will be <u>improved</u>	1	2	3	4	5
e. Enjoyment of the practice of medicine will be <u>negatively impacted</u>	1	2	3	4	5
f. Communication between physicians and caregivers will be <u>negatively impacted</u>	1	2	3	4	5
g. Patients' satisfaction with the quality of care they receive will <u>improve</u>	1	2	3	4	5

Demographics

Q19. What is your age?: _____ YEARS

Q20. What is your gender? (circle your answer)

- 1 FEMALE
2 MALE

Q21. Would you be willing to continue to participate in this research project with a 1-hour personal interview?

- 1 NO
2 YES

Thank you for completing this questionnaire

© Cork RD, Detmer WM, Friedman CP (1998), © Gadd CS, Penrod LE (1999), © Churchill BE (2003)

APPENDIX C: Interview Cover Letter

November 14, 2003

Dear Doctor:

Thank you again for completing and returning a completed "Computers in Medical Care Survey!"

You had indicated that you would be willing to continue to participate in this research with a personal interview. Brian Churchill will be contacting your office in the near future to schedule a 1-hour appointment. Attached are a copy of the interview questions and a copy of an Informed Consent form.

If you have questions about the project, please contact Dr. Leonard Friedman at Leonard.Friedman@oregonstate.edu or call (541) 737-2323 or Brian E. Churchill at Bchurchill@peacehealth.org or call (541) 984-4012. If you have questions about your rights as a participant in this research project, please contact the Oregon State University Institutional Review Board (IRB) Human Protections Administrator at IRB@oregonstate.edu or call (541) 737-3437.

Thank you again for participating in this important research to discover how community hospital physicians view the impending implementation of computerized physician order entry to be able to better adapt the implementation process and communication.

Sincerely,

Leonard Friedman, PhD.

Brian E. Churchill, MS, RN

APPENDIX D: Informed Consent

Informed Consent Document

Oregon State University
College of Health and Human Science
Department of Public Health

**"Community Hospital Physicians' Perceptions of
Computerized Physician Order Entry"**Investigators:

Principal Investigator: Leonard Friedman, Ph.D., Associate Professor, Department of Public Health, College of Health and Human Science, Oregon State University.

Additional Investigator: Brian E. Churchill, MS, RN

Computerized Physician Order Entry (CPOE) is planned for implementation at the hospitals of PeaceHealth, Inc., including Sacred Heart Medical Center, Peace Harbor Hospital, and St. John Medical Center, in the near future. Current literature has focused on the perceptions of residents and physicians in academic medical centers regarding computerized physician order entry. It is important to the implementation plans at PeaceHealth, in addition to the general body of knowledge, how community hospital physicians' perceive CPOE prior to implementation.

I understand that participation in this study is voluntary. I may refuse to answer any question or withdraw from the interview at any time without penalty. My comments may benefit the implementation strategies of CPOE at PeaceHealth hospitals. Removing any identifying information will minimize any risk to me. Participation will include the following:

- I will be interviewed according to a list of questions that I will be supplied.
- The interviewer will take handwritten notes.
- A tape recorder will capture my comments.
- Comments will be transcribed with NO personal identifying information and tapes will be erased after transcription.
- My comments will be used to describe general themes in the write-up of this study and possible future documents.

I understand that any questions I have about the research study or specific procedures should be directed to Leonard Friedman, Ph.D., Associate Professor, Department of Public Health, College of Health and Human Science, Oregon State University. 315 Waldo Hall, Corvallis, Oregon 97331, **Email:** Leonard.Friedman@oregonstate.edu | **Phone:** (541)-737-2323. If I have any questions about my rights as a research subject, I should contact the Oregon State University Institutional Review Board (IRB) Human Protections Administrator at (541) 737-3437 or via **Email:** IRB@orst.edu.

I understand that the interview will take approximately one-hour.

I will have the option of seeing the transcription of my comments and copies of the final research document.

I will receive a copy of this signed informed consent document for my future reference.

Signature: _____

Date: _____

APPENDIX E: Interview Questions

Computers in Medical Care

Interview Questions:

1. I'm here to find out more about your perceptions of CPOE. Have you heard about PeaceHealth's plans to do this? If so, how did you hear about it?
2. How do you feel about the plans to implement CPOE? Why do you feel that way?
3. Do you think CPOE will affect patient care? In what way do you think it might be affected?
4. How do you think that CPOE would affect your workflow?
5. How do you think that CPOE would affect the productivity of other hospital personnel?
6. One reason that hospitals implement CPOE is because it is supposed to reduce medical errors. Do you think it might help here?"
7. Do you have any personal experiences with a CPOE system? What happened?
8. We are all used to the current paper method. Do you think CPOE will be an improvement over it? Why or why not?
9. Some hospitals require use of CPOE and others make it optional or strongly encourage it. What do you think would be best for this hospital?
10. How important do you think it is that CPOE be easy to use at this hospital?
11. How important is it that you have the ability to try out the system before implementation?

12. Most people feel that there needs to be a balance between adapting the system to your workflow and adapting your workflow to the system. What are your thoughts on this?
13. If CPOE were to be phased in, would you like to be one of the first to use it?
14. How hard would it be for you to explain the pluses and minuses of CPOE to your colleagues?
15. How important would it be for physicians to have an opportunity to see a demonstration of the system? At what point in the process

APPENDIX F: Interview Transcripts

Interview Dr. A

I: A few questions, I'm here to find out more about your perceptions of CPOE. Have you heard about PeaceHealth's plans to do this?

R: Yes.

I: What have you heard?

R: Well, I actually have been part of the planning for this, so I have heard that the plans are to eventually get to where CPOE is the standard for hospital order entry, but that this is a process that has to be gone through and we'll get there eventually to the final goal.

I: Great. How do you feel about the plans to implement CPOE?

R: I think it is a very good thing to do.

I: Okay.

R: I also think that I'd like to see it happen faster than it is, but...

I: Okay. And, sort of, why is it that you feel that it is a good thing?

R: Several issues: 1. There has always been a big issue with doctors and handwriting and this is certainly much easier to read. I think the fact that we've gone to a computer system for part of our charting, that the natural extension is to have your orders in there so you really have more of a one stop, sort of, shopping kind of thing.

I: Unhuh

R: And, certainly there are studies that suggest that from a med standpoint that things are more accurate when they are in a computer order entry type of system. You have the ability to check for adverse reactions, you get better...a clearer description of what you are asking for, or, you know, there is not as many chances to have an error over how you wrote the prescription, that type of thing.

I: Great. And, as far as affecting...CPOE affecting patient care, do you think that it will affect patient care?

R: I think it will improve it.

I: Okay. And, in what particular ways?

R: Well, I think the biggest things are going to be accuracy.

I: Okay.

R: And, the bulk meds and just, in general, for orders. I think even to the standpoint of things like chest x-rays and putting the right thing on there as to why you want the chest x-ray done as opposed to the nurse trying to figure out what to put on the form. And, I think for those of us that work in offices, being able to have all of the orders on the chart and everything will make it much easier for us to manage patients from the office...you

know, that are in the hospital from our office and not having...have difficulty getting access to information.

I: Great. That's a great point. How do you think that CPOE would affect your workflow?

R: I think initially it's going to slow it down for...until I get used to it. But, I think in the long run, it is going to improve it considerably, especially when I can do all of my orders online, both admit and any additional orders that I want, because it will make it much simpler for me to...right now it's really slow to do an extra order, because you have to call the nurse, wait for them to get to the phone, and all of the other kind of stuff and then you're never quite sure if they got the order accurately, even though they repeat it back to you, you are never sure if it really got put down the way you want it, whereas if I'm just going to get into the computer and do it, I know it's the way I intended it.

I: Right. Good. How do you think that CPOE would affect productivity of other hospital personnel?

R: Well...[laughter] I think, I personally think in the long run, it's going really improve it, especially, like for instance, if I'm entering the orders in the computer, that means they don't have to enter them in the computer and that improves workflow. I think the biggest thing is that it is going to change workflow and some of it is still a quite an intangible as to whether that is better, worse, or what because it's...but it will definitely change workflow.

I: Right.

R: And, I think in the long run, for the better, but, like I say, that's an intangible still, I think.

I: Right. Any particular people, I mean, any staff in mind that you have, as far as, I mean, nurses and pharmacists and...

R: Well, I think from the standpoint of the nurses, right now the process apparently is that they have to enter some of the orders into the computer themselves, but both them and the ward clerk.

I: Right.

R: If we're entering them, that's obviously a step they don't have to do. So, I think that helps their workflow a lot. I think from the standpoint of pharmacy, once we get the...have everything built as to how the...you know, what times and the doses and that type of thing, the pharmacy, I think, will have less things that they have to redo. I mean less times they have to change, less things they have to call us about, say, "Well you know this isn't the right dose", or whatever.

I: Right.

R: I think that there will still be some of that always, but it will be a lot less of it.

I: Good. One reason that hospitals implement CPOE is because it is supposed to reduce errors. Do you think that this might help here?

R: Yes.

I: Okay.

R: Mostly for what I've said about...

I: Okay. ...illegible handwriting, and all of the other stuff.

R: Yeah.

I: Good. Do you have any personal experience with CPOE systems in the past?

R: Nothing where I've had any hands on experience, no.

I: We're all used to the current paper method, do you think CPOE will be an improvement over it? I think you've sort of...

R: Yeah, and actually in the office, we've pretty well gone to where we're paperless...reasonably paperless, anyway.

I: Yeah.

R: And, we've found that's improved things a lot as far as being able to find things.

I: So, the records are more complete?

R: They are more complete. It's easier to pull up what you want. The trouble with paper is that it may be in there but it may be stuck to another piece of paper or it may be...looking through paper has always been frustrating to me because you can look and look and it can be there but you miss it every time you go to look, whereas in the computer, if you know where to look, it's there.

I: Umhmm.

R: I mean, all you have to do go there, bang, it's there, and so once you know where to look, it's much easier to find things in the computer.

I: Great. Some hospitals require the use of CPOE and others make it optional or strongly encourage it. What do you think would be best for this hospital? Mandatory or voluntary?

R: I think it should be mandatory.

I: Right off the bat? Or, after a period of time? Or,

R: I think that...I think it needs to be phased in. I think you need to figure out the...you know, you start with a few groups and get the things figured out and during that time while you are working with the few groups, you could let there be sort of optional for everybody else, but I think once you've worked out the bugs, that at some point need to make it mandatory; otherwise, you are working in two worlds and you are not getting the benefit then, you are really not getting the...some of the people that might need to be from the legibility standpoint might need to use the computer are some of the ones who don't want to use the computer, so I think eventually you have to make it mandatory.

I: Okay. How important do you think it is that the CPOE be easy to use?

R: That's really important.

I: No brainer, sorry, but...

R: Especially since you have to...since you are talking about such a wide group of people that some of them very...not very computer savvy and they're the ones that you really need to convince, and they need a really easy system.

I: Right. How important is it that you think they have the ability to try out the system before implementation?

R: I think everybody should be given the option to do that. Some people will want that, some people won't, to a greater extent. Some people, you know, have worked with the computer system and know that it is not that hard for them to make that next step and then you have the people who don't use the computer now who need a lot of time to try it out.

I: Right. Most people think there needs to be a balance between adapting the system to your workflow and adapting your workflow to the system.

What are your thoughts on this?

R: Well, I think in the end it's a little bit of both.

I: Okay.

R: I think there's no way to make it exactly like what you are used to doing on paper, but I think you can sort of meet in the middle somewhere.

I: Okay. On that, I've heard comments about...from some physicians that have said, "Well, gee, you know, it's a computer, you should be able to make it do anything and it needs to do...it needs to do things exactly the way that I'm used to doing it now."

R: Well, the thing about that is that some of those things that we are used to doing aren't very efficient and it needs to sort of meld the things we do well with the things that the computer does well and somewhere in between is a, you know, a better answer than just doing everything the way I used to do it, just because I've done it for about 20 years.

I: You bet. You are absolutely right, paper and computers are just different and I think, you know, some people suggested that we should try to take advantage of the efficiencies in computers.

R: Yeah. I mean, I think it's just like RX Pad.

I: Yeah.

R: You know there is some...I don't write prescriptions the same way I did before, my flow is not exactly the same, but it's 10 times faster and better.

I: Right. Great. If CPOE were to be phased in, would you like to be one of the first to use it?

R: Yes.

I: [laughter] evidently. And, how hard would it be for you to explain the pluses and minuses of CPOE to your colleagues?

R: Well, I mean, I can certainly easily explain the benefits and I think I can be quite an advocate for it, but I think the problem that I've found in the past with other parts of the computer system is that it's easy to explain that to the people that want to listen, but there are the people who are very convinced it isn't going to be as good and it is very hard to talk to them, even if you are the most...

I: Right.

R: Best advocate in the world. So, but, I think...you know, in the past I've done that for our own group.

I: Right.

R: And, I've found that if you just sit there, you know, you go through it with them, you show them a demo and you say, "Well, you know this will get you faster and this will get you faster," you can actually convince some people, but it's, you know, it's a tough thing when you get people that don't want to...who think it's...you know, they're sure it's not going work for them, no matter what.

I: Right. And, how important would it be for physicians to have an opportunity to see a demonstration of the system?

R: I think it helps.

I: Okay.

R: I don't know that it's...I mean it's part of the whole process.

I: Right. At what point do you think is it most important?

R: Well, I think the best thing is to do it several times.

I: Right.

R: To do it early, when you are saying, "Well, Dr. So and So is going to be doing a pilot and this is what we are going to do."

I: Okay.

R: And then bring it back at the end of the pilot and say, "This is what we found", and then you know, maybe when it's time for them to go live with it, do it a third time, or something of that nature, where it's easing into them, that it's going to happen. Doctors are really hard to change and if you just drop something on them all at once, they bow their back, but if it hits them two or three times, eventually they sort of get this idea, well, it's going to happen and I guess I'd better get on board.

I: Okay. How do you think, as far as getting them involved in that, how best...because you've delineated sort of like three times, and that's equals an amount of time for them, how...should we be reimbursing physicians for this time?

R: Well, I don't think so, but I think that it's kind of one of these deals where the best time...you know you are never going to get all of the physicians to come to these things, number one.

I: Right.

R: The best time is probably things like staff meetings or something where you are going to get the biggest bang for your buck of the people that are interested and then everybody else...you know, and sort of advertise that that's going to happen...

I: Right.

R: And, then after that, you are going to get them or you are not. Some people will avoid it no matter what you do.

I: Right. Absolutely. Good. That is the limit of my formal questions. Any additional comments from your perspective.

R: No, well, I guess the only thing...my biggest comment is that, and I don't know if it really has anything to do with your study, but is that, I think that in our fear to...of offending physicians, we get too slow on these processes and we spend too much time getting to where we are making them live as opposed to just a concept, and I think that a lot of times we just have to sort of do it and eventually they will come..

I: Umhmm. Right.

R: As opposed to wringing your hands about whether nursing is going to be ready, or whether doctors are going to be ready, or whether...because they are none of them are going to be ready until you say it is here and we've got to use it.

I: Right. Okay. Well thank you very much, because again, obviously the comments from today are going to augment the information that I have from the survey and so that will help me as I move forward with writing the dissertation and finally completing my PhD, as well as you know, I'm involved with the implementation and we're hoping that some of the comments from not only from the survey, but also from the interviews themselves will help us, you know, structure implementation strategies for within PeaceHealth and a lot of what you've said here really makes a lot of sense, especially since we are so involved in trying to set this scope for here. I'm trying to develop the scope right here. So, again, I really appreciate your time and I'll let you know how this turns out. Thanks!

Interview - Dr. B

I: I'm here to find out more about your perceptions of computerized physician order entry. Have you heard about PeaceHealth's plan to implement CPOE?

R: Yes.

I: And, what have you heard?

R: That it's going to happen someday, whether we want it or not.

I: Okay.

R: And how and what the progression will be is yet to be determined.

I: How do you feel about those plans?

R: About how I felt about all computer things for the past 15 years.

I: Okay. Which is?

R: Seductive in its potential and fraught with problems in its implementation.

I: Okay. And, as far as the problems with implementation, any specifics on that?

R: Well, I've worked in several different computerized systems in the Army before coming here eight years ago.

I: Okay.

R: at Tripler Army Medical Center which was a beta test site for their system.

I: Unhunh

R: And in Washington D.C. before that and then we've gone through [insipient?] programs. In each case, the ICUs were exempted because of the need for rapidity of their changing and difficulty with pick-list menus. I found them very useful for pharmacy...

I: Okay.

R: In hospital situations where you could...

I: Umhmm

R: Enter and get the pharmacy details and very good for labs. But what little I saw in the nursery environment for order entry, there were just exhaustive pick lists, tedious to wade through and without much flexibility in those instances where something doesn't quite fit, so you can spend a lot of time going through multiple choice lists and not quite finding what you want is kind of frustrating.

I: Okay.

R: Even though ideally in the newborn nursery setting, and in the NICU too, that they should be fairly ideal situations because a lot of the situations are similar and could be order settled. They're nice because different physicians could develop their own order sets...

I: Umhmm

R: They didn't have to be institutional order sets.

I: Right.

R: And it could be efficient and time saving in some respects, but as far as the nursing documentation...it's a little harder. Actually there is another system that I've worked with briefly for two weeks at [Madigan] Army Medical Center when I was in the reserves and stayed there, but the doctors seemed to be fairly happy with, in fact. They had eliminated paper charts at the bedside.

I: Unhunh

R: And this was probably six years ago I was there.

I: Right.

R: And they truly had eliminated paper.

I: Great.

R: Both the nurses and doctors were using it all, and all the notes were entered computerized and they had bedside radiology access, for routine x-rays.

I: Great. Physician progress notes and that sort of thing, did you dictate them or did you type them.

R: They were typed in.

I: So, you typed them?

R: During that two weeks that I was there, as a reservist, yes.

I: [laughter]

R: ...But, see that's a the training center, where they have residents, and I've found in both of those settings, that residents pretty much just bow to what they are told to do, in a traditional residency in bringing the older staff on board in the same way is really challenging.

I: Right. Actually that is one of the things that I'm hoping to identify with my research is that a lot of the research that has been done, as you point out, has been on residents and interns, and actually after CPOE systems have been implemented and my bent on it is that I'm hoping to find out and [tease out the?] differences in incentives for community hospital physicians.

R: That's right, and I'm probably a good one to talk about it because I've been around...

I: Yeah.

R: I was a fellow in Washington D.C. when that system was just getting up and I was...so, I wasn't at the lowest resident echelon, but I was first tier above monitoring them and similarly, at the [Tripler?] Army Medical Center, I was covering young staff, but I was very aware of the differences between what they had to do and what I had to do.

I: Yeah.

R: I fell into that older doctor age group, but just barely.

I: Unhunh. Well, the other thing is also getting information before a system is implemented and getting feedback on some of the things that you just mentioned, that were your experiences that made the implementation maybe not go quite as well. Hopefully, some of those types of things that now, I will be able to identify with our research as well as my role of helping PeaceHealth to roll this out, but perhaps we can take some of your recommendations and put those into our strategy, implementation strategy.

R: One thing they were doing in Hawaii, they had done, since it was a beta test site of our new system and they had fairly frequent meetings with the actual users, with the residents from what was working and what was cumbersome and what could be improved...

I: Great.

R: Attempt to improve it as you go along, but they're the ones, the younger physicians just out of training, and they clearly were amenable and they are more computer savvy. They've grown up using computers, they've grown up typing their information, they are generally better typists. I think that's a big element in it too. I don't know where the break point is, what year exactly, but I'm sure you get a sense...where you are in training.

I: Right.

R: And I think the facility you are typing is a component in it.

I: Wow. That's a real good observation. Do you think that CPOE could or would affect patient care?

R: Could, yeah.

I: In what way?

R: Fairly obvious is the legibility of doctors and standardization...when it's a good thing.

I: Unhunh

R: Is a good thing.

I: Right.

R: And it could affect it negatively on instances when it's very hard to incorporate an exception to what the order set was and what the pick list included.

I: Right.

R: And could negatively impact patient care when you can't detail...

I: Right.

R: A finely tailored plan. I find that true when you are hand-writing orders also, and even when you are talking to the nurse at the bedside. If it is something that they are not accustomed to, it is not part of the nature of a system.

I: Right.

R: It's always a struggle with the human nature factor as well as the computer factor.

I: You bet. How do you think that CPOE would affect your workflow?

R: Not good. It would slow it down.

I: Okay.

R: Because you enter codes, the typing factor...

I: Okay.

R: And there are just patterns of how people work, become accustomed to...

I: Right.

R: I find that I, when I'm working on something, I don't type it, I write it. My brain works differently and I think differently when I'm writing and making notes in longhand, then when I'm interacting with a computer screen.

I: Right. Umhmm.

R: That would be another one of those things that you would find, with your individuals who didn't grow up typing.

I: Right.

R: So, what was the question? How is it going to affect my work?

I: What, yeah, how work, or your workflows.

R: Yeah, it would slow it down and because of the typing, and because of the thinking factor, and because of the need to have that machine at hand with you. The other thing is that is annoying is the log on stuff.

I: Right.

R: That barrier to interfacing with it.

I: Umhmm.

R: When I can just pick up a chart and flip it open and write something, look at something, I am more likely to then if I have to go through this barrier.

I: Right. So the log on is a barrier to you?

R: Yes.

I: Okay. How do you think that CPOE would affect the productivity of other hospital personnel, like nurses and pharmacists?

R: I think that's too general of a question.

I: Okay.

R: From what I've seen, as far as...when you do now have medications online only, particularly in ICU...

I: Right.

R: And I hear mutterings to the effect that it slows them down and comments about potential for increased errors. I find it a little unnerving to have no record on the paper chart in front of me, when the patient is on

medications. Luckily, we still have a Kardex system which isn't part of the part of the permanent medical record...

I: Right.

R: Which details what medications they are actually getting.

I: Right.

R: But it's no where on the chart and if I'm looking for a correlation of maybe a negative reaction or a positive reaction correlating to any medications taken...

I: Right.

R: It is only fortuitous that the Kardex happens to mention when a medication is taken, it's not on the chart.

I: Right.

R: But I think you could make the argument where eventually, we need to... that's a hazard of having a split charting, the evolutionary process, as you move one portion on and the other portions off, you've probably [remarked about?] the whole thing on a computer, you open the patient's chart and you can correlate those things more readily. I don't think that's, even as I use the system now, medications are on there and I do, have worked with the system to have customized provider views, for example.

I: Right. UmHmm.

R: And I use that a fair amount.

I: Great.

R: It still doesn't let you...it's awkward to get at the kind of information you want as compared to a simple flow chart system, where everything that happens is recorded on the spot.

I: Okay.

R: In the time frame that it happens.

I: One reason that hospitals implement CPOE is because it is supposed to reduce medical errors.

R: UmHmm

I: Do you think it might help here?

R: Certainly in some respects, like the legibility of dosing, medicinal things [inaudible]

I: Right.

R: There is access to the pharmacy of the patient's weight and also there can be some systematic cross checks.

I: Right.

R: So, yes, there are some obvious ways that it could be an improvement and, hence, the seductive nature of it.

I: Right. Obviously, my next question is do you have any personal experiences with CPOE and you just outlined that you've had quite a few.

Obviously, we're all used to the current paper method. Do you think that CPOE will be an improvement over a paper method?

R: In some respects.

I: Yeah. Certainly, you've outlined already that the flowchart is better currently.

R: Yeah, when you can have paper in front of you and you can see everything there is so be seen.

I: UmHmm. Right.

R: It is more helpful. And, I know that you computer systems are making big improvements and are trying to do that, and they need to have some different read outs...

I: Unhunh

R: ...currently. The trouble is, that's not as big as a ...and flipping back and finding it is not always as readily apparent. I don't think it's...with this system I found it a little disturbing the use of the physicians, who don't have the same views, or access to the same material.

I: Right.

R: And I think that is a little alarming, maybe it isn't, but the medical record should be the medical record.

I: UmHmm

R: And when one person gets a different view of it than another, then they are not privy to each other's perspective. It's like, you know, they identify the elephants from the different angles and keep everybody in the dark a little bit?

I: Yeah.

R: It sounds like how I feel about the medications not being right there on the chart in one place.

I: Right.

R: I think that's disconcerting.

I: Some hospitals require the use of CPOE while others make it optional or strongly encourage it. What do you think would be the best method for this facility?

R: Well, I think if you make it optional, at least until you have staff turnover, not everybody would go for it. And, I think just looking at systems fashion systems tend to malfunction less when there is one system.

I: Right.

R: Where ever there are [inaudible] systems, so in principle, I would support something uniformly applied.

I: Okay.

R: However, I know that most hospitals don't implement it uniformly and for good reason, because every facet of the system is not as amenable to...

I: Right.

R: The ICUs, with a lot more rapid dynamic changes. Pediatrics is another area where I know a lot of them have lagged behind. They don't fit in the same box and you can't force them to go in the same one.

I: UmHmm.

R: I also know that pediatrics is doing all of their charting [inaudible] and those are areas [inaudible].

I: Right.

R: [inaudible] patient record sometimes and I find that the boxes that are there, what you put in sometimes limit the amount of individual comments and individual [inaudible] ability.

I: Right.

R: [inaudible]

I: How important do you think that it is that CPOE be easy to use?

R: Extremely.

I: Okay.

R: And it's ironic, because the paper chart isn't easy to use.

I: Yeah.

R: You've noticed that [laughter]

I: You bet.

R: I think there's a human nature factor, just like the way, just like [inaudible]. You struggle to learn each system; you are very reluctant to abandon it for something else that is difficult to learn,

I: Right.

R: Because you've invested a lot of time in learning [inaudible]

I: You bet.

R: I would suggest to you; you've interviewed doctors and nurses who do locum tenens and worked in a lot of different hospitals. I think that might be an area that you would find very valuable.

I: UmHmm.

R: For exploration, because those are people who are forced to learn and use new systems on a regular basis. They've got to have some very valuable observations about process.

I: You bet. Right, especially having seen different ones, picking out the best. What is the best? What is easy? That sort of thing.

R: Or what fits their particular need?

I: Yeah.

R: You have to be careful about using the best; I think the needs differ...

I: That's true.

R: And that's within a system [inaudible]

I: You bet. How important is it that you have the ability to try out a system before it is implemented?

R: Oh, probably not very important.

I: Okay.

R: Because a lot of times we usually have a trial period, you won't...you know, it depends on how long the trial period is, you may not even uncover what the difficulties are ultimately going to be right off the bat.

I: Right. Most people feel that there needs to be a balance between adapting the computer system to your workflow and also adapting workflow to the system. What are your thoughts on that? Which is it...should it be an equal balance? Should one be more important than the other?

R: Yeah. The computer system should pretty much adapt to what the patient care needs are.

I: Okay.

R: A lot of physicians will maybe quickly equate what the patient care needs are to what their work patterns are and that may not be true. So, I'm not particular to either or you gave me,

I: Right

R: I think it's a different either or.

I: Right. That's fine. If CPOE were to be phased in, would you like to be one of the first to use it.

R: No. Computers hate me.

I: [laughter]

R: IF they can break or not work, I can't tell you how many times people tell me, 'I've never seen it do that before.."

I: [laughter] How hard would it be for you to explain the pluses and minuses of CPOE to your colleagues?

R: Hmmmph. You tell me. How well did I explain them to you?

I: Very well.

R: [laughter]

I: Quite well. And then lastly, how important would it be for physicians to have an opportunity to see a demonstration of the system?

R: I would think that would be pretty important.

I: And then a follow-up question to that, sort at what point?

R: At the point where it is inevitable.

I: Okay.

R: If they are going to have to apply it themselves soon.

I: Okay.

R: When it is a theoretical concern, just like me, I'm not interested when it is a theoretical concern.

I: Right.

R: Just like the RiverBend structural site. It is irrelevant until it begins to take some form because there are so many undoings and rebuilding in the process.

I: Right.

R: I'm a bottom line thinker.

I: Okay.

R: Different people have...

I: Right, right. Actually, sort of a follow-up to that is that getting back to the question about adapting the computer system to the workflow, is that, again, this has probably been more from my hat of implementing CPOE at PeaceHealth rather than my research, but, to try to get to that end of the spectrum where we are adapting the computer to the physician workflow, again, it's important for us to try to figure out when the best time is to incorporate physicians. It is certainly one thing for us to go around and observe you and say, 'I think I saw Dr. Bent do this, and, so therefore, I think the system or computer process should do this.'

R: Where in reality, she may only be doing that because of these peculiar restraints that the paper system has.

I: Right. So...

R: It's very hard.

I: Yeah, so, someplace in there may be a balance somewhere where that sort of, to use your building example, maybe that the structure is already in place and that sort of thing and you are getting down to the fine details and to have input at that point.

R: You know, it's hard to say.

I: Right.

R: I think [inaudible] a lot of assumptions about the building without experienced architects and administrators that know how things work and have done a pretty good job up until that point.

I: Right. So, at some point...

R: You may have the same assumptions, but...

I: Yeah.

R: Oh actually, I'll be realistic, it is not something that I would want to do...

I: Okay.

R: But realistically, you would have physician involvement at every level.

I: Right.

R: Try getting it right the first time. And the problem with that is, the needs in the system differ so much. You are not going to...it's probably hard to find representative physicians in every relevant area to put that kind of time in it.

I: Right. And, maybe just to reinforce a comment that you made earlier on was that you felt that a success of one of the other systems was that they had frequent meetings afterward and were able to make changes.

R: Clearly.

I: Yeah.

R: So, people could give their feedback of the things about the system that were annoying, or could be better or...after they'd used it for awhile and found things that could be improved.

I: Yeah. I think generally speaking, that's what we have sort of come up with is the fact that, you know, we say that we want to have lots of physician involvement, but we're thinking that it's probably more once you are actually using it to be able to get feedback.

R: When it's theoretical, you don't know what you want or how you'll use it.

I: Right. Absolutely.

R: And even now, when you are using the LastWord system; with all of my customized screens, there are things that come up that are annoying, but I don't necessarily make a note of them and make a call about [inaudible]

I: Right.

R: I just keep working.

I: Right.

R: My whole existence is full of things like that.

I: That's right. Good.

R: You pick your battles.

I: Absolutely. Any other comments for me, either as a researcher or as a person that is going to be ultimately implementing the system here at Sacred Heart and our other hospitals?

R: Order sets...

I: Okay.

R: Flexibility has to be in it.

I: Yep.

R: I think that is one way it might become more attractive, pretty attractive to physicians, although they are already using them on paper. lot of paper too.

I: Yeah. Well, again, thank you for your time.

Interview Dr. C

I: I'm here to find out more about your perceptions of computerized physician order entry. Have you heard about PeaceHealth's plans to do this?

R: Yes, I have.

I: And, what have you heard so far.

R: Well, I've heard there is a plan to have physicians enter the orders, from what I understand, this is talking about in hospital work mostly.

I: Yeah. How do you feel about those plans?

R: I hope that they will decrease the error rate...

I: Unhunh

R: In the ordering.

I: Do you have personal experience or personal knowledge of error rates or...?

R: I don't know about error rates. I have seen...I've been doing this for over 20 years now, and the answer is, I have seen errors where...I've seen it on both sides. I've seen it where physicians will write something and the nurse will not be able to decipher it and when they decipher it then it is wrong.

I: Right.

R: I remember one that was a patient, somebody wrote Lanoxin and you saw the 'L' and you saw something else in there and the person thought it was Lasix, which wasn't much of a problem because the numbers just don't make any sense - the amount of milligrams doesn't make any sense, but I remember that was an obvious one. There was another obvious one that happened to me where an inexperienced nurse...I had written the order correctly, but she had missed the decimal point.

I: Oh boy.

R: So, it made a big difference in this medication, where it basically knocked out the patient...

I: Wow.

R: It was a sedative type of medication...where it basically really zonked out the patient.

I: UnHunh.

R: So, it wasn't an error in the writing, it was an error in interpretation.

I: Wow. Well, my next question is, how do you think CPOE will affect patient care? Obviously,...

R: Well, I'm hoping that decrease in error rate is what I'm anticipating it will do is that the legibility problem will go away.

I: Right.

R: It will be typewritten, so therefore, they will see exactly what the name is, so that will decrease. The error that I mentioned, about somebody not reading where the decimal point was, that will not go away, because the number was there and I had seen the number, it was just that they somehow didn't perceive that properly, so it won't eliminate those errors.

I: Right.

R: But, my hope is that it will dramatically decrease the legibility problem.

I: Great.

R: Which is what I've noticed here, since we've been doing the computerized record here, my prescriptions are all sent to a computer, so it is typed out on the other end and I would probably have maybe, one or two, probably every other week, or something like that where the pharmacy would call and say 'what was this dose?', 'what was this medication?', 'I can't read the sig', 'I can't read something or other and so I think it will end all those things.

I: Right.

R: I see it dramatically decreasing.

I: Great. How do you think that CPOE would affect your workflow?

R: It all depends on what the software is that is used.

I: Okay.

R: My experience so far the last three years of LastWord is that it will dramatically increase my workload. It takes significantly more time to do anything on the computer than it does to do by paper. Even when you get good at it, I believe it still takes significantly longer over a period of time.

I: Okay.

R: So, it will increase my workload.

I: How do you think that CPOE would affect the productivity of other hospital personnel? Pharmacists, nurses, that sort of thing?

R: Well, I'm envisioning the physicians will have to take the time sit down and type in all of the information and so I would anticipate they it will decrease their amount of time because of the legibility factor, and I assume it is probably in sort of template form and so it is the same way every time where as some physicians have a tendency to write certain ways.

I: Umhmm.

R: They write over the lines, they write at angles, they write all sorts of different things and if you have a template so that it is always in the same place...

I: Right.

R: ...and not trying to find the different information I think would be very helpful. So, I think it will decrease everybody else's work time.

I: Right. One reason that hospitals implement CPOE is because it is supposed to reduce medical errors and we've talked about that already. Do you have any personal experiences with a CPOE system?

R: No.

I: Other than...you're basically doing CPOE now, as far as using RXPad.

R: Well, for all my prescriptions are...it's basically like that.

I: Right.

R: Ummm. The actual orders, though, when I tell my nurse I want an x-ray, I'll walk out the door and say I want a chest x-ray, as opposed as having to type it in to some type of computer, for then her to get the information.

I: You bet. We are all used to the current paper method. Do you think that CPOE will be an improvement over our paper chart? Why or why not?

R: I have mixed feelings about that. I think there are definitely some pros and the pros have already been mentioned, the legibility aspect of it. The organization aspect of it I think would be a positive thing. Paper chart have a tendency of getting stuffed in all sorts of places. The down side also of that is that the computer, while theoretically more organized, you have to be able to hunt for stuff and that takes, unfortunately, sometimes just as much as time to sit and try to hunt for information as not...

I: Right. Umhmmm

R: For example, when I have a patient who has been in the hospital, all of their vital signs get put into the computer. So, when I pull up the patient's computer screen and I want to look at their vital signs over the last several visits to see what the temperature was, or the weight was, for example, or the blood pressure was, I pull up that screen and I will have my last visit here and then I will have 35 pain scales...

I: Right.

R: All right. Has no information except every ten minutes the nurse walks in and says how much pain are you in. So I will see all these things for 35 things.

I: Right.

R: There is no way for me to filter that out properly and there is no way to scroll quickly. I have to individually click, click, click,...35 times to find the next one and then to get back to the previous screen, I have to click, click, click, click...back 35 times, so my main gripes are, not with the idea, but my gripes are with this particular software.

I: Right.

R: If you are going to put this in this software, that's a problem.

I: Okay.

R: The other problem I have is when the computers go down.

I: Oh yeah.

R: Which is not an infrequent occurrence.

I: Okay.

R: When the computers go down, you have nothing...I have nothing. When I have a patient in the office, I cannot see what their medications are, I cannot see what my last visit was, I cannot do anything without information...

I: Good point.

R: At least the paper chart, it was isolated with place - meaning I had to go upstairs and grab the paper chart. So, if I was at a separate location, like in the Emergency Room, I have no access to the paper chart.

I: Right.

R: Now, the ER has access to my computer record instantaneously, which is fantastic for the ER. But when the computers go down, then we have no access because there is no backup and everything is basically down. And, practicing that way, I think is a huge liability.

I: Umhmm.

R: So, the problem is with backup when the new system fails, which it will do, not uncommonly...

I: That's right.

R: ...You will have big problems with it. So, would it help? In some regards, yes. In other things the system may be a problem.

I: Some hospitals require the use of CPOE and others make it optional or strongly encourage it. What do you think would be the best for our hospital - for Sacred Heart?

R: My feeling is that it should be either required or don't do it...

I: Right.

R: And the reason is, is because with this current system that I have, some people are deciding not to do it because it takes more time.

I: Right.

R: And, so therefore they don't do the problem list, or they don't fix the medication list, which is a very big problem - I think - for everybody, is if you don't have a current medication list, you don't know what the patient is taking and so the patient will go to Urgent Care be put on medication. The doc will put it on as a 1 time dose but will not do the automatic off, so when I see the patient 6 months from now and they've been in the Urgent Care 5 times, I've got all these medications that now I have to go through and eliminate off the active medications because they are not taking the medication any more.

I: Right.

R: ER does the same thing. Hospitalists don't put any medications on the list.

I: Right.

R: And, so when the patient is discharged from the hospital, perhaps on totally different medications from what I had them on, I pull up their screen and I have their old medication list. So, I have to manually go through and reintroduce that. So, if some people choose not to do it, and other people choose to do it, you have basically chaos.

I: That's right.

R: You have, like they have here in some instances, an incomplete computer record.

I: Right.

R: And an incomplete paper record and you have no complete chart any place.

I: Umhmmm

R: A doctor in the office here does not want to sit and dictate a complete history and physical to get it on to the computer. Like today he says, 'see paper chart'...

I: Right.

R: Because he's got a check-off thing which goes so much faster than simply dictating every little bit of information to get written down, he makes the checks, he does his little things and says see paper chart. I don't have a paper chart and I am the only doctor in the clinic who is actually not using paper charts. All of the other doctors are pulling every single paper chart, even though we've been on the system for 2 1/2 - 3 years, they are still pulling every single paper chart and we are still shuffling all this paper because some of their information is there and some of their information is here and to get it onto here, takes huge amounts of time.

I: Yeah.

R: And, right now, a) they would have to be the doctors doing it, and b) we are not compensated to do any of this type of work.

I: Right.

R: So, the doctors will say, I'm not making money doing this, why would I spend 5 hours doing this?

I: Right.

R: So, all or none.

I: Okay. Good. How important do you think it would be for CPOE to be easy to use if it were implemented at the hospital?

R: It has to be easy to use because otherwise it is a failure...and I think that is the key that I've figured out in software...

I: Right.

R: Is that if you pick the wrong system, the idea is great, but the implementation is less than adequate.

I: How important is it that you have the ability to try out the system before we implement it?

R: Only if it would make a difference in the implementation of the system. We were the first site that had a computer, and so at the end of the 6 months, I think it was, we unanimously said, 'it's a great first step, but this is not the way you implement it to the rest of the system'.

I: I see.

R: And the answer was, 'well we've already been committed', so the answer is...

I: Yeah.

R: We have a long list of suggestions, which are great suggestions, but the problem is now we can't really spend that kind of money to fix the problem. And, so the answer was then, what did I do for the last 6 months except to hear down the road that when it is taken to another clinic, my supposed response was, 'Oh, Dr. B loves this program'.

I: Right.

R: And the answer is 'No', I didn't recommend they actually bring this thing out, I don't think it is...

I: Ready?

R: Yeah, I don't think it is ready yet.

I: Most people feel that there needs to be a balance between adapting the system - the computer system - to your workflow and also adapting your workflow to the computer. What are your thoughts on that?

R: The computer system is less flexible than a paper chart, which is very individualistic and the answer is, absolutely, the paper chart is much more individualistic. The computer record is much more regimented.

I: Umhmmm.

R: There are pros and cons to that. The pros are, of course, is that everybody can see and hopefully know where everything is because it is all uniform. The problem is that doctors have a tendency to be very inflexible.

I: Right.

R: And, that doesn't mean we are not trainable...

I: Right.

R: It just means that we've come from different backgrounds over large periods of time, where as opposed to other people in the workplace may not have as much experience or whatever, their right out of school, [inaudible], because there is a fairly quick turnover in those fields, where as the physician is a physician for 40 years, where somebody may be a nurse for 10 years and that's the end of their career type of thing. So, I can see where doctors are a little bit less flexible. The other thing about physicians is that it is our names that are on the bottom of everything.

I: Absolutely.

R: And we have the ultimate responsibility. Therefore, if we are required to do something, which we do not feel comfortable with, it makes us very insecure because it is my name, and it's my responsibility if anything goes south, I'm the one that is going to get sued.

I: Right.

R: PeaceHealth may pay for my insurance premiums, it is my body that will be sitting on that defense stand and it is my reputation and my name will go in the databank and all of those types of issues. So, physicians want it done their way because it is my responsibility.

I: Right.

R: When you take away the responsibility for that, then somehow there has to be a shift of the responsibility as well. If there is an error because of it, then that is not my responsibility. Plus, I think physicians are being required to do more and more work for less and less pay.

I: Oh yeah.

R: And, there is at some point going to be, I think some type of physician organization, we already see unions already...to say 'No, this is not unacceptable'.

I: Right.

R: Whether or not it is the HMO plan that was forced on us, or some other type of plan that says you will do this.

I: Right.

R: And, the answer is, if we are going to be responsible, then we are going to have some input or we will say, 'No, we will not do that'.

I: From an implementation standpoint, it's...you know I've been doing interviews with physicians in both of my hats - researcher and also as an HID employee - is that some physicians have said, well, you know 'I'm not going to use the system unless it mimics exactly how I do my work today'. From a computer implementation standpoint, just as you point out, everybody does it just a little bit differently and some of benefits, as you've pointed out, and really the limitations of the system is that often times it had to be done one way.

R: Right.

I: And, so that's one of the challenges that we have in this area is we're trying identify what things are set in stone, you know, the computer has to do it this way, but also identify where things can be adapted to the workflow of individual physicians - a balance there.

I: If CPOE were to be phased in, would you like to be one of the first to use it?

R: No.

I: Okay. Any particular reason?

R: Time.

I: Yeah.

R: I didn't with the other one and what I found out is that because the time necessary to do the thing, my productivity went down. And, now I'm going to be paid on production, therefore, my income went down to serve the good of the company and that creates hard feelings.

I: Umhmmm.

R: That the company is requiring me to do this, but on the other hand, they are saying, 'Oh, we want you to do all this work, but on the other hand, we are not going to pay you for doing this work'. Then, by a matter of fact, we are going to actually cut your income because of it.

I: Yeah.

R: That doesn't feel good. I don't like it. I will not do it again.

I: Very good. How hard would it be for you to explain the plusses and minuses of computerized physician order entry to your colleagues?

R: Depending how well acquainted I was with the system...

I: Yeah. Right.

R: But, if I was all knowledgeable about the system, I think the explanation could be easy. The problem is the buy in from the other side.

I: Right.

R: If you are saying, 'How easy would it be for me convince another doctor to do this plan?'. I would say it might be impossible to do.

I: Right.

R: It depends on how savvy the other physicians are. I know there are some physicians who will not use the keyboard.

I: Right.

R: Zero, nada, zilch.

I: Umhmm.

R: So, to have some doctors sit and hunt and peck, who...that doesn't make any sense.

I: Right.

R: So, yes, I can explain it. The problem is, if you want me to convince somebody, I think it will be a hard sell.

I: And, it was really more towards whether or not you feel confident with the amount of information that you have about CPOE. Not so the specific system, I think.

R: To be honest, I understand the concept, that's at least to me all we have right now, the concept. And, I think everybody understands the concept because everybody buys into the idea, especially with all the negative press about physician errors.

I: Right.

R: You notice it says physician errors, rather than somebody else's errors. It is always the physician's errors. I think everybody is very cognizant of those problems, wanting to correct them. How do we correct them is the issue.

I: How important would it be for physicians to have an opportunity to see a demonstration of the system before implementation? And, at what point if so?

R: Demonstrations - having people who are extremely well versed with the machine demonstrate it. And, my experience so far with demonstrations is that they all run into glitches for some reason, which does not reassure the person who is witnessing the demonstration. They can't get the machine to work. They spend 10 minutes doing that and blah, blah, blah, blah. And, it would be important for physicians - we have to see it. We are very visual people. That's why we go into medicine.

I: Right.

R: It is not a theoretical science; it is a hands on, blood and guts kind of an occupation. We are all very visual people and so we have to at some point, see the demonstration. We have to see what's going on. We are also of a mindset that we are very hands on kind of people.

I: Right.

R: Let me do it. Not just show me this, but we are all very 'Show me one and I will do it', but 'What about this and what about this?'

I: Right.

R: And every time I've seen those kinds of things with new doctors, with a new particular program - I'm on the DUCKS Committee [the computerized whatever physician committee] - anytime they bring out something new, there is this 'Oh Great' and we all start - everybody's wheels are clicking really, really fast, 'Well, what about this and can it do that?' and I think that the system has to be worked out very, very well and not a test idea. Because, doctors don't have to buy it. I'm really against the concept and everybody who's rational will say, 'That makes sense' to do this concept. And, doctors will say, the concept is great, but they've got to get way down the road and they want to see basically what is going to be rolled out. I would not want to see something that is in the infant stages.

I: Okay.

R: I think physicians should have lots of input at those stages, but not the guys in the trenches who are saying we want to implement this. There is large amounts of anxiety to see stuff that doesn't work or looks cumbersome, or 'I wouldn't do it that way', or whatever.

I: Umhmm.

R: So, it is a real tricky point as to where you are. A doctor wants to be...there's still a lot of old school where we were in control of our medical

practices and the reality is that we are not in control of the practice of medicine anymore and that is just the reality of the real world. But, a lot of us are old enough that we came from that mindset, is that if it involved medicine, and my name goes on the bottom line, I want to be 100% behind this and somewhat in control.

I: Right.

R: And, that's been a real hard balance too.

I: Yeah. That is the end of my formal questions, do you have any other comments for me?

R: I think I tried to hit them all and hopefully I wasn't too wordy...

I: No...

R: and have given you a sense of...

I: No, I really appreciate your comments.

R: what I thought, because I've spent a lot of time thinking about it and seeing what we've been able to do. Again, it's a great idea and my feeling is that 10-20 years from now, hopefully it will all have been sifted out.

I: You bet.

R: I do understand...I do want to make a couple of comments about the LastWord system.

I: Right.

R: Because I've been bashing it a lot and I understand the difficulty of trying to find some type of system that balances the inpatient and the outpatient.

I: Right.

R: And, I think that's been the dilemma that we've had and I think a lot of the frustration is that we are creating a system that may work well for the inpatient system and does not work particularly well as an outpatient system. I think there are better programs out there for outpatient system. This is primarily a dos run system. There are no windows. It creates...well, for example, the lab alerts is the latest thing that has been kicked out. So, I get 47 lab alerts yesterday morning.

I: Oh.

R: Okay, so I have to then plow through all these 47 lab alerts, which I got paper for them in the past; however, I got them all on one usually one sheet,

I: Oh really.

R: Because each one here is a CBC will be on one computerized lab alert and the next blood test will be on another lab alert and the next one will be on...so I will get 10 lab alerts for the same patient, when before I got one piece of paper.

I: Right. Yeah.

R: Before I was able to go normal stamp with my stamp and hand it to my nurse.

I: Right.

R: And, now, I have to go in and type even normal, but the number of keystrokes that it takes me to do that is significant. Plus, when I do that, let's say I'm in the middle of a message to my nurse about this lab test and I want to think, the patient's on what medication and what dose, because the cholesterol is high, I may want to change that. I cannot minimize that screen. I have to actually exit the thing, lose all of my typing, click, click, click, click, get to prescription pad, look it up, click, click, click, back to the lab alert and then have to start the thing all over again because I can't pull up a window...where's the medications? Oh the medication, there it is, then I finish my typing, it doesn't work. I just want to minimize screen on any of the alerts to decrease the screen so I can interrupt the typing process and get to some other information.

I: Mmmmm.

R: So, the dos system is antique, dinosaur, in the windows based system and...

I: Sounds like it is pretty frustrating for you.

R: It's extremely frustrating. And, the reality is, a lot of doctors just don't do it, which defeats the whole purpose and my feeling is that if I were the King, and this is the system that we picked,

I: Right.

R: Okay, I understand that it cost 10s of millions of dollars to throw it in the garbage can and start all over; however, we do have to make it work or else compensate me for all the time it takes me to do that.

I: Right.

R: But, I would recommend that what we do is that we need to go full speed ahead with this. If we are not going to backwards, then we've got to go full speed ahead. We can't sit and tread water.

I: Right.

R: And, so, what we need to do is we need to require - just like the question said - we need to require everybody to do it and that will force the process forward as opposed to, 'Well, I can live in this limbo of doing half and half'

I: Right.

R: For several years and we never advance out of this Stone Age. We've got to move on and it might be painful at some point, but we have to commit the resources to do it if this is in fact where we want to go.

I: Right.

R: So, on one hand, I may bad mouth it, but on the other hand, this is where the future will be. We have to get there.

I: Right.

R: We can't go back to the paper chart as much as some people may want to do it. We can't go back.

I: That's right.

R: We've got to go forward and that means we really have to then go forward and make it required and then create tools to make it then go forward. There may be a possibility that this software will never get to where we want it to go. But at some point, the leaders have to have the wisdom and the strength to be able to say, 'You know, this will never get us there'. And, at some point, we have to say, 'Okay, it may cost us \$40 million to back track, but it will cost us \$100 million to go ahead.

I: That's right.

R: And, I don't know, I'm sure those decisions are being made. You're involved with that, but I just see the slow implementation of a 4.1 this year and then we get a 4.2 next year, we need a 9. something or other.

I: Right.

R: And, maybe that's unobtainable, but I don't think it is, because these things are not rocket science. These things are, the technology is 10 years old. We should be able to get there.

I: I've heard that a lot from folks about functionality. It seems to be pretty old in the system.

R: Oh, it is. It is a 10-year-old system, at least, I'm sure, 10 years old. Like I said, it is not even windows.

I: Yeah.

R: So, it is almost 20-year-old technology. But, I'm a firm believer in computer systems, because we've got to get there. And, the thing is - how are you going to do it in the most direct path.

I: Right.

R: That is not going to jeopardize patient care (A, #1 highest, BINGO priority). If it takes doctors longer, that's okay. Patient care has got to be #1, so that's why, as I said. I start off in favor of this thing, and I still am because it will decrease errors and that is a good thing.

I: Good. All right. Well thank you very much.

R: Your welcome.

I: That concludes the interview.

Interview Dr. D

I: Thanks again for taking this time. I'm here to find out more about your perceptions of computerized physician order entry. Have you heard about PeaceHealth's plans to do this?

R: Yes, I have.

I: And, what have you heard thus far?

R: I've attended various meetings including the local Information Services Steering Committee, so I've heard the overview and the timetable for and the plans...

I: How do you feel about the plans to implement CPOE?

R: I'm very much in favor of it.

I: Good.

R: I think we are doing it too slowly, but that's a personal opinion.

I: Okay. And, why do you feel that it's too slowly?

R: Probably because I think that it really has great promise in the, particularly in the safety of the patients in the hospital.

I: And, actually that leads very well into my next question, which is, how do you think it will affect patient care?

R: Basically, it will improve safety, cut down on medication errors, which will decrease errors being [inaudible]

I: Unhuh.

R: And, certain morbidity and mortality [?]

I: Okay. How do you think that CPOE would affect your workflow as a community hospital physician?

R: Well, it will affect workflow because you will have to put in place new processes, because it will take more time to see individual patients. Yes, it will greatly impact our workflow.

I: Okay. How do you think that CPOE would affect the productivity of other hospital personnel?

R: I don't...that's a difficult question. I don't think it is going to affect productivity, hopefully it will streamline processes - their processes - and, of course, it will the overwhelming goal is to improve patient care.

I: One reason that hospitals implement CPOE is because, as you just stated, it is supposed to reduce errors. You've already said that you think that it might help here.

R: I don't there is any doubt that it will help to reduce errors.

I: What kinds of errors do you think that it would be most effective with?

R: Well, basically it will reduce transcription errors because there will be indications [inaudible] interaction checking. It will reduce medication interactions. It should reduce errors in dosing, because that can be checked right then.

I: Right. Do you have any personal experiences with a computerized physician order entry system?

R: No, I don't.

I: We're all used to the current paper method, do you think CPOE will be an improvement over it? Not just for medications, orders and that sort of thing, but...

R: I think that well, it will, in the beginning it won't be an improvement because it will require the individual practice and physician to take more time.

I: Right.

R: So, there will be a resistance to the doc because it will force you to spend more time which we have very little of anyway.

I: Right.

R: But again, it will be used to reduce errors and improve patient care, which it will do in the long run.

I: Right. Some hospitals require the use of CPOE while others make it optional or strongly encourage it. What do you think would be best for this hospital?

R: I think that it is going to have to be required; otherwise, you will not get everyone using it.

I: Okay.

R: I mean we've found from past experience with other projects that there are some physicians who are just going to resist change no matter...unless improvement to patient care that exact change will lead to.

I: Kind of an easy question here, but how important do you think it is that CPOE be easy to use?

R: Extremely important.

I: How important is it that you have the ability to try out the system before implementation?

R: Important.

I: I guess in sort of follow-up, at what point would you try out the system?

R: What point in the CPOE implementation?

I: Yeah.

R: I think as early as possible. As early as you have it on the system and hardware to get people started ...

I: Even...

R: Even optionally using it, rather than it being required, in the beginning you have an implementation where everyone is going to be required to use it, I think you open it up as early as possible to show the doctors because there's nothing like word of mouth to help move projects along.

I: You bet. Sort of going along with this - most people feel that there needs to be a balance between adapting the system, changing the computer system to meet the workflow of the physician (in this case), balancing that with changing workflow to meet the idiosyncrasies of the system, or the computer. Where do you fall on that?

R: I think the most important thing is the adapting the hardware as much as possible to establish processes that the physicians have. In other words, having devices in each room, or near each room, because that is how the physician is used to doing work on that patient and then moving to the next patient.

I: Sort of like a portable device?

R: A portable device or one device per room, you know, even if it is fixed in that room.

I: If CPOE were to be phased in, would you like to be one of the first to use it?

R: Yes.

I: Okay. How hard would it be for you to explain the plusses and minuses of CPOE to your colleagues?

R: Not difficult.

I: Okay. You have certainly been able to catch all the ones included in my research. Now, this sort of ties back to an earlier question I had, but how important do you think it is for physicians to have an opportunity to see a demonstration of the system and at what point?

R: I don't think it is that important for the majority of the physicians to see a demo because there are a lot of physicians who really don't care - they just want to be trained on how to use it, when they have to use it.

I: Right.

R: And then there are others, obviously, who want to be kept up to date.

I: Right. It is an individual difference.

R: Yeah. Right.

I: And also to be able to have input into the design and the process.

R: Yeah, definitely, definitely.

I: Okay. That is the end of my formal questions, do you have any particular comments or any additional things?

R: I would just...I mean again...I think they are doing this too slowly, but I can understand that there is cost issues involved here.

I: Right.

R: Because I think it is going to improve in the way it reduces errors; so, if you know you have something that will reduce errors, I would think you would want to implement it ASAP.

I: Yeah. I would think so too.

Interview with Dr. E

I: First of all, I'm here to find out more about your perceptions of computerized physician order entry. Have you heard about PeaceHealth's plans to do this?

R: Yes. We've already been told by PeaceHealth, so I've heard sort of inklings over the years.

I: Okay. And, what kind of inklings? What have you heard about it?

R: You know Rehab piloted it and sounded like it went fairly well.

I: Okay. Good. How do you feel about the plans to implement CPOE.

R: Well, hopefully, it helps out with efficiency and safety and timeliness of getting tests done, and knowing where patients are. Really the safety issue.

I: Right, right.

R: If it can do that, that would be great.

I: Yeah. How do you feel about this whole project? Do you feel that it will impact your life positively?

R: I think that we are already doing some aspects of computerized order entry with medications.

I: Right.

R: And I think that has been really great.

I: Good.

R: Just, in terms of being able to track people better.

I: How about patient care? Do you think it is going to impact, I mean you mentioned this already sort of, but...

R: I think it really helps, the pharmacists don't have to read my writing and there is not all that interpretation. There's...one of the nice things that you can do with computers, there always things for...in terms of, you know, like interactions with medications.

I: Right.

R: Probably you can, you know if you are ordering a test, you can get the actual... everything you need right there.

I: UmHmm.

R: You know, tell the patient this, or a sheet would come out and this is what the patient needs to know.

I: Absolutely. That is certainly one of the things that we are looking forward to, once we get the system set up so that physicians are actually using, there is a lot of different tips and decision support types of things...

R: Right.

I: ...that we're hoping that we would be able to implement. How do you think that CPOE will affect your workflow.

R: Hopefully, it will make it easier, you know, because we have computers already in every room and if we could just order that barium enema, click on it, print it out, and there's what we need, where you need to go when, and if you have any questions, call this number.

I: All right.

R: That would increase efficiency instead of having it now, you go to the ward clerk who has to call me on the phone [laughter], come back...

I: Right. Okay. Good. How do you think it will affect the productivity of other hospital personnel?

R: I think that we could probably get rid of some people.

I: UmHmm.

R: With a little less staffing costs. I hope that it doesn't get all shifted to the physician, because they are already somewhat overloaded, but hopefully, it will let the physician's job easier too.

I: Okay. So, possibly pharmacists and other staff that currently handle a lot of the orders will...

R: I mean more like the time spent with the nurses having to interpret, and the ward clerk, perhaps, there could be a few less people.

I: Right.

R: Anything that came from staff, you know, if it was all electronic, you could have less staff at the other side...

I: Oh yeah.

R: Yeah.

I: All the phone tag.

R: Phone tag [laughter], phone tag, I hate phone tag.

I: Yeah, okay. So, again, you sort of touched on this, but one reason hospitals implement CPOE is because it is supposed to reduce medical errors. Do you think that it might help here?

R: Yeah, I think it helps with medications. It is hard to know. There are studies, but I have that impression.

I: Do you think that medication errors is a real live issue?

R: Oh yeah.

I: Okay. Have you had any personal experiences with a CPOE system?

R: Just RX pad in our system so far.

I: How about in residency or internship, or anything like that?

R: No, none that we used.

I: Okay. And you've been pleased with the way that RX pad is working?

R: Yeah, it's been good. If there is an interaction, like Lipitor, it is nice and if you don't know...it's not that I don't think it is terribly significant, but I remember it sort of changing, well, let me try this other one instead [laughter] to see if doesn't do that, or something.

I: Okay. Great.

R: That's happened a couple of times.

I: We are all used to the current paper system, do you think that CPOE will be an improvement over it?

R: I think so. I mean the paper gets lost a lot. Paper can be, especially with medications, could be copied, you can divert easier when you have paper, you can put 100 on there instead of 10 of the Vicodan. There are a lot of ways that I think the system...I think it has improved our, you know, well safety for the patient and [inaudible] to what we give here [inaudible]

I: Right. Do you think you have better access to the information with the computer vs. the paper system?

R: Oh yeah. I do that every day, looking back at what we...the history on it, how many of these have we given and how long have you done it.

I: Just to clarify, you have just got the medications on-line, RX pad, you are not necessarily documenting using the rest of the so-called provider tools.

R: Oh yeah, we use lab alerts.

I: Lab alerts? Okay.

R: Telephone encounter general alerts, we are like one of the few that have lab alerts, though.

I: Okay. Great.

R: In fact, I realize I should have radiology alerts. There's probably a lot of reasons we don't, but it would be nice.

I: You bet. Some hospitals require CPOE and others make it optional or strongly encourage it. What do you think would be the best for this hospital, or this facility?

R: Oh, I don't know. You know we are doing...I do Patient Connection...

I: Unhunh

R: They are letting people do it...

I: voluntarily?

R: Yeah.

I: Do you think that is the best way to go on some of these things?

R: I'd really expect...at first I thought it was the worst idea I'd ever heard. I still sort of think about it. You definitely are going to go further faster by saying it is voluntary.

I: Right.

R: I think at some point, just from what I hear from different people, is that it is probably not going to voluntary at a certain point. We are just sort of piloting, I guess, or an extended pilot is how we are looking at it [laughter].

I: Right.

R: Once I think it is not a pilot anymore, then I think it will be a mandatory thing.

I: Yeah.

R: PeaceHealth will...

I: So, at some point, you think it is necessary to say, okay, it is a mandatory thing.

R: Yeah.

I: Okay. How important do you think it is that CPOE be easy to use at the hospital?

R: It has got to be really easy.

I: Okay.

R: Because it is just...gonna, you know, if...I think that is why we are getting some improvement in being able to want to use EMRs is that as long as it is seen as something that is going to add to efficiency and easier to see patients and spend more time with your patients, documentation is seen as an impediment then I think you are getting into a lot of trouble.

I: Okay. How important is it that you have the ability to try out the system before the implementation?

R: Oh.

I: Like in a pilot format? Or...

R: I sort of am not...I think we sort of react instead of going to see things and so I think when it comes, we are sort of used to like adapting to whatever it is.

I: Okay.

R: I don't know that we...

I: So, you don't think that that's necessarily...

R: I don't think I even tested out RX pad before it went live.

I: Okay.

R: I mean I do a lot of testing, as with PC Shorthand testing, that pilot. Actually, pilots are kind of nasty. You are working out the details, you know, I've been piloting Patient Connections for awhile, so if it's good and it works well, and it is fairly easy, I don't think that you have to try it out first.

I: UnHunh.

R: Hopefully, it is intuitive enough to figure out within a 10-minute impression. I think that has been a problem with T-system. It's kind of been a 3-4 hour learning curve for the physicians and they don't like that too much.

I: So, 10-minutes is about...

R: About our attention span.

I: [laughter]

R: [laughter]

I: I will try to...

R: No, I mean you are doing great. [laughter] Not for me, but, in terms of...

I: I understand. Yeah. Sometimes it is sort of that magic number.

R: You need to do it in like 10-15 minutes little cubicles, or something, you know, sort of 'this is LastWord'...

I: UmHhm.

R: unless that you are really into it, and since I've taken on the Patient Connection, I'm more into it, so I can kick a little longer, I can work with it, but it is a different thing than we do, you know, it is much more time drain. It is much more thought process. We're used to just making a bunch of quick decisions really fast.

I: Right.

R: And so, it doesn't feel like we're being very efficient to learn a new computer thing. It feels like we're sort of wasting time. What do we really need to know so that we can do our jobs, is the...thing that is important.

I: So, having training really succinct. Actually, that is a great segway into the next question, which is, many people feel that there is a balance between adapting the system to your workflow vs. adapting your workflow to the system. So what are your thoughts on that?

R: Well, again, I'm just a little different because I have some time where I'm supposed to be sort of working more on Patient Connection, that is dedicated time, so I just got a lot more interested in it since then, you know, getting it up when I'm at home and being able to look at my labs at home. That was sort of really changed my idea on how powerful it was.

I: Okay.

R: To get lab alerts and lab alerts at home, I can do a lot of stuff at later at night when the kids are in bed, so to me it is all a big positive.

I: I see.

R: And, I like that. I think, if anything, lab alerts really changed my feeling about computers because if you receive one really good thing in technology...

I: Right.

R: I mean, RX pad was fine, but it sometimes goes down, or the pharmacies aren't as keeping their fax machines going, or there are some calls back if Amoxicillin isn't listed as t.i.d in the system, and you put t.i.d in, commonly given, just some things happen. It could be a little cleaner. But the lab alerts, you know you click right on it while you have the whole patient chart and then you have the ability to forward it right to the ward clerk and you can do that at night if you want.

I: Okay.

R: So, I can look at my labs and decide what to do at home, so I'm a little bit more efficient than at my clinic, so I don't have to do that during clinic time.

I: Okay.

R: So...I don't know if you should balance between adapting a system to the workflow.

I: Well, for example, sometimes we've heard physicians say that, it's a computer and it should be exactly how I need it to do.

R: Right.

I: It should be able to adapt, for instance, one of the things with inpatient physicians, some physicians do rounds individually on individual patients and others do rounds on a group of patients at a time. Really the presentation of information needs to be a little different, depending upon your style. So, some of the comments that we've received is that, well, you know, you can only do it one way. The computer sometimes can only do it one way. It doesn't really adapt to workflow. They want it...just information that they want to see.

R: [inaudible] wants to just see the vitals, because with anesthesia you just have to run by and see the vitals for one thing.

I: Yeah.

R: Another thing they...yeah

I: Right. And because of...

R: Because of the way the computer works, you actually have to go to each [inaudible] that they want to...I think that's the vitals, or something...I don't know what it is, but they didn't want to have to pull up each patient, or something.

I: Right.

R: When you are rounding on a different floor, you just walk to the patient room and...

I: Have it already logged in, and that sort of thing...and, so I think that is sort of what I'm trying to get at, is that, anyway, there's somewhat of a balance as to what you can do with a computer to adapt it to how physicians currently do their work vs. sometimes you say well, "Gee, you know, if you did this a little differently, then the computer would support that better." I'm just wondering...

R: Well, I think that, you know, there's kind of a whole thought about, you know it is what it is...

I: Unhuh.

R: it is not anything more. Unfortunately, this is what we have and I think that over time we'll get that message. You know, we would like it to be able to do this miraculous stuff, but sometimes that miraculous stuff takes

an enormous amount of work and effort like the Menon Report or whatever that has been going on for 10 years.

I: Unhuh.

R: Nice thought, but how much time and energy has been spent, well, it is just ridiculous, so, sometimes, like, a lot of it is the culture and what you do in the back office that sort of makes the change and be adaptable a little bit and that is a tough one, but we have to change and I think at PeaceHealth we are a little bit more, "Ok, it's change, we'll do it," because we've sort of been more owned, I guess, or more...ummm...I think that the leadership has been very forward with technology and very forward and visionary in terms of where they want to place us and put us. So, we're more adaptable, but I can imagine in some sort of little one office, one person that's a little harder.

I: Yeah. Or groups of physicians that are more procedure oriented at the hospital.

R: Right. I mean you know the bottom line is that anesthesiologists could just pull all of the...pull up their group lists and then just look through the vitals and write them down all at once and then they are saving time and efficiency walking from one floor to the other, but they don't want to change at all. They want somehow the computer to change to fit them.

I: Right. Yeah.

R: You know, at a certain point, when you are given all the other powerful things it is doing, then it's probably not going to happen, unfortunately. It doesn't matter how much money they are bringing into the system, or how much power they have. You know...

I: Right.

R: They've got to give a little if they are going to get this. I mean, I'm always struck by people that can't handle the technology now and they just want to move on and then there's other people that I know out in the, you know, like when Dr. X moved to town and he came with his palm pilot, and you know, his own...he's bringing in some of advanced logic and he would kill for even an electronic medical record where he's working.

I: That's right.

R: You know, I mean, it's an enormous benefit that we have and instead of fighting it, I think we should take full advantage of it.

I: Right.

R: I mean, even out there the system costs \$750 a month, or something, to put in your office per physician and that's fairly cheap for an electronic medical record. And then, pretty much grant us personal... there's some really nice people that come by and help me out. [laughter].

I: So...

R: So, I guess, that somehow they have to come around until they realize how much safer their jobs are, or somehow it's going to be a benefit for them, over their little bit of incon..., that's how I see it.

I: Great.

R: I'm sure [inaudible]

I: That's important. That's exactly why I'm here is to find out how you feel about it. So, really as far as the adapting, it's...sometimes it depends on the person and the situation as far as whether or not we need to try to change the system to adapt to the workflow and visa versa.

R: Right.

I: If CPOE were to be phased in, would you like to be one of the first to use it?

R: Yeah, I love all the neat stuff.

I: Okay. And, how hard would it be for you to explain the pluses and minuses of CPOE to your colleagues?

R: Oh, I already do that with Patient Connection. I think Patient Connection is more of a stretch. [laughter] sometimes they're a little, they're a [inaudible], if I can do that. As long as there's lots of people to support me, I get all these wonderful, you know people, that actually write things for me...[laughter]

I: Right.

R: Like Shannon, so I'm pretty supported in that role. I guess I'm already a physician champion for stuff at PeaceHealth.

I: Right. And, then finally, how important would it be for physicians to have an opportunity to see a demonstration of the system, of CPOE?

R: I think it is nice for them to see what it can do. I think that it also needs to be somewhat timely. I think we came out with PC Shorthand here and just sort of showed people and then I'm piloting it, but it's been like probably 6-8 months that I've piloted it. We don't really have enough people working on it to really make it where it could be, because Analyst Y, she's been out a few hours, where she's kind of programming it, but...

I: Right.

R: I think, I heard the other day that there was some upset people that they haven't gotten the templates yet, you know, so I don't know how that whole process works, but I think that it would have been nice if it was already out there, we had a demonstration and then in a few months you have it instead of...

I: Okay.

R: Like 6-8, I mean they still know, still remember seeing the demonstration because the demonstrations are always pretty cool and with PC Shorthand it all sort of writes it out for you at the end.

I: Unhunh.

R: But, I sort of think it should be, like I'm thinking you do it too early. I wanted to tell them that I was piloting it here so that if they had any questions about how my dictation looked, they could, they would know.

I: I think that just a further comment on that is...from a development standpoint, sometimes it's sort of a fine line between demonstrating a product that is basically all put together and say, "OK, this is the way it is going to be," and then x number of...x amount of time we are going to have this available for you vs. doing sort of a demo and saying, "These are the concepts that we are talking about..."

R: Right.

I: and your input is very important to us and we're going to take your comments and then restructure or redesign it a little bit and then come back to you, and that sort of thing, so it's...

R: We're pretty...we've done a lot of piloting...

I: Yeah.

R: so, we're okay...

I: You are very progressive at...

R: That...I guess that...sometimes it seems to move slow, that's just perspective on my part, you know.

I: But, the bottom line is that you think it is important for people be able to...for physicians to be able to see, a system demonstrated, a demonstration of the system and the other key point is that it needs to be then available in a fairly...

R: Right so that we still remember what it was, and that we're not saying, "Whatever happened to...", two years later. "What happened to that," or...

I: Right.

R: Yeah.

I: Great. Any other comments about the use of computers and obviously, the survey was much broader in perspective and the value of the interviews for me is to sort of hone in on computerized physician order entry more, and get perceptions, and again, I really appreciate your opinions today, because not only again will it help me with finishing my dissertation, but also will be using this to sort of mold...you've given me some great ideas as to how we might create an implementation strategy, especially this last part about making sure that you do a demonstration that you say, "Ok, we're going to be back in x amount of time, not too far in the future to discuss actually using it as a product."

R: Right.

I: Any other things that you'd like to...

R: Was computerized order entry developed with IDX?

I: Yes. Actually, as far as the specific product is concerned with IDX, a group of physicians at Montefiore in New York worked with them and sort of enhanced the order entry component of IDX so that it would adapt more to physician workflow. So, those were the pioneers and they've been doing it for about, golly, 3 years, 3 1/2 years. Since then, a lot of other facilities are using the IDX product for CPOE. Computerized physician order entry, there is a variety of vendors that have products that support a POE and there are some large academic centers that have sort of done their own, developed their own systems, but of the vendors, IDX has the product that we use and it is used currently at Montefiore and Stanford and Thomas Jefferson and also at Lehigh valley which is near Allentown, PA. They have a couple of hospitals that they are implementing it and using again, the IDX CPOE product, exactly what we are using here. They are much more of a community hospital setup.

R: Unhunh.

I: And, certainly the incentives for having residents and interns use the computer to enter in their orders vs. community hospital physicians are different and that is really where my interests lie, as far as my dissertation research, is to try to see what those differences might be as well as I mentioned so that we can develop a more successful implementation strategy.

R: Do you need other people that are interested in computers, you know, because this Dr. X, he's uhh, I think he works at River Road, I think is still doing that.

I: That is great. That's exactly what we're...

R: Because he just admits to the hospital on his own.

I: Yeah.

R: But he is a community physician.

I: That's great, I appreciate that. We'll give him a contact and see how he feels about that. Again, we're trying to figure out what the implementation strategy is at Sacred Heart, as well as the other PeaceHealth hospitals, primarily what they've done at these other facilities is they've identified a unit, and say, "OK, all of the physicians that admit patients to like 3Main, next week, we are going to train you on how to use it and the week after you are going to start using this." We think again...our bias is that might work fairly well in an academic center, however, we don't think that it will work necessarily very well in a community hospital setting because of the variety of...

R: People coming on the floor, sometimes you get a medicine person on orthopedic unit or...

I: That's right.

R: or whatever.

I: And then the patient gets transferred someplace, this creates a variety of complexities. One of the things that we're trying to identify right now is, could we, indeed, set up the system so that the nurses and the pharmacists and the other people that are taking care of the patients as well as the other physicians could say, "Oh, yeah, it's not a big deal, I know that certain orders are in the computer, and certain orders are on a piece of paper, and that's fine," and that way we could just go to physicians, that perhaps are like yourself, or Dr. X, or some of the other physicians and say, "You know I'm interested in this. I think I could, I'd like to try this out."

R: Yeah, I found out and that's a really hard one. I sort of think...I mean, I think my main feeling is truly that, I mean, don't shove it down their throats, but they've heard about this long enough, you know maybe a little bit more PR before it goes forward about injury prevention, safety issues, then like getting someone who really...kind of...we use Communications Expert Z a lot, and she's kind of internal PR also. She's very aware of the communications internally.

I: Okay.

R: And, I would think that actually, still...I don't think that with Patient Connection it's the right thing. I think that everybody should sort of be required to use it.

I: Right.

R: I think you get farther that way. I don't think you are going to have people walking away from it. I know that it was hard with getting LastWord implemented, but it is always a little bit difficult, there's lots of little bumps and valleys, but I think this is so integral, with where we are going with the computers, but I mean you could say it is an expanded pilot for awhile.

I: Right.

R: And then, but with the expectation that everyone is going to be using it. Otherwise, you get this...too much fragmentation of the orders and too many orders coming in different ways, which increases confusion and decreases safety, I think.

I: You bet.

R: I mean I think you could find some physician champions to sort of push it forward, that you know are going to want to use it, say all the Hospitalists, and you know Dr. X and a few community other people that are technologically savvy and say, "We're going to train you well and you sort of...come into the system"...maybe even paying for some focus groups, or something, I mean, I don't know, just sort of like, we want this bad enough that we want to really put some input into it. I don't know, but I think that when it goes, it should just be throughout the hospital. I

mean, I think a small pilot works, and a small pilot sometimes is a good thing because you can get some feedback about what people think. You've done it on one floor, which is really nice way, but those people don't really go anywhere else, too much. They kind of stay in their little rehab place.

I: Right. That's one of the limitations that we recognized, with our pilot...

R: But, you don't want to just do the Hospitalists who are doing a ton of admissions and hopefully, I know a few of them are...I think that they see the benefit, most of them, of computers in general. I don't know that all of them are all there, but [laughter]

I: Right.

R: I think if they see that it could help them communicate and possibly not have to go from one floor to the next, to the next, to the next, that they can sit down in one place and catch their breath for two seconds.

I: Absolutely. And, yeah, not have to run up to the floor to get another order on one...

R: Like call...you know they can actually sit at the computer and make the order happen. I would think they would just be all over it.

I: Well, we think so too and so we will be approaching them in the very near future. Barry is helping us approach them right now to see if they would be interested in the next on deck.

R: Yeah, just do all the Hospitalists as sort of...you know you kind of own them in a certain way.

I: PeaceHealth Hospitalists...I mean we did an OMG Hospitalists that we need to work with as well.

R: Yeah.

I: Great. A couple of key things that I heard is that, you know, communication is really key, that sort of an implementation plan...

R: Right.

I: Sort of an inevitability, highlight the values of why it is that it's important to us.

R: The fact that use studies that all those kind of people know, that you see the study that shows the power of this in terms of safety.

I: Right.

R: I mean it is hard to measure efficiency. I think you've got to measure safety. If you push the safety issues, I mean, we push that HIPAA compliance, confidentiality...[end of tape] we went to the Executive Team, Governing Board. We went to the user's group, whatever, you name the group, we're there, you know and we've gone everywhere.

I: Great.

R: And I don't know why that is, but they've got us on this schedule, and we just went [laughter]

I: Great.

R: So, in some ways, that I think has been good. We hope to see some increase in use and...

I: You bet.

R: Probably some benefits.

I: One thing I wanted to clarify. You mentioned that you have a benefit in that you have some administrative time and you also mentioned that it would be good for some of the physician champions to be paid in some way. How important do you think that that is for us in our implementation strategy is to have, you know, some, obviously, you know all the training and that sort of thing would be paid time, reimbursing their time for work that they do on it before they are actually using it, that sort of thing. Do you think that is really important that we make sure that we have that...to compensate them for the time that they work on it.

R: Hard to know, I mean, if you can get everybody on board, it would be pretty hard to pay them even \$100 to train. I mean, because that's how many physician, probably 500. That's a big budget item. I think that, let's see, like you said, there may well be, I mean, this is talked about a lot, but there may be a few people that are really sort of more thought leaders, hard to identify those, but you know I already know to encourage and enjoy technology, like Dr. T, or Dr. X, or some people like that you could kind of bring in as a co-developers in some sense...because really, those people have been using technology for some time, you know Dr. T did Dragon Speak and tried to do that at his own clinic and he's been involved in a lot of different things and now he's going into the community, but he'll still be admitting to the hospital. I'm sure he has a lot of ideas and then, you know, Dr. X, just also somewhat new...I don't really know much about some of the sub specialists or specialists. It would be nice to sort of figure out one of the orthopedic doctors and one of the...

I: Okay.

R: It would be nice to see if you could get a cardiologist...

I: Yeah?

R: And then they should be techy, I mean they've worked all those techy things all the time.

I: Right.

R: If you could find one who...and then kind of bring them together, almost and pay that group for at least...and it's not so much perhaps like, I mean you can use some of the ideas, certainly, but maybe more in terms of goodwill, also. Instead of just another thing that they have to go to, but also, and I'm not even clear that there has to be a monetary thing, that gets into all sorts of W2s...

I: Right.

R: Almost like offering a new book, I mean, you know, like, I mean, that sounds a little crazy, but a Harrison's [laughter], you know, a surgical book, I don't know. [laughter] I'm just being kind of a...

I: For their PDA?

R: [laughter] Whatever. Yeah.

I: Okay.

R: Yeah, but, there's a lot of interest in biological markers, and I guess, biology would be...that's sort of like if you come in with your PDA. You probably are pretty advanced technologically if you own one.

I: That's right.

R: And then, I think there is always the whole nurse's point of view too, that unfortunately, or fortunately, is pretty important to be acknowledged. How much they think it's going to benefit...it can be...can interact with the doctors.

I: They could be good advocates.

R: Yeah.

I: Okay, great. Thank you very much for your time.

R: Yeah. I went on there, didn't I?

Interview with Dr. F

I: I'm here to find out more about your perceptions of computerized physician order entry. Have you heard about PeaceHealth's plans to do this?

R: No.

I: Okay, that makes it easy. How do you feel about plans to implement computerized physician order entry?

R: I think it is probably a good idea.

I: Okay. Any particular reason why you think it's a good idea?

R: Only from what I've seen in other places.

I: Okay, which is?

R: Which was in South Carolina.

I: Okay.

R: In the community hospital there, they had...you know, they were computerizing the medical record and had started with physician order entry and...

I: Oh really?

R: It seemed to be...nobody was tremendously resistant to it, in fact, one of our previous advocates of it was a 70-year old guy...

I: Hunh!?

R: A 70-year old family practice guy, so, it was not like he was a computer guru...

I: Right.

R: It's not like he was a, you know, a 34-year old physician, this guy.

I: So, it's kind of interesting that they implemented the computerized physician order entry before they implemented other things?

R: No, they initially did, you know the labs, just like everybody else does.

I: Okay, all right.

R: The lab stuff and you do x-ray, and then they do the nursing record and then they do like what they are doing here with this LastWord medical record.

I: Right.

R: So, no, physician order entry is always at the other end.

I: Sort of at the end of it.

R: Right. I guess they figure because...I guess they think that's where the most resistance will be.

I: Yeah, well that's kind of interesting, at each facility...there's so many different varieties and flavors of how it is introduced. There are facilities that that's the first thing that they do, I think, they implement the physician order entry first. So...

R: Really, yeah?

I: That's the way Stanford Medical Center did it. The nurses didn't touch the computers at all and physicians were doing everything into the computers.

R: That makes sense.

I: I guess. Anyway, do you think that CPOE (computerized physician order entry) will affect or could affect patient care?

R: Only from perhaps a transcription of information, or medical error perspective.

I: Okay.

R: Minimize medical errors...

I: So, it would minimize...

R: Things are typed, or printed out or read out in a readable font, a lot of us do handwriting...

I: That's right.

R: Which are unreadable fonts.

I: Good. Yeah. How do you think that CPOE will affect your workflow as a physician/surgeon?

R: I guess, I don't do a lot of inpatient stuff, so I think that's where the greatest...I mean, everyplace I've ever seen it at, it's always been in the inpatient arena.

I: Right.

R: I've never seen it beyond that, so...

I: Okay.

R: And, from what orders you can get from people that I bring in to do surgery...

I: Right.

R: You know right now I use pre-printed orders that I bring in with me.

I: Right.

R: Already. I mean, again, just because it is easier to read. So, certainly if they were already macros or things that were already...he has his 'septo' orders...

I: Yeah.

R: That they could automatically generate without me having to...

I: Right.

R: Or email, or if I just had to change like dosages, or something like that, I had to do. Right now I write, I have the pre-printed orders blank, so that I just write in amounts.

I: You bet. That's very close to what the functionality is with the system.

R: Right.

I: You just sort of have that stuff already set up automatically, you just say, this is okay and then go. How do you think that CPOE might affect the productivity of other hospital personnel?

R: Well, it would certainly minimize phone calls.

I: Right.

R: You know, while I'm on hold, and this would eliminate all my hold, you know, you can't talk to a doctor somewhere else or, you know, I don't remember. So, it would minimize phone calls from one place to another.

I: Right.

R: It would certainly minimize the work that...who are the ones that do the medical error stuff? Quality Assurance?

I: Yeah, Quality Assurance.

R: And they teach you [inaudible] I don't what it is called now.

I: Yeah. Unhuh. [inaudible]

R: Yeah, some of those things may be lessened by things that are standardized or certainly easy to read, or...

I: Unhuh.

R: Primarily, I think when those people would certainly from [inaudible] to me, and I just have to click on, it's quick, that would be great. That would certainly minimize my writing, I'm sure from a frontline nursing station, [inaudible] that doesn't mean is this Adriamycin or is this Acromycin.

I: So, from that perspective it would be possibly, not only from the nurse's perspective, but also pharmacists.

R: Correct.

I: Do you get many clarification calls from pharmacists?

R: Well, no, because I use pre-printed...

I: Oh, right.

R: The only thing that I use is pre-printed.

I: So, that really helps.

R: Right.

I: One reason that hospitals implement CPOE is because it is supposed to reduce medical errors, we just talked about that, do you think it would?

R: I think it would.

I: And, do you have any, you mentioned as far as personal experiences with CPOE, you mentioned that you had some exposure to it in South Carolina. Was that during residency?

R: No, I was in my role as Chairman of Medical Records. We went to a place to look at a system.

I: Oh, I see.

R: We were in the midst of starting to implement a computerized medical record, though, and the hospital was just like McKenzie-Willamette with solitary for-profit institution and since we...

I: I see.

R: that was way on the back burner.

I: I see. We're all used to the current paper method. Do you think that CPOE would be an improvement over the paper chart?

R: It will improve it; it won't eliminate it.

I: Yeah. Any particular examples that might improve it.

R: Statistically the amount of paper that's being generated in a computerized world is more than it was 10 years ago.

I: Yep.

R: So.

I: It is pretty amazing. There is a little cartoon that I've seen is that [inaudible] delivery guy with his truck full of papers that says here is your electronic medical record.

R: [laughter]

I: Anyway, but anyway, getting back to improvement, as far as replacing paper or anything like that, you...

R: Well, I don't...a lawyer would never allow that to happen.

I: Okay. So, you really think it is more of a legal thing than a patient care thing?

R: Correct. You know I think we use this LastWord here as a computerized medical record. So, I never look at the paper record. I use LastWord all the time. You know, I've only been here less than a year, but I use that all the time. I actually don't even look at the paper record anymore.

I: Unhunh. When you look at it, are you looking at both sort of outpatient (because I know that PeaceHealth Medical Group has all of the documentation, the clinic documentation online) and inpatient stuff too?

R: Well, I'm using it like, histories and physicals, discharge summaries, I'm not looking at all the...unless there is lab work or something that is of interest to what this patient has at the moment; let's find the result of that, I do that.

I: Okay.

R: It certainly appears to be faster.

I: Right.

R: And, certainly much easier than the paper record. In fact, right now, whenever I have to look at a paper record, which may be once a month, that is horrendously tedious.

I: [laughter]

R: You know, you sort of forget how tedious it is to look through a record.

I: Right.

R: And then actually, here [inaudible] it's kind of...I guess because, I don't know maybe it's the institution, but the record is pretty standardized.

I: Right.

R: You know, even the paper record is like...you know, well, it should be in this section, is what most people are saying. This is where it is supposed to be, which gives me the impression that the record is a little more standardized than any other record that I've ever dealt with.

I: I see.

R: As far as paper.

I: It sounds like you've the chance to try to hunt the things in the paper record. Do you hunt for things in the computer?

R: Not as much.

I: Okay.

R: I think if I hunt, it's much...the perception is that...computers are easier, it may not be, even if it isn't.

I: Okay.

R: It appears to be.

I: Complete? Completeness? I mean, do you think computers are any more complete than the paper record.

R: Well, I think...no.

I: Okay.

R: I think because there are some regular steps, the speed of...you know, you have a computerized medical record, but dictation is still isn't.

I: Right.

R: That direct...bottom line it is being created as you speak. There is a human being that has to type it. So there is a 3-5 day window before... in other words, somebody is seen in Urgent Care yesterday, I'm seeing them today, it's useless, it's blank.

I: Right.

R: But again, the paper record is not any different.

I: Right.

R: There are still limitations with computerized record.

I: Right. Some hospitals require the use of computerized physician order entry and others make it optional or just strongly encourage it. What do you think would be best for our institution?

R: I would make it optional for a period of time and then after a period of time, I would tell you to make it required.

I: Okay.

R: And, I would make that period of time very short.

I: Okay.

R: I would not tell you, oh, 2 years, more like 3 months.

I: Okay. All right.

R: Because if not, you will...well let's see, when you use it at first, it's like the stages of death.

I: That's right, unhunh.

R: [inaudible] do this, do that, and everyone is going to grumble and complain about it. There will be a cadre of guys that will be like, "Yep, this is wonderful," and there will be the guys that are still struggling with it and a couple of guys that are totally against it who will eventually will convert.

I: Right.

R: And then there will be that one that you may have to force them to do it.

I: That's right.

R: But, if not, I think probably some sort of graduated introduction to it...

I: Great.

I: But I wouldn't make it like a two year period of time.

I: Yeah.

R: What did you hear when they implemented LastWord, was it, do you know? Was it just there one day?

I: As far from a physician's standpoint?

R: Yeah.

I: Well, they did sort of some trials. There was a couple of clinics that piloted it first.

R: Right, pilot is right.

I: And then, basically, especially, I mean, I think from this building's perspective we tried to do sort of roll it out by group,

R: Yeah, I know they sort of would roll out certain things to like Barger and other places. This was to be the last place to roll things out because..

I: It impacts so many people. How important do you think it is that CPOE be easy to use?

R: [laughter] It's going to require, no, I think there are certain things in LastWord that are not easy to use.

I: Right. Any examples?

R: The prescription pad. I think there are numerous ways of streamlining that. Now that might, maybe they have plans for that, I don't know, but again, I don't know whether...if this were mine...I think radiology is a problem.

I: Okay. In what way?

R: Well, because even though it is supposedly...even though OM...what is it? OIL or OML, whoever they are...

I: OIC. Yeah.

R: If it is done here at the hospital, then it is in the computerized record. If the same company, the same radiologists do it in a different building, that doesn't end up...you have to go to a hard copy.

I: Right.

R: I think that is not helpful at all.

I: Right.

R: A lot of things they should correct.

I: outpatients...

R: That gets a little bit tedious, let's see, what else? I don't find the lab thing very good to use, but that maybe because as an otolaryngologist, we don't do a lot of labs.

I: Right.

R: So, it is not a screen that I'm in all the time.

I: That's right.

R: So, for me it is like...kind of foreign.

I: Right.

R: I think the times that I've gone and seen patients as a consultant in the hospital, I found the computerized record to be very nice.

I: Okay.

R: Because it is right there where I'm sitting. You know, it is right there in front of me. I can look at stuff, I can see what people have done with current...from an inpatient perspective. It is certainly much nicer than the paper record.

I: Okay. That may have something to do with sort of the LastWord, it's beginnings were...

R: They're probably a few steps ahead of the curve compared to the outpatient, right.

I: That's right. Yeah. And then they are behind the curve when it comes to outpatient, but they're trying to catch up. How important is it that you have the ability to try out the system before implementing?

R: That would be nice. I think that would be very, very nice. I think that would be wonderful.

I: Okay. Sort of try it out for a little while and then...you know, maybe a day or two, like in a demo? Or, maybe usability?

R: I would do both.

I: Okay.

R: I think a demo for a day, then hey, listen try it out for a month, to see what you think.

I: Okay.

R: I think for me, from my...again, because I don't do a lot of inpatient stuff, that's why I would say a month. There are guys that do lots of inpatient stuff, for them they would probably tell you in a week.

I: Yeah. Well, that's really important and that's why it is really important for my research and also for getting information, interviewing and I appreciate your time, because we really do need to make sure that we design a system or adapt the system so that it does meet the needs of the

Hospitalists that are using it every second and physicians, such as you, that may not use it that often.

R: If it's not easy...if it's not easy or it requires multiple clicking to get to something.

I: Right.

R: You get a real feel, of what they [inaudible], or its something that, 'Yeah, I'm on my way now', he was mainly an outpatient kind of person.

I: Right.

R: Who like rarely, you know, maybe like once or twice a month does something in the hospital, like, "Oh God, I don't frankly know,"

I: Right.

R: "Oh no, and how do you do this?"

I: That's right.

R: and if that...

I: The odds are it will fail. It's got to adapt to both. Speaking of adapting, most people feel that there needs to be sort of a balance between adapting a computer system to the physician workflow and adapting workflow to the computer system. How do you feel about that?

R: Yeah, I...well, I guess if you are going to make it right, if it's going to make the guy...

I: Unhunh

R: Because if it is hard to use, or there are some steps that are going to disrupt the guy's flow, they might say, 'This is junk'.

I: Right.

R: He'll never go back there. So, yeah, I definitely...it needs to, I think it's both.

I: Right.

R: I don't think one or the other is greater, to be successful both of those things...the physician and workflow and workflow is the other half of that needs to be an ongoing at the same time...

I: Umhumm

R: Or...

I: You bet.

R: To make it...if not, I think it would fail if you didn't.

I: Right. Just as an example, some physicians say well, "Gee, if the computer system...if you don't make the computer system mimic my exact workflow today, then I'm not going to use it."

R: No, I think that...well, no, that's correct.

I: Yeah.

R: That is correct. Today, that you are not going to use it, but...

I: That's right.

R: But, I mean, I use a dictation...what's the...handheld dictation system which I bought on my own and I brought it with me here. So, I've been using it since I've been here. But, when I first got it, I had to adapt my...if I wanted to make my...it cost me...my \$6000 investment work, I had to understand...I had to do some adaptation to it.

I: Right.

R: Right. The guys who are very, very resistant are the guys who will never use it. Those are guys...that's going to be like...the 1% loss.

I: Yeah. Unhunh.

R: That's part of the equation.

I: Right.

R: But, no, if somebody is to say that's correct today, it's not going to be adaptable to what you are doing, but with time, you are going to sit there and say, "Okay, can I give up on this behavior,

I: Right

R: ...because this thing is making it easier."

I: Right.

R: And what will happen is guys are sitting around talking and stuff; they will sit there and say, "You know, I have no idea why, I modified this behavior and this piece of [inaudible] is wonderful.

I: Unhunh.

R: I think every computer requires some adaptation, either it's occurring without you knowing it, or you have to sit there and make a conscious effort. I mean, I did that with this computer thing that I have and, you know, it generates certain languages in a certain way. I sit there and say, I'm going to accept that as my language, as opposed to, "Oh no, I like to be more colorful."

I: Right. Yeah. That is very similar to what some of our Emergency Room physicians are going through.

R: Right, that template thing...correct, they are going to sit there and say, "Oh, wait a minute, this is not how I talk, or this is not how I move around." You know.

I: That's right.

R: You are going to have to figure out a different way of doing it, because in the long run, you will find out that, yes, they get more efficient that they are just...

I: Right. Sort of the example that I've heard is sort of instead of the system says, 'chest pain upon mild exertion' compared to the physician is used to saying, well, you know, 'chest pain while mowing lawn' type of thing, you know, and it's like well...

R: You mean deep down, does anybody care?

I: No.

R: You know mowing lawn, not everybody knows what that means. Is the guy push mowing, is he riding the mower? Mild exertion could be anything with mild exertion, you know, drinking a cup of coffee...mild exertion or something like that.

I: Right.

R: You know, I agree, I think those are things they have to...

I: You bet.

R: That they'll adapt. I mean...three months from now, it will be like...

I: And certainly taking advantage of what a computer does best. One of the things along with just using a CPOE system just to do your work of entering in orders, one of the big values is this thing called clinical decision support, so that when you are thinking of protocols, or when you are thinking of a variety of orders that you don't do frequently, to have the computer remind you of certain things.

R: Yeah, the more it can do that, it's great. Something like that, that's wonderful.

I: Well, that's certainly in the plans. You know the first hurdle is to get physicians to the computer to start using it and then we can start implementing these other things.

R: Yeah. I would imagine, probably the Hospitalists themselves, because they are here all the time, they probably use the computer a lot.

I: Right.

R: And, probably some of the other guys...some of the community [inaudible] have to go to the hospital every now and then, probably not as much.

I: Right.

R: I think the reason...I mean, I could see why...I don't interact with it yet much, that I would use it that much, but I know when I'm there I use it.

I: Yeah. Right. Absolutely.

R: I think physician order entry is a way of actually getting guys to become more interactive with the machine.

I: Unhunh. Yeah.

R: I think it's one thing, I don't know, you know, do you feel slighted, [laughter] because we're not interacting with it as much, you know we are just in there viewing things?

I: Unhunh.

R: You know.

I: But again, it's the computer has different things that it can offer and it does better remembering all of the things that you have tried; just from the admit orders. You have your pre-admit orders already pre-printed, so that helps you remember, that, "Oh, gee! I might make sure that I have that activity order, or diet order, or.."

R: Correct, I know if I depend...days that I forget to bring my pre-admit orders, and I'm like staring at the sheet, you know...

I: That's right. Yeah.

R: You know, "what do I normally write?" You go back to the med school mnemonic, [inaudible] or something like [inaudible], you know and mine is [ABC VNDSEL?].

I: Unhunh, yeah, right.

R: If I interacted with physicians, they always can remember that. It's always a little different, but..

I: If CPOE were to be phased in, would you like to be one of the first to use it?

R: Yeah, I'd like it.

I: Okay. How hard would it be for you explain the pluses and minuses of CPOE to your colleagues?

R: Well, I think it would be...I think the pluses...again, to me, I think the biggest pluses are it really standardizes...

I: Yeah. Umhmm.

R: You it's just basically, you know, here it is. Here is my septal...this is my tonsillectomy protocol.

I: Unhunh.

R: So from that perspective...a medical error perspective, I think that's easy.

I: Unhunh.

R: The negatives, I would have no idea, because again, unless it is cumbersome, or this or that, but yeah, I don't know. I don't know how...I'm not that familiar with what their plans are, what they want to do. So, I would have to say at this time today, I would say, yeah, I might be kind of hard pressed to give them a big giant speech on it.

I: All right.

R: If you go back to the first time I knew anything of this is when you guys sent me the letter saying, you know, that you guys are doing this project. I'm like, "Really? I didn't know they were planning to do this."

I: How important would it be for physicians to have an opportunity to see a demonstration of the system, I think, yeah, that you mentioned that, yeah.

R: I think without that...and also when it shows up, and I don't know how frequently.

I: And, sort of at what point in the process? I think you did allude to it as that a demonstration and implementation fairly soon after.

R: Correct and I think you sort of select...who are the guys that will be using it a lot and who are the leaders?

I: Right.

R: I guess when they were introducing it at this hospital (a different hospital in South Carolina), actually no, I was in Pennsylvania. I went to South Carolina to look at this system.

I: I see.

R: That's right. I was South Carolina in Charleston when they were implementing the...when they started bringing in the computerized medical record.

I: Right.

R: You know, what they did is they had the company come in and do the big show.

I: Right.

R: You know, the dream...the system that nobody will ever have.

I: Yeah. Unhuh.

R: Saying we will be showing all the record, images and all this on there and correct and like, "Wow! This is like fabulous."

I: Right.

R: Then they have little stations where you can go and play with it.

I: Umhumm.

R: So, that's how they sort of...and it was all done sort of as invitation, not really...like I said, I didn't want to come...they are here from here to here, and, you know, anything to pour in dues and that. I think we need to do, now that you saw the big giant demo, say, "Hey, we are going [inaudible] two weeks from now, you know, or if you guys are interested in taking the next step, then sign up here. Then you know who the guys are who want to take a look at it or whatever.

I: You mentioned the leaders. With respect to...

R: Who are they?

I: Yeah. I mean, maybe not names, but you know, is it like the chief of staff type of people, or is it the chief of department, or...

R: I think...I have no idea how it is set up. So, yeah, I think it is the chiefs of the various divisions and definitely, you know, those guys need to be included in all of that. I think the people in charge of the assorted committees probably need to be involved...some of those people.

I: Especially for us...sometimes there are sort of the official leaders and then there are the unofficial leaders and...

R: Right.

I: You know we want to try to get both.

R: Right.

I: We get opinion leaders, that sort of thing.

R: Right, I think that's the way to do this. I still don't know. Again, but...I'm so outpatient

I: Right.

R: I rarely am at the hospital, I don't know who...I know guys from various committees...and you know, I mean there is a medical director, chief of staff or whatever you call it, certainly, yeah, But those guys also tend to be older guys and may not like computer-wise... may not be... "I don't need that, I'm..."

I: That's right.

R: Retiring in 5 years."

I: Right.

R: You know then you've got to find the guys that are young.

I: Yeah.

R: I think you would include a lot of the workers; probably, I don't know, maybe the opposite needs to be done. Maybe it should be rolled out to the worker bees first and then the leaders who are going to come on board.

I: Right.

R: If they want.

I: Umhmm

R: Maybe its the opposite needs to be done. Actually now that I think about it.

I: Unhunh.

R: I guess we could do it with nursing, right? Then we would have like the chief's play around with it for awhile. It's basically...then in two weeks it's going to be on your...

I: That's right.

R: It's going to be on the floor. And, you guys have a couple of classes, some sessions, or...

I: Umhmm

R: Right?

I: Right.

R: Right. I think maybe that's the problem, for some reason with the physicians, maybe the opposite is being done as opposed to...well, wait a minute, no, you know the Hospitalists might use it all the time...because right...because, by the time, you know, the executives see it..."Oh, this is wonderful"...and it gets down about the worker guy goes, "Wait a minute, this is crap."

I: That's right.

R: "It takes me 9 million steps to do this."

I: Right.

R: So, it would be nice to get the worker guys first, and then...

I: You bet. Your comments are really appreciated, I mean, again, not only from the perspective of my research and getting this darn thing done, but also in my role as the project lead for this; now, because as you

mentioned there's a whole variety of ways that we could do that and getting the various opinions of how best to do that, hopefully it will allow us to come up with an implementation strategy that's successful and accepted more easily.

R: Getting the worker guys, that might be the way to go.

I: Yeah.

R: Forget the leader part.

I: Yeah.

R: They will come on board no matter what.

I: From a nursing perspective, we have a thing that we designate sort of super users.

R: Yeah.

I: So, we have those people that sort of get really familiar with it, the processes and workflow and they are very familiar with the computer, so anything new, we sort of take it to them.

R: That's the way...I think, that's probably where I would start. The physician, that may be harder to determine because you've got that audience for 8 hours and that place.

I: That's right.

R: The physicians are there...whatever...30 minutes...in the morning and 30 minutes at night, kind of thing. I think, yeah, I would sort of sit there and say, "Hey, who are the guys who...I actually think another, I don't know good surveys are..."

I: Yeah.

R: But if there is another way, you know "How often do you use this" and then you can determine, you know, "I never have", "LastWord, I never heard of it."

I: That's right.

R: This guy may not want to talk to us.

I: That's right.

R: You know, or somebody, like, "Oh, yeah, I use it all the time. You know, I don't want anything else but that."

I: Unhuh

R: Okay, well there's a super user among the physicians, but again, surveys are always sort of very dependent on whether people fill them out or not.

I: Right. There's certain bias in anything.

R: What was your response to your initial letter?

I: Actually, I got a pretty good response. I sent out 660 surveys to physicians at our Longview hospital, at this hospital and also at the hospital over in Florence. And, I got 278 completed.

R: That's not bad.

I: Yeah, 42% completed rate, so that's really good. I think for physicians it's...

R: Pretty much even around all three? Or...were the majority from one facility?

I: Pretty even. Actually a fewer from Florence than I anticipated, but a fair amount.

R: They're pretty small

I: Pretty evenly spread. Yeah. So...from a percentage perspective, it was pretty even.

R: I mean, I don't know, I...some of the guys from Urgent Care and ER perspective and hospice perspective, to me it's a no brainer.

I: You bet.

R: For somebody who usually does tons of orders, is always writing orders, seeing a lot of inpatients, I see it as a, you know, no brainer.

I: Right.

R: Especially if it is doing something...you know that's like...I don't know...let me think of something...like Tylenol in children. I think it would be wonderful if I have spot for Tylenol, that it basically...it already knows the weight, it calculated the dose.

I: Yeah.

R: That doesn't happen now. Actually now, there's even the basal metabolic weight to figure out...BMI...is too many steps.

I: Yeah.

R: I use BMI for sleep apnea, but to get that BMI number it requires too many steps for me.

I: Well, see that's...and that's exactly the type of thing ...

R: It would be great for stuff like that.

I: You bet.

R: Or you know, or [inaudible] you know the [inaudible] penicillin [inaudible] allergic to penicillin. "Oh, okay" which reminds me of that kind of stuff.

I: Right. That's ...

R: It keeps reminding me of that kind of stuff.

I: That's one of the things that's really inherent in the computer system is allergy checking and medications, but as far as dose calculations and reminders and that sort of thing, those are all sorts of things that...

R: It should be automatic. Now we have to go to a different place, calculate that and remember the number and then type it in.

I: That's right.

R: It would automatically know...it would already know the weight, the [inaudible] checks the weights, you usually hope it is.

I: Right. And that's what those sorts of things we refer to as this clinical decision support and the other thing that is really key is that you understand that it has to be part integral into your workflow. So, you have to have the information when you need it. So, as you were saying, it's a kid and you are ordering Tylenol it should automatically pop up and say "Please find out the weight that's in the system". In fact, I was involved in a conference call with physicians from Montefiore Medical Center and they are using the LastWord version; they're using the same version that we are, and they have all the physicians using...entering in their own orders and that was exactly what they were demonstrating for us was how they got the system behind the scenes to do the Tylenol, and actually not just Tylenol, but all pediatric dosages.

R: Right. That's a hard thing to fix, you know, [inaudible] the most, we are not pediatricians doing that everyday after day.

I: Right. And it did the calculations based on their actual weight as well as their ideal weight.

Interview Dr. G

I: So, I'm here to find out more about your perceptions of computerized physician order entry. Have you heard about PeaceHealth's plans to do this?

R: Yes, I have.

I: What have you heard so far?

R: Just that it is coming, that it is going to occur, I guess, within the next 6-12 months.

I: Okay.

R: And, there appears to be some anxiety about it.

I: Okay. And so how do you personally feel about implementing computerized physician order entry?

R: I guess that I imagine that it will enhance the reliability of the orders...

I: Okay.

R: That we write down.

I: Unhunh

R: The orders that we make...I'm not convinced that, it's going to be very efficient time wise.

I: Okay. Do you think that CPOE will affect patient care?

R: Well, it's the same kind of thing, it's going to probably help our orders to be implemented better in terms of the way that meant them to be, but it is going to slow us down in the morning doing rounds, for instance.

I: Okay. And, actually that goes right into the next question, which is how it is going to affect your workflow.

R: Yeah.

I: So, slowing down in rounds, anything else...

R: Umhmm

I: That you can think of that it might affect your workflow?

R: Ummm, well, we happen to have a system here where one person is responsible for the care of the inpatient, as far as people during the day, but...so it's very infrequent that I get interrupted by the floor for...with concerns about inpatients, but it does occasionally happen. And if it happens that I have to interrupt seeing my outpatients, go to the computer and take care of inpatient stuff, that will also slow down stuff during the day.

I: Right. Okay. And, so does that mean that you take call after-hours and on weekends for the inpatients as well?

R: Yeah.

I: Okay. All right.

R: So, all of that would be slower too. You know...our call is from 6:00 in the evening until 7:00 in the morning, but I've had occasion to get 5 or 6

admissions between 6:00 and 10:00, and if I'm having to mess around with the computer, it's just going to slow all of that way down.

I: Okay. How do you think that CPOE would affect the productivity of other hospital personnel?

R: In the very same manner, because I don't think many of us are computer savvy, a few people are but the majority of providers I would guess are not.

I: And, what about doctors, excuse me, about nurses and pharmacists?

R: You know, all medical providers who work on the floors will have had occasions where they listen to the nurses struggle to read our writing, struggle to understand what the heck it means once they've read it and then struggle to find someplace in the computer where they can order what we've asked them to order.

I: Right.

R: So, I'm sure the nurse would wildly be enthusiastic with this [laughter] and I don't know about the pharmacists.

I: Okay.

R: They'd probably be happy.

I: Right. One reason that hospitals implement CPOE is because it is supposed to reduce medical errors. Do you think that it might help here?

R: Yes.

I: Do you have any personal experiences with a CPOE system?

R: No.

I: Okay. And, we're all used to the current paper method. Do you think that CPOE would be an improvement over it?

R: It will not improve our productivity. [laughter]

I: Okay. How about, some hospitals require use of CPOE and others make it optional or strongly encourage it, what do you think would be best for this hospital?

R: Ummm

I: So, mandatory or voluntary?

R: I think it would probably be best if it were mandatory with ample, ample, support available. Five Analyst G at all times.

I: Wouldn't that be great!

R: 24 hours a day. [laughter]

I: That's a real key is to have lots of support readily available. How important do you think it would be for CPOE to be easy to use?

R: It's going to be critical...

I: Okay.

R: [inaudible] doctors everywhere.

I: Okay. How important is it that you have the ability to try out the system before it were implemented?

R: Oh, very high.

I: Okay. Most people feel that there needs to be a balance between adapting the system, the computer system, to your workflow and also adapting your workflow to the system, what are your thoughts on this?

R: Well, I would agree with that, but you can't put the hospital on divert while you know [laughter] you try to figure out how to make this work.

I: Okay.

R: So some of that is possible and some of it isn't.

I: Okay. So, for instance, you know, some would say that they want to make the computer do exactly the way...follow the exact same process that they currently have on paper, whereas others are saying that, "Gee, you know there are some things computers do better, so maybe I need to change my workflow a little bit and take advantage of some of the efficiencies of the computer," so, that's sort of the balance that we are talking about here.

R: Umhmm.

I: Okay. If CPOE were to be phased in, would you like to be one of the first to use it?

R: Sure. [inaudible]

I: How hard would it be for you to explain the pluses and minuses of CPOE to your colleagues?

R: Average in terms of articulateness.

I: Okay. All right.

R: I wouldn't have a problem doing that.

I: How important would it be for physicians to have an opportunity to see a demonstration of the system?

R: I think pretty key if you want them to not complain and feel involved, so maybe like a month, or a couple of months before this is going to come online, if you have some sort of meeting time, and some way of making things available to physicians at a time that they feel is convenient for them.

I: Okay.

R: With food and coffee [laughter] and Analyst G.

I: Well, that's actually a great point, because that's one of the things that I wanted to ask specifically is sort of, how to get physicians...

R: Well, how do drug reps do it? They bring great food and they have these really pretty ladies come.

I: Unhunh

R: The male doctors love it. [laughter]

I: What about female doctors? What brings you in? Food and...

R: I don't come to drug rep stuff.

I: So, food at convenient times and...

R: I guess that the fact that it is going to be imperative and I am going think that if I don't learn it...that's what makes me come.

I: Okay.

R: Just tell me it's mandatory and this is how it has to be and I will have to show up.

I: Okay. All right. Any other comments?

R: Ummm.

I: Or things that make sure that we include?

R: No, you know, I'm here...I've only been here 9 months and I came from a system which had no electronic medical records and I've been so impressed on how much better the care is that I can provide with this EMR, I really think that getting the orders online will improve things that much further.

I: Great.

R: It's just an incredible struggle [inaudible]

I: Right. Has it been difficult for you to...now, you do your encounters online and RX Pad and that sort of thing.

R: Yeah.

I: Has that been a tough implementation for you?

R: Yeah, but it's not tough any more.

I: Right.

R: It was hard initially, and Analyst G came out and there are still things that I don't know how to do, quite honestly.

I: Umhmm.

R: My day is just so frantic that I need to write them down so I can get some help and figure out how to use it.

I: You bet.

R: But that's just medicine.

I: Well, two key points that I just want to reinforce and that is, we realize that what we were referring to is help at the elbow. In order to make this work, we are going to need to have resources available right there, so that I'm standing there over in the corner and when you have a question, you give this high sign to me and I come in and I help you. The other thing is that we can't, you know, it's not like we can hand you a manual...a five-page manual of detailed instructions...and say, "OK, here's everything you need to know about the system". We realize it's more of a ...training needs to be more of a...sort of a just in time perspective...

R: Umhmm

I: And, just what you need to know and that later on that we can sort of share tips along the way and say, "Gee, I wish I could do this" -"Well, you can. Let me show you how," type of concept as far as the training.

R: Umhmm

I: I'll put...just for 30 more seconds, just put my other hat on which is my PeaceHealth hat, and that is that we do have...we actually have a unit that has been trialing and piloting computerized physician order entry at Sacred Heart. That's sort of where I am based. We have a group of 5 independent rehab physicians and they have been, for actually the last 4 months, have been entering in all of their orders into the system.

R: Umhmm

I: What that has allowed us to do is sort of figure out, how can we make it most efficient for the physicians, what are the changes in process that nurses and pharmacists and that sort of thing have as a result of them doing that, and it has really been a great learning experience for us. We're also working with Drs. Avalon and Wright here to try to set up some sort of pilot here, just a limited scope type of pilot just to see...because each facility, their workflow is different and we need to try to figure out what the workflow is of the non-physicians as well as try to work with and adapt the system (and that's where that one question gets back in), adapt the system as much as we can to the workflow of the particular physicians, because we do...LastWord is somewhat limited, but it does have some flexibility and we want to try to flex that flexibility as much as we can.

R: Yeah.

I: So, again, we're...as you said, 6-12 months...I'm not...we'll probably start doing something in 6-12 months, as far as when it is that...I'm not sure as far as when we'll want to make it mandatory. Again, we want to pilot things so that we have a good feel for..."Yeah, with enough training, physicians can do this," and "Yeah, with these changes in process, the nurses and pharmacists can effectively carry out electronic orders and paper orders," because from the time that we start until the day that we said, "Okay, everybody has to do it", we are going to live in a dual process world, so we need to make sure that the processes co-exist well enough so that good patient care can continue.

R: Yeah.

I: So, again, thank you very much for your time.

Interview with Dr. H

I: I'm here to find out more about your perceptions of computerized physician order entry. Have you heard about PeaceHealth's plans to implement CPOE?

R: Yes, quite a bit.

I: Yes, and specifically, how have you heard about it?

R: Well, I've heard mostly about it because I work on it.

I: That's right.

R: Although I've heard about it in other forms also. It is occasionally in our online electronic newspaper, Crossroads. It is in the print version once in awhile. It has been in our medical staff newsletter that is put out by the chief of staff every two or three months. It has been mentioned at our clinical service group meetings, so it has actually come up several different places.

I: Good. How do you feel about plans to implement CPOE?

R: Well, I think personally that PeaceHealth should move aggressively in that direction and that it offers the opportunity to mitigate many of the problems of the current ordering process and thereby enhance patient safety. It certainly has some hurdles to overcome and it is going to take a lot of work, but I do think that in general, this is the right approach for healthcare to take.

I: What hurdles?

R: Well, I think hurdles of accep...well they can be divided into several ways. One is just acceptance of change and that is physician, non-physician, all of the way down the line. It is a different way of doing it so it causes some different interactions and I think those hurdles have to be overcome. I think there are technical hurdles. The software that is available is certainly not as flexible, foolproof, helpful, etc., as it could be. I think there are, in a sense, almost perception hurdles which is part of the acceptance, I guess, but somehow the perception that doing these things into the computer is just not the same, some people just don't think it is the right way to do business.

I: UmHmm.

R: I guess there are really two basic categories that I think of, technical and acceptance which becomes part of the change management issues.

I: Great. Do you think that CPOE will affect patient care, and how?

R: Yes, once it is really done well and it is an accepted way of doing our work, it will enhance patient care. It will reduce all of the sources of error that everybody talks about, physician handwriting, handoffs, enhance speed of getting orders implemented. It will reduce some redundancy, offer decision support real time for whoever is ordering, things of that

nature. It has the potential to introduce some errors that have to be carefully watched, because physicians are doing things they haven't done before. Behind physician writing of orders on paper, there has always been somebody coming along to kind of clean it up and some of that cleanup actually does go away. Some of it is perceived by some of those people to be going away, so they, some of the support people, feel like they don't need to pay as much attention in a sense if the physician has ordered it in the computer because the computer made them do it right and that is not necessarily true. And, so it has the possibility of some negative impacts, but I think, you know, again, as we gradually improve the technology, I think it will enhance patient care, and hopefully get people in and out faster and safer and at lower cost.

I: Great. How do you think that CPOE will affect your workflow?

R: As a physician?

I: UmHmm

R: Well, I think, one, it is going to slow me down. I don't think, at least in the current life of products, I haven't seen one that wouldn't slow me down overall. I think it will force me...so that that is the biggest single negative to me. I think the positives are it will force me to recognize some things that I don't currently recognize. It will force me to put in information, say in ordering of imaging studies, information that currently doesn't get transmitted to the interpreter of the study, but is information that may be helpful in allowing them to help me. They know what I'm looking for, so they can help me better. I think it will...it should force the adoption of more order sets of various sorts so that care becomes a little more standardized, especially in diagnoses that are fairly common, so that I am picking, instead of from an infinite list of whatever pops into my head, I'm picking from things that are appropriate and relevant orders and being reminded about things to order. I think that having decision support as it gradually evolves will help prevent me from doing the wrong thing, or the inefficient thing, sometimes it's not always right or wrong, but should help me be more efficient in what I order. I sometimes worry that it may decrease communication between physician in the hospital, the physician and nurse, typically now, I will often, especially with admission orders, when I have a group of orders on a patient, lots of orders, I will typically grab the nurse if there is somebody handy and say, 'Can you think of anything that I'm forgetting?', and that will be a little harder to do when I'm interacting with a computer. So, I worry a little about that. But, I think that it will ultimately help me be a better physician once in place, five years from now.

I: UmHmm

R: When things are more developed. I think in the meantime, as with any change, there will be some ups and downs.

I: How do you think that CPOE would affect the productivity of other hospital personnel?

R: Well, it will improve the productivity of ward clerks. Nursing, I'm not sure it is going to have a big impact on their productivity. I don't think they spend a huge amount of their time, I don't know for sure. I don't think they spend a huge amount of time currently, taking off orders. That would be reduced, but they still have to check them. I don't think it is going to change that a lot. Pharmacy, probably not going to change their time or productivity a whole lot. I think it is not going to make a huge difference to the others.

I: Okay. One reason that hospitals implement CPOE is because it is supposed to reduce medical errors. I know that you just mentioned that, but do you think that it might help here? I think you've already outlined the specifics very well in our previous question.

R: Yes.

I: Do you have any personal experiences with a CPOE system.

R: Yes. I have played with a couple of various vendors at meetings and I have experience with our LastWord IDX system.

I: Okay. You all are used to the current paper method. Do you think CPOE will be an improvement over it? Why or why not?

R: Well, kind of some of the things that I've discussed. It is going to be an improvement in some of the things that I've mentioned. I think it may, you know, in some of...where it won't be an improvement is probably physician time, that's probably about the only negative, really, once it is all implemented.

I: Some hospitals require the use of CPOE and others make it optional or strongly encourage it. What do you think it would be best for this hospital.

R: I think at this point in time, or in the foreseeable future, optional.

I: Okay. And do you see a time when it should be mandatory?

R: I think so. I think when it gets to the point that it's...A) that there is good data locally as well as nationally, that it is a positive benefit to patient care, in particular, if we can establish data locally that shows that, I think physicians will pay more attention to that than just national studies done at Harvard saying that it's better. And, so, I think once we can actually document that it is a positive benefit here, then I think it will gradually, not overnight, but gradually evolve to being a mandatory thing. Many other things have become mandatory over the years for physicians that have been hotly debated...

I: Right.

R: Or physicians have said, 'Oh God, no, not this. It's a terrible burden' and it won't do any good, in effect. It hasn't played out that way. I think this will be similar.

I: Right. How important do you think it is that CPOE be easy to use?

R: Very important.

I: Okay. How important is it that...do you think that physicians have the ability to try out the system before implementation?

R: Well, on individual physician basis, I don't think it is important. I mean I don't think Dr. X should necessarily have a try out period, but I think as a group, certainly things like this should be piloted and used by small groups and improved until it can sort of be readied for prime time.

I: Okay. Most people feel that there needs to be a balance between adapting the system to physician workflow vs. adapting the workflow to the system. What are your thoughts on that? I mean is it equal...

R: Yeah, I think it's both.

I: or should there be emphasis on one or the other.

R: I think it depends on the individual process. I think that you have to...it's an opportunity to look at the processes that you are currently using. Just because they are what they are, doesn't mean that they are necessarily good.

I: Right.

R: And, so there may be clearly situations in which the current process is bad for one or more people affected by it and then the process should be adapted so the workflow should be changed. I think at other times, if the workflow as it exists is pretty good, we need to try to mimic that in the electronic process.

I: Okay. If CPOE were to be phased in, would you like to be one of the first to use it?

R: Yes.

I: Okay. How hard would it be for you to explain the pluses and minuses of CPOE to your colleagues.

R: Pretty easy.

I: Good.

R: I might get stoned, tarred and feathered by some.

I: Unhuh. How important would it be for physicians to have an opportunity to see a demonstration of the system, and if so, at what point in the implementation timeline.

R: Well, I think more than one opportunity. I think that the most important thing is to have the opportunity to repeat showing it, because the first time one sees it's not going to have...not really looked at the same way as once you've had a chance to look at it some more. I think that the more opportunity physicians have not only to see a demo and they can see

back, their eyes can glaze over and they can think about last night's baseball game, but rather have the opportunity to interactively play with the system.

I: So, as far as...so several times along the continuum and as far as the demo is concerned, at what point...at every point when you demo it, do you necessarily get feedback as to how you might change it.

R: Well, I think if you have a group of physicians in the room, they are going to give you feedback, even if you don't ask for it. There are going to be the, 'Why the heck are you doing it that way?' questions and we should be able to learn from that.

I: Okay.

R: Or for whoever is putting this together to learn from that.

I: Right.

R: One of the unfortunate things at this hospital now is that we don't have large group staff meetings or even department meetings, so the...kind of the avenues for talking about it, disseminating information about it, are fairly limited. We have these quarterly internal medicine and family practice education conferences that are CME conferences. I've talked to the chair people of all of these several times and said, 'Hey, we could give a nice presentation on POE, or other topics using our electronic library doing other things having to do with computers that doctors may want to hear,' and everyone says that's a good idea and then, you know, it never gets on the schedule because instead they talk about a medical problem. And, so we don't have a very good forum for demonstrations or for feedback and that's something that has been kind of nagging me a little bit.

I: Should we try to...I'm sorry...

R: I would like to...I would think that you want to have the opportunity to put this in front of people repeatedly, so even if they seem critical of it, at least it starts becoming familiar.

I: Should we try to compensate physicians that come to these demos?

R: Oh, I think if they come to a demo I don't think they necessarily need to. I think if we actually involve them in some of the work for a couple of hours, or something like that, then we really should.

I: Okay.

R: Make them have some responsibility, they feel more involved. They have a little more buy in to the process that way.

I: Okay. Anything else from your perspective that you would like to make sure that you share, that either gets included in my research or gets included in our implementation strategy for CPOE?

R: No.

I: Okay. Great. Thanks.

Interview with Dr. I

I: Again, thank you very much for taking this time with me.

R: Okay.

I: As far as the first question is concerned, you know I am here to find out more about your perceptions of computerized physician order entry.

R: Okay.

I: And just a little bit of background about that, what I'm hoping that makes my research somewhat unique is that research up until now in this area has been done mainly on residents and interns at major academic centers after a system has already been implemented.

R: Right.

I: And, again, as I mentioned to you, I'm hoping to get some of your perspectives and perceptions of a system prior to implementing.

R: Excellent.

I: Have you heard about PeaceHealth's plans to implement CPOE?

R: Yes, I have.

I: What have you heard so far?

R: I've heard that it is in the process; they do have some computer going on already, with some of that stuff, but, yes, I know that they kind of want to do that on a real basis, where everybody does it all the time.

I: Great, great. And, how do you feel about those plans to implement?

R: I actually have no problem with the plan. I think in the long run, you know, it will be a good thing; it's just how complicated will the system be and how often they will change it on you, that's the thing that we will have to kind of see how that goes.

I: Okay. All right. And, the other thing is, you don't have a problem with that you say..

R: No.

I: Anything particular that leads you to that?

R: I think that, well as far as the order entry, I think you will have lot less mistakes, particularly with drugs, medications, orders (as far as dressing changes, those types of things). So, I think it would be a lot clearer than having hand written. I think hand written gets a little bit fuzzy sometimes; so, I don't have any problem with that.

I: Right. Great. That probably sort of answers this, but do you think that CPOE will affect patient care?

R: Yes. Absolutely, I think it will be a positive thing.

I: Okay. Any in particular things about why it is that it would be positive to patient care.

R: Well, I think it would be positive for the same reasons, just basically because I think the orders will be a lot clearer. You know, everybody will

be able to read them. Also, I think there will be probably some help in the system as far as if you screw up an order, something that doesn't exist, you know...

I: Right.

R: ..or the doses are not, you know, .0 instead of 0., you know those types of things. The other thing I think probably may be, I kind of worry about, is will it slow things down.

I: Right.

R: That's the other thing - working the system, how complicated is it going to be? Will it be more intuitive? Or, will it be something that you have to learn the whole computer program and kind of figure out.

I: Right.

R: That's what I worry about.

I: You bet. Actually, that flows right into our next question, which is how do you think that CPOE will affect your workflow?

R: My workflow, because I don't have a lot of inpatients, it is probably going to have minimal impact on my workflow. What will happen is every time that I go in, you know, and have to actually see the rare inpatient, or have to do some sort of orders, is will it look the same as I saw it before?

I: Right.

R: That's the thing I kind of wonder about. How often are they going to change the look of the system? How the system operates? You know, every time I go in, am I going to have to learn it all over again?

I: Right...

R: That, I think, is kind of...we'll have to see.

I: You mentioned earlier, access.

R: And, access, yeah.

I: Do you think having access to the record via the computer in your office...

R: In the office would be great.

I: ...would be beneficial to you?

R: Yes, absolutely. Yes.

I: Okay.

R: Yes.

I: And, just to, certainly, of all the things that CPOE is touted to do, not having just that one place where that medical record - for that chart...

R: Right.

I: ...having access to it in multiple locations has been...

R: Yes, it makes a big difference, because you've got to have access to the information, otherwise, you know, you can't really check anything.

I: Right. How do you think CPOE will affect the productivity of other hospital personnel?

R: Hmmmm. It depends on the system.

I: Right.

R: It depends on the system. If it is a good, straight forward, simplified system, then I think it will basically make everything much better. It certainly will affect how much paper you will have to have.

I: Yeah.

R: If it is a bad system and you still have to have a lot of paper backup, then you've got a problem.

I: Umhumm.

R: You have two systems running and that is not going to be cost effective, it won't work.

I: Right. That's a very key point, because that is one of the things that we are trying to address right now in our plans.

R: Exactly.

I: ...is how to design it so that a dual process, which is inevitable, making sure that it is efficient and effective and good for patient care.

R: Exactly.

I: One reason that hospitals implement CPOE is because it is supposed to reduce medical errors.

R: Umhmm.

I: Do you think that it might help here?

R: I think, yes, absolutely. I think it will definitely makes a difference vs. handwritten orders.

I: Any...

R: And, of course that goes along with helping reduce any kind of errors as far as patient treatment, you know, those types of things that can happen.

I: You bet. I was reading an article today just on some of the...

R: Oh yeah, good lessons [inaudible] [laughter], but yeah, if you can get in the chart and see what the patient's allergies are, those types of things...

I: Unhunh

R: Because, sometimes you just don't get the whole - you either can't ask the patient that, you know, you can't run around looking at a chart because there is no chart there, so you need to be able to look it up in the system and hopefully it is in there clear that you know what is going on.

I: I would imagine that from your specialty that you hear the horror stories about the patient, the typical patient that has 3 or 4 physicians and no one physician knows all the medications.

R: That's right.

I: I can imagine that especially with your subspecialty that it is even harder for you.

R: That's why, you know, I mean to co-admit with their primary care physician just for that reason, because the patient themselves either doesn't know what they are on or what they are taking, or forget to tell me. Their family hasn't got a clue, so, I usually will co-admit if I'm admitting somebody with their family physician because they're usually the one that has most of the information.

I: [laughter]

R: Hopefully.

I: Yeah.

R: You know, so, and that does make a difference.

I: Yeah. I just chuckle because the thing is that we say that most of the information and yet, those of us in healthcare, we can certainly appreciate that, but yet on the other hand, our customers, our patients, they really...

R: They cannot be very helpful, at times, you know, it's amazing.

I: Yeah. Do you have any personal experiences with a computerized physician order entry system?

R: Actually only what they have now.

I: Okay.

R: The system that they have now, there basically is...yeah...very little actual except for the transcription stuff that I do...

I: Right.

R: ...for surgeries. In an outpatient surgery, I deal with the system mostly with that, and, so it is mostly transcription, saying it is okay and that type of thing.

I: Okay. Do you admit both at Sacred Heart and McKenzie?

R: I don't have privileges over at McKenzie-Willamette. I don't have much...because they are way over there. So, I didn't bother to pay them their \$250.

I: So, as far as the system is currently, you interact with...

R: interact with it Sacred Heart...

I: ...transcriptions...

R: Yeah, with transcription, mostly with that system.

I: Obviously, there is the current paper method.

R: UmHmm.

I: Do you think that CPOE will be an improvement over it?

R: I would say yes, but only if you can get access to the information, that's the thing.

I: Access to all information?

R: All of the information, yeah, then it will be definitely a good thing.

I: Is there information that you don't feel like you have access to now? Any piece that you want to make sure that you have access to?

R: I think that at this point, with the current system that they have, the problem that I have with it, is kind of education in using the system.

I: Right.

R: They do have classes and things like that, but because the changes that happen fairly frequently over time, it makes it difficult to keep up with which icon goes with which, and what's that over there, so it gets a little bit interesting to try to work the system because of the changes in it because I don't use it very much.

I: Right.

R: That's the thing that I have problems with.

I: I just want to, we have besides the fact that your comments are especially valuable because we want to make sure that whatever system accommodates all of these...

R: Definitely want a system from someone who doesn't use it very often. Exactly.

I: You bet. Some hospitals require use of CPOE and others make it optional or strongly encourage it. What do you think would be best for Sacred Heart?

R: I think that if you are going to do it, you should just do it all the way and that keeps it from getting too complicated for everybody, going I will do this or that, you know, so if you are going to do it, you should just do it.

I: Okay. How important do you think it would be for CPOE to be easy to use?

R: Absolutely the most important thing. [laughter] It has to be intuitive, otherwise...

I: And you use the word intuitive, what does that mean to you?

R: Similar to what we do already. If it is set up, if you can almost set it up as if it was a chart,

I: Okay.

R: that would be really easy to figure out, you know, instead of renaming everything, try to keep things the same as they are actually used, if you can.

I: Okay. Great. How important that you have the ability to try out the system before it is implemented?

R: For me, probably not much, because I wouldn't use it that much. I probably wouldn't have whole lot to give you as far as what is good and what's bad, type of thing. Somebody who has had the experience before, or is more experienced, probably can give you more information.

I: Right. Okay. And, actually you've sort of answered this already, in that some people say that there is a need to balance between adapting the

system to your current workflow and adapting your workflow to the system, where should we land?

R: Well, I think that workflow, I'm not sure about workflow...what do you mean by workflow?

I: How you do things.

R: How I do things?

I: Yes.

R: If, because of the way the system is with charts, if you kept it with SOAP notes, those, this, this, this and this is in this order. If you keep the system similar to that, I don't think you will have as many problems with where we find things.

I: Okay.

R: You know, that type of thing.

I: Okay. So, again, probably, just to reiterate, you probably favor...

R: I prefer to have it adapt to me than me try to adapt all over again to something.

I: Okay.

R: You know, a different system.

I: Great. Certainly. One of the challenges that we have is that all physicians and surgeons sort of do things a little...

R: There's a little, but if you find out the common things, and stick with those and you usually do pretty well. The little things we can all change.

I: That's a really good point as far as finding the common things that everybody does.

R: Umhumm.

I: And focusing on those.

R: Yeah, because there definitely is an order to the chart, or there is a typical order to the chart, particularly with the newer physicians. Most of us know what SOAP notes are, you know...

I: Right.

R: The chart goes from here to here, you know, that type of thing and so you will see that system. Almost all of us will kind of use that.

I: Right. Actually, one of the things that we are working on right now is sort of the admission type of orders and so we are trying to follow the flow of those orders...

R: Right.

I: The mnemonic that...

R: Right. Exactly...

I: that the ADCDVACR...

R: Exactly. History of present illness, blah, blah, blah, blah, blah, blah, blah.

I: That's right.

R: And that will actually keep us, that will make it easier for anybody to use the system because that is pretty much the system we know now.

I: Right and keying you to the next flow.

R: Exactly. Don't forget this...and then you just go down and you can't get lost, yeah.

I: You bet.

R: That's good.

I: If CPOE were to be phased in, would you like to be one of the first to use it?

R: [laughter] I wouldn't mind, you know, I would definitely want to kind of get used to it and see what it going on.

I: Well, again, I just reiterate that we want to make sure that they system is going to adapt to all kinds of users.

R: Yeah, so I have no problem with giving it a shot.

I: Getting feedback from those that are fairly occasional users is going to be real important for us.

R: Yeah. That would be great.

I: Okay. Today, how hard would it be for you to explain the pluses and minuses of CPOE to your colleagues?

R: I don't think it would be that hard. I think it is actually pretty straight forward. We all feel the same way about certain things.

I: Okay. So, you think that in the literature that you review that there has been enough information about it initially?

R: Yeah, I mean certainly I think there are enough other systems out there that are using it to know sort of what happened, what didn't work, that type of a thing.

I: Good. And, how important would it be for physicians to have an opportunity to see a demonstration of the system?

R: Depends, I think it depends on which physicians you are talking about. Frequent users, I think the sooner they get in and take a look at it, probably the better for everybody, especially if there are something that everybody complains about.

I: Right.

R: As far as someone like me, I think if you've done that first, then by the time I look at it, it will be pretty straight forward as well, so...

I: Okay.

R: I think depends on the amount of use you are doing.

I: Okay.

R: Because I wouldn't have a whole lot of input sometimes, to say, "Oh this one is better than the other one, or this...", you know, somebody who has more experience probably does.

I: Unhunh.

R: Although, you've got to be careful not to get the physician who is a computer nerd physician who, you know, because that is not very many of us, you know.

I: Right.

R: I think the people that give classes over at Sacred Heart, you know, the computer classes, that they hear the same things over and over again about complaints. So they would be a good...they would know some of the things that might work.

I: Right. And, again, the thing is that is one of our challenges is to not only set up the system for the frequent users, but also for the infrequent users.

R: For the ones that don't know computers very well...

I: Yeah, well...

R: [laughter]

I: Again, going back to that word 'intuitive', if the system is set up so that...

R: If it is intuitive to what we similarly do, then it is not going to be, it is going to be very easy to deal with.

I: Right.

R: Exactly.

I: Great. Any other additional information that you would like to make sure that I go away with today in either with my hat on from a research perspective or as my hat of an implementation person?

R: Hmmmmm. I don't think there's actually that much more. I think you've pretty much got the idea of what to look for.

I: Unhunh.

R: You've seen the other systems and then all troubles with them, I'm sure everybody is telling the truth about that.

I: You bet

R: And then like I say, talking to people who actually have tried to teach it.

I: Yeah.

R: And see what kind of weird things have come up that they...you know.

I: Unhunh.

R: And then, like I say, making the system, I know you are always going to have changes, but to keep the changes down to the minimum and only if they actually really need to be changed.

I: You bet.

R: Don't get into change for change's sake. [laughter]

I: Umhumm. Right.

R: Because some places do that. You know, you have to give a password every time, you know, every time you show up...

I: Right.

R: every time you show up, it's like they've got to change your password.

I: You bet.

R: It's like, what a pain in the butt.

I: You bet. You know that is really a key concept, as far as the changes, is because, again, it is one of those balances that we need to approach with our implementation strategy, that on one side, people say you want to make sure that you adapt the system to the workflow, so you know, as physicians use it, you are going to want to change things and if they identify things that could be smoother, you want to change things.

R: Yeah.

I: but on the other hand, one of the things I'm hearing from you is that you also have to balance that with too much change...

R: Yeah, too much change is not good. And, you know, the nice thing about at this point in time anyway, is that most physicians have been doing charting a specific way because of the legal issues, and that.

I: Right.

R: So, we get real good, this is the chart, this is the information everybody wants to have. So, luckily you have that basis and once you get that basis, then, you know, you have a new medication or you decide that you want to kind of tweak it as far as how to keep errors out of the system...

I: Right.

R: Or you see something developing that way, then fine change it, but for God's sake, don't try to make us do a whole new system of charting.

I: Right.

R: That's not going to work, as the government found out when they tried to do the little bullet stuff.

I: That's right.

R: You know pin you down to how many...they found out that's not the way we chart.

I: That's right.

R: It ain't gonna work, because it's gonna add time to it, because it ain't easy and you are going to have everyone unhappy.

I: That's the other thing is the time issue.

R: Yep, exactly.

I: Well again, I want to thank you for your time today.

Interview - Dr. J

I: I'm here to find out a little about your perceptions of computerized physician order entry. First of all, have you heard about PeaceHealth's plans to do this?

R: I've heard a few rumors, but no definitive plan when it is to be implemented.

I: Okay. How did you hear about it?

R: Probably through our medical director, Gary Young, has mentioned it, you know, as we try to implement our physician documentation things, we obviously kind of want to look into the future what's going to be the next step.

I: Good. So, how do you feel about the plans that you've heard about implementing CPOE? How do you feel about those plans?

R: I'm quite anxious.

I: Okay. How so?

R: My concern is not having a physician or several physicians involved in the entire process. Because I think it is one thing to design a system; it is another to use the system on a daily basis.

I: Right.

R: I've kind of found that we are in the midst of that problem right now with physician documentation system that we are using.

I: Okay. At what level, in the implementation, in the programming,...

R: That's a good question, where ...I guess...Where would we get involved? I would obviously like to see the product; sit down and see what the plan is and how it is going to function and be able to demonstrate the use of the system prior to it being implemented throughout the PeaceHealth system.

I: All right. Just a quick aside, in a lot of ways, I'm hoping to provide information and results of this survey and have an impact on how...because I'm the lead for implementing computerized physician order entry at PeaceHealth, and I will be supplying the results of this to Dr. John Haughom and Dr. Jim Scott and Barry Perlman and the physicians that are currently involved in helping to design the implementation strategy. So, again, I'm hoping that some of the feedback that you are sharing with me today will be impactful on how we strategize this, so it sounds like you want to be involved early...

R: Really..

I: You want to see what it is going to do before it is a done deal. Okay. Do you think that computerized physician order entry will affect patient care?

R: I'm hoping that it will improve patient care.

I: Okay.

R: I think the biggest impact, which I hope it will do, is reduce the possibility of errors. My practice is much different than my partner's practice, etc., etc.

I: Exactly.

R: And, I know exactly what I want to order, it doesn't make sense to me what we are doing now, is put a check off on a paper system, give it to somebody else to enter. I think that obviously when you create a chain of commands, you open yourself up for the possibility of errors.

I: The more handoffs, the more chance for errors?

R: [nod?]

I: Okay. How do you think that CPOE would affect your workflow?

R: In the big scheme of things, I hope that it would improve my workflow.

I: Okay.

R: I obviously envision a program where my nurse's documentation is computerized, my documentation is computerized, obviously my physician order entry, so that I could be working anywhere in my department, look at a computer and say, 'OK my patient is not responding to this treatment, I need to add...order this. Boom'. I don't need to walk across the department to put an order in, to tell somebody. I think it will simplify; I would hope make the whole process more efficient.

I: Okay. Great. So, having access to all of the patient information from anywhere is really important to you.

R: Unhunh.

I: So, how do you think that CPOE would affect the productivity of other hospital personnel (nurses, ward clerks,...)?

R: Well, I think their job would change dramatically. I think that obviously the biggest impact would be our ward clerks.

I: Unhunh. You think that would be a good thing?

R: Oh, it would be a great thing. They could help...their job then would be coordinating phone calls, admissions, other patient flow, issues.

I: One of the reasons that hospitals implement CPOE is because it is supposed to reduce medical errors. You mentioned that earlier, but, you agree that you think that it might help. Can you just expand on that just a little bit, in what way do you think that it would help reduce errors? You said the hand offs. Anything else?

R: In terms of errors? To reduce the errors?

I: Yeah.

R: Like I said, you don't have a handoff. In the Emergency Department patient Careflow, if my treatment changes, you know, I can say okay I want a CBC and a base panel. Well, the patient comes in later and says,

'Oh, I've had some chest pain'. Well, I need to order an EKG. If the EKG is abnormal, then I need to add other tests.

I: Right.

R: So, I'm immediately ordering those things as my decision process changes and I don't need to involve somebody that doesn't have any idea what is going on with the patient care in the process.

I: Right. You mentioned, sort of the decision that is another one of the big benefit of computerized physician order entry is that all of these algorithms and patient care standards and that sort of thing are really difficult to keep all that stuff straight in your head and again, one of the benefits of CPOE is that they refer to it as decision support, where options can be presented to you along each step of the way, 'Did you remember to do this?', or automatically calculating algorithms and saying this patient's creatinine clearance estimation is such and such and you may want to consider da-de-da. Do you think that would be helpful to you in your practice?

R: Oh, I think it would be ideal to improve efficiency, cost management issues. For instance, obviously we see patients with pneumonia all the time. If a pneumonia protocol just automatically came up to remind us, or ankle x-rays and the auto-ankle criteria.

I: Right.

R: It would be easy for a system to come up and say, 'What about....', 'Did you look at these physical criteria?' I would like that.

I: Great. Do you have any personal experiences with a CPOE system. Have you used one before?

R: Yeah. I used a system when I practiced three years at Ridgeview Medical Center in Waconia, Minnesota, just outside of Minneapolis. They had Wellsoft, was their system, and during the three years there, they implemented...first they implemented, I think it was a process where they implemented nursing documentation, followed by physician order entry.

I: Okay. Did you personally like that? The software itself?

R: There's obviously things that I liked about it. Obviously it had some faults and frustrations and was...

I: I'm trying to separate between the software itself and the way that they implemented it, was there anything that you would have done differently?

R: In retrospect, my biggest concern about the whole process is feeling that I'm tied to my computer, rather than my patient. For instance, obviously we had a system where you go in and take the history, do your exam and then come back to a centralized location, put in your orders, etc. I don't think that is very effective patient care.

I: Okay. Would it have improved if you were able to have access right at the bedside?

R: Yes.

I: Okay. We're all used to the current paper method here. Do you think that CPOE will be an improvement over that current paper method that we have.

R: Yeah. No doubt.

I: All right, because it seems like with the current paper method, it has gone through years and years of iterations and changes and that sort of thing and almost always seems like when the computer comes in there appears to be this really inflexible thing, where as we try to, as much as possible, make it flexible as well, make changes available to it. Some hospitals require the use of CPOE and others make it optional or strongly encourage it. What do you think would be the best for this hospital?

R: Mandatory.

I: Mandatory? Okay. And why do you feel that way?

R: Having multiple systems for entry and orders, I think is, leaving you opened up to create errors

I: Right.

R: and...I can see it in our practice, the younger physicians in our group are eager and willing to try new systems. The older physicians don't want to change and there has to be that everybody get over the hurdle kind of thing. We need to do it as a team.

I: There are certainly examples of how doing it Big Bang is, well, either way you do it, it is painful. And, sometimes, there are examples of doing it Big Bang that has not been wildly successful and certainly there are also other examples of where they've tried to ease it in slowly over a number of years and sometimes that is not as successful either. Again, as you point out, you don't really reap the benefits of the system very quickly. How important is it, do you think, that CPOE be easy to use at this hospital? Pretty important?

R: [laugh] Your #1 priority.

I: Okay. How important is it that you have the ability to try out the system before the implementation?

R: Like I said earlier, I think that would be critical in order to get all our physicians in our department, say we are all going to go day one...

I: Right.

R: ...only with physician order, you would have to have a lot of training, practice, so we would all feel comfortable.

I: Most people feel that there needs to be a balance between adapting the system to your workflow and adapting your workflow to the system. What are your thoughts on this?

R: I think that, adapting the system...

I: So, in other words, should we bring in a system that mimics and supports your workflow exactly as it does today in using paper systems, or should we try to adapt and change your workflow processes to the way that the computer is designed? I guess that is sort of two ends of the spectrum.

R: I guess I would like to perceive the system adapting to my workflow.

I: Okay. If CPOE were to be phased in, would you like to be one of the first to use it?

R: Sure.

I: Okay. You also mentioned important to be sort of a team. Your thoughts on you using it and your partners not using it, would that be okay with you?

R: No, you know obviously it is a company-wide or department-wide decision and I think we all need to...all of the physicians need to be on board and agree to use the system.

I: How hard would it be for you explain the pluses or minuses of CPOE to your colleagues.

R: I don't think it would be hard for me.

I: Again, patient safety...

R: All that sort of thing

I: And, then how important would it be for physicians to have an opportunity to see a demonstration of the system?

R: I think that would be all part of the implementation process, a demonstration and practice time.

I: And, at what point in the process? Again we sort of alluded to that earlier in an earlier question about, sort of, when do you bring end using physicians into the implementation process? Because there's software development and then there is sort of software tweaking and then there is looking at the software integrating in with the workflow processes of the particular department and that sort of thing. Where do you see yourself?

R: There would be a question, obviously, about having any background in it [laugh], design development, or whatever.

I: Yeah.

R: I guess I would ideally like to know about what the plans of the future are as soon as it is available. Obviously, our group now, we've heard rumors about physician order entry.

I: Right.

R: If there have been some definitive plans and so on, it would be nice to at least hear about them and then obviously as a group, I think there would be an individual or someone from our group that would want to be more involved in the process, that would be ideal.

I: Great. Those are the end of my formal questions; however, I just want to point out that, do you know that there is a pilot of CPOE going on right here in this facility?

R: No.

I: Obviously, we haven't done a very good job with communicating that.

R: [laugh]

I: Our physiatrists, the rehab physicians, have been using CPOE for all of their orders on the rehab unit for the last three months, and so part of, you know, it was used as a pilot...

R: Umhumm.

I: Can physicians in this facility use the software that we currently have available to enter in all of the orders and can nursing and the ancillary staff, and they continue to provide good patient care while doing this. Again, that was a pilot that was done. We continue to look at it. At this point, there are some nursing processes that we feel that we need to change just a little bit that could be supported by some additional software that is available to us, so we are in the process of implementing that and then we are looking for another area to pilot it, because, on one hand it has been a good test of the system and processes itself, but it is somewhat limited because, they don't have certainly the acuity of orders and just the acuity of the patients that you guys do, for sure. So, we need to find another environment that is a little bit more acute and test out the system. So, anyway, at this point, Dr. Barry Perlman, I'm not sure if you know him,

R: I've talked to Barry.

I: He's leading the effort here of implementing it at this facility. So, anyway, again..

R: And, how do the physicians...

I: Like it?

R: Yeah. Do they..

I: I think that, based on what we've heard, they really like it. One physician, in particular, Dr. Annette Weller, she really likes it. She used a system in her training, so she adapted to it very quickly. She really feels, like you had pointed out in the interview, that now, with that piece, that just about everything is in the computer and that has really forced her to go to the computer, where she tried to rely on the paper before and the paper chart is fairly incomplete right now, and she feels that with the completeness of the documentation now online, that she really likes the ability to see a lot of different things, to ask a lot of different types of questions that she wouldn't normally think of looking into the paper chart, especially for her lifestyle, having access to the information from the office, from the home, or being able to enter in orders from just about anywhere

has been really very good for her. So, at this point, we have 5 physicians that are entering all of their orders and we are going to be implementing slowly and again, hopefully, some of the responses that you've given me today will help us guide in implementing or developing implementation strategy. It sounds like one of the first points that we need to work on a little bit is to communicate what is going on and what the plans are.

R: That would be great. Or maybe my partners know more. I've heard about it. I'm sure Gary Young must know about it, our medical director.

I: Right. Okay. Do you have any questions of me or any additional comments?

R: [no]

I: Great.

Interview Dr. K

I: I'm here to find out more about your perceptions about computerized physician order entry. First of all, have you heard about PeaceHealth's plans to do this?

R: Yep

I: And what have you heard?

R: I was in one of the whatever the groups that implements computer _____ and that kind of stuff and they were talking about it as coming up.

I: Okay.

R: A lot of barriers, but they are basically there is a lot of plans for when, how, and whether to implement it.

I: Right.

R: Basically, at meetings, I've heard about it at meetings and of course you hear rumors here and there.

I: Right. How do you feel about those plans about implementing it?

R: I tell you I need to refer to my paper. There was computerized order entry where I was at before I worked here and it came and went practically when I was on vacation, I think.

I: Oh really?

R: It was like within a week. It came on, it created so much dislocation and so much problems that they cancelled it.

I: Where was that?

R: That was in the military, that was at Wright Patterson Air Force base.

I: Okay.

R: It can potentially be a good thing, but it has to be better than paper. That is basically it. And, one of the things, this is just an aside, it's not that relevant, but as an aside, we schedule our procedures, and we have these electronic calendars and Outlook and that kind of stuff. And the people who do the most efficient job of scheduling procedures are my secretaries and they have a great big calendar on their desk and they write stuff down on the calendar, erase stuff and then they write it again, erase it. Another doc who just joined our group, our pod here, said, 'I want to use that system', basically paper. What I think, I tend to use computers, tons I think that they increase efficiency dramatically in a lot of settings. But, if all we ever had was computers and electronic stuff, basically if we started with computerized order entry and computerized medical records and so on, then someone invented paper, it would be considered a dramatically useful and high-tech, incredibly great invention - create a thing that you can fold up, you can copy it easily, you can carry it with them, and you could have multiple copies here or there without any sort of

expense, that kind of thing, paper would be considered a dramatic type of logical improvement over electronic, if electronics came first and paper came second. So, I think there is a lot of advantages of paper that are under sung, and a lot of advantages to electronic order entry that needs to be recognized.

I: Right.

R: Each program you can figure out which is better for whatever job it is.

I: Right.

R: It has the potential to cause problems; it has the potential to decrease problems.

I: Can you...problems that it might cause?

R: If you don't have a computer terminal in every patient's room, it becomes the whole issue of writing orders or creating orders, becomes finding one has become or [inaudible] one ends up searching out for a computer terminal and I think and you have questions about this later on, I think the mode of operation of most doctors, most of the time, particularly if you only have a few patients, is to go wherever your patient is, see your patient, gather all the data, talk to the patient, write orders.

I: Okay.

R: It is not see all your patients, think about what you want to do, remember it, and then sit down somewhere and do it all and batch it. Basically see a patient, figure out what you want to do, write the orders and you kind of clean that out of your mind. Even the whole act of going to see a patient, finding a terminal, logging in, going through all the passwords, finding out that your password expired and you have to change it and come up with a whole new password that you try to remember, all of that will tend to discourage orders. There are ways to do it that are intermediate that I think would work, that could work really well, which is you don't have to kind of have one or the other.

I: Okay.

R: If you had the ability to put orders on the computer and the ward clerk had the ability to put orders on the computer, one of the biggest advantages of computerized order entry is the same as the electronic medical record. I can sit here and see what the patient has ordered, which is incredibly useful. I don't want to be the one that has to put it in the computer though.

I: Right.

R: So, how I write orders on paper and a nurse or the clerk transcribes them into the computer, that would work. Because they can batch it; they can log in once and then batch whatever orders they do, rather than having to have me change the way I work.

I: Okay.

R: Or, have the option of doing it that way. So, if I just happen to be sitting in front a computer and I want to write orders, then I can put it in the computer, but have the option to doing it sort of the old fashioned way as well.

I: Okay.

R: Anyway, so...

I: In your...so it cuts down on many of the...but that's great, I really appreciate that.

R: ...doesn't impact patient care.

I: Going back. Yeah, do you think it will affect care?

R: It could have a negative impact on patient care just because if the system is complex to write a simple order, you just don't do it.

I: Right.

R: and the metrics should be - if I run down to see a patient, decide a patient needs an order for Tylenol or a sleeping medicine, just one order on one patient.

I: Right.

R: How long does it take to do that? How many keystrokes, how many mouse movement, how much time to find a terminal, basically include all the overhead on both ends.

I: Right.

R: I sort of find as a computer programmer, it is very easy for a computer programmer to say, 'It only takes 2 seconds to put this order in'. That is assuming that you are already sitting down at the computer, you are already logged in, so, the actual time it takes to put an order in should include the entire time from after you get done talking to the patient.

I: Right.

R: Like I said, if you are talking to the patient, you turn around, there is a terminal right there, you take a badge and with this badge that you carry around with you that identifies you completely and you don't have to go through anything else beyond that, and it comes up on a screen that just has their orders...

I: Right.

R: That's actually probably better than paper because you do spend time searching the chart too.

I: Right.

R: But if it says that we are going to do it the way we have it now. We are going to implement within LastWord, it is not at every patient's bedside.

I: Right.

R: For me...I don't even...to be honest with you. I look in the chart for patient's labs. So, if the patient has a lab that did not get printed up and

put in the chart, unless it is sort of critical, I won't pay attention to it until the next day. So, even though I could go kind of search out a terminal and all that stuff and come up with Clinical Labs, I would get from the computer sooner, the overhead of doing that is too high.

I: I see.

R: So, similarly with orders, if it is a critical order then you do it, if it is sort of a minor order that maybe you can wait until the next time you think of writing orders on the computer, you might just say, 'I'll just wait until later on because it takes too much time to put it in now.' That could impact patient care for obvious reasons.

I: Right.

R: There are lots of positives too, and the positives are easily ...the positives everybody knows - less errors, better documentation, if I put in an order in for a med and it automatically goes to the Pharmacy, then it will get up sooner. There are lots of positives to computerized order entry. The positives are almost obvious. The negatives are more subtle.

I: Right. Good. You mentioned how it might affect your workflow. Do you think that CPOE would affect the productivity of other hospital personnel.

R: Yes.

I: And who and how?

R: It would increase the productivity of a lot of ancillary personnel such as Pharmacy, Physical Therapy, all of the people who are getting the orders, assuming it is done right, I would assume, although I don't know this for a fact. I would assume that when they write an order in a computerized system, it immediately goes to wherever it needs to go to. So, the Pharmacy could in principal, write an order for some med, you could kind of go to the complete extreme where that goes right into a Pyxis system, the med gets packaged up with a little thing and within 2 seconds it pops up in the patient's room. So, that could very much improve the efficiency of a lot of non-clinical people. Basically, people who spend their days sitting in front of the computer. Those guys will have their efficiency increased.

I: Okay.

R: People who spend their time running from patient room to patient room, it has the potential to decrease their efficiency, the doctors, and potentially even the nurses, again, depending how it is implemented.

I: My next...

R: [It could potentially impact?] the nurses, I call a nurse and I say, 'I forgot, can you, I need to order an echocardiogram on such-and-such a patient'.

I: Right.

R: If they are doing something else, then what means they have to do is, do a whole bunch of things to put one order in the computer. That impacts their productivity in this way.

R: There is a model that can work pretty well, that is basically, having computerized order entry, but not require the providers to do it.

I: Okay.

R: We had an electronic medical record when I was in the military, and it was this big system that was based off of a UNIX based Windows system and it was actually really nice - CIS is what it was called, Clinical Information Systems, and we actually had (when I was an attending - this was in a teaching hospital), all the progress notes, basically everything that you write in the chart was on the system. So, there were no progress notes in the chart. So, if I was consulted on a patient, I could go on the computer as I was talking to somebody and pull up not just the H&P and the first consult, and I could pull up all the progress notes along the way.

I: Wow.

R:...which was great and it really provided incredibly good documentation. I loved it. Part of the reason that I loved it was that I didn't have to type the stuff in. The person who typed it in was the intern.

I: Okay.

R: You know, interns are functionally clerks.

I: Right.

R: So, they hated it, but they basically they had to be typists and you would go in and see this room full of interns and instead of actually managing patients and reading this, they would be typing the notes, so that they're basically becoming transcriptionist, but what ends up in the computer is actually really good. In an academic setting you can do that, because interns will do whatever you tell them to do. You won't get doctors to do that, so that is why we can't have progress notes here.

I: Right.

R: Now, if we could dictate our progress notes, such that those end up in the computer, basically it is a computerized medical record, but the person who is working is not the [primary?] interface with the computer, they interface through another person.

I: Right.

R: That would work well in almost any system and it would improve quality of care. Similarly, for computerized order entry, if we communicate our orders to somebody else, and they go through all the headaches of putting it in the computer.

I: Right.

R: Which, no matter how good the interface is, there are always some headaches.

I: That's right.

R: ...and somebody else does that, then it could work really well.

I: Moving on, my next question is reducing medical errors, you have already touched on that.

R: Sure, it probably would.

I: ...and also, you mentioned as far as your personal experiences with CPOE, you have had that

R: Order entry was abandoned within a few weeks.

I: Was it really?

R: Yeah, I think the medical record was in for a long time, but order entry was abandoned. I think part of it was because of people not doing it well and not using it right. But, I think part of it also was that, they didn't have an interface with everything else. So, basically, the computerized order entry basically resulted in the paper order being printed up, that became nothing more than kind of a word processor.

I: Right.

R: You couldn't really...it wasn't implemented to increase efficiency of anybody.

I: Right.

R: You found yourself being the system and because the system and the Pharmacy didn't work yet, or they didn't interface well there, whatever happened, you put it in there and the clerk would have to print it up anyway.

I: Right.

R: And then fax it the old fashioned way; they basically had to do the work of both systems.

I: That's right.

R: So, it didn't come in well and nobody was really all that big of a fan of it. Computerized order entry is a lot harder than electronic medical record, because you need to have...the menu of possible orders is huge. You need to figure out a way that makes it so that it is easy to navigate. Putting orders in is difficult.

I: We're all finding that.

R: It makes the job difficult. It's not even like putting in transcription, where basically you transcribe a note; it can be free form because someone is going to read it. No one has to parse that note and say, "OK, this needs to go to Physical Therapy, this needs to go'...This has a text is enough. To read out an order entry it would have to be done in a way from the computer system, that the computer knows what to do with the orders, but also has to be the way that you think about the patient. You don't think about the patient in Pharmacy vs. PT, you think about them in diseases. For this disease you do these five things.

I: Right.

R: And, if I have to go for heart failure, say, 'OK, this guy has heart failure, so I need to prescribe these two meds and I need to have this, and this and this. I do those in first'. OK, they also have diabetes. So, then we get to back to the med screen... So, it doesn't quite...it's a lot harder to do.

I: So, maybe my next question, as far as paper method, that might be used as an example, is that you can think maybe across a continuum more on paper than computer?

R: Yeah, exactly.

I: Okay.

I: How important do you think that CPOE be easy to use at this hospital? Would that be like #1, I've heard you mention that already.

R: Well, here's the selfish perspective is if doctors are required to use it, it is critical that it is easy to use. If doctors are not required to use it, in other words the model is we write orders, but they get entered into the computer by somebody else, currently, the way it is now. A set of them in the computer that gets faxed. So, basically [inaudible] instead of faxing these orders to the Pharmacy to have the people who are at the desk enter them into the computerized order entry system and then you would minimize errors. Then, it just needs to be easy enough that the small number of people who are using it can be trained.

I: Okay.

R: So, they have some systems that they have to use, I'm sure, are complex already, you know some of the computerized systems that the people have to use at the desk, but as long as that's what they sit and do all day, you can train them. You could it with something even that is hard.

I: Okay. How important would you feel that the ability to try out the system before it would be implemented?

R: Yeah, that would be pretty... well, yeah, whoever has to interface with the computer has to be able to try it out.

I: Okay, getting close here. Most people think that there is a balance between adapting the system to your workflow and adapting your workflow to the system. So, what are your thoughts on that?

R: I think the system needs to adapt to the workflow, and the problem is, all doctors have different ways they work that is based on what makes them efficient and how they feel they can best care for their patients, and some doctors are able to see...kind of batch...they go see all their patients and then they go look at all the vital signs and then they look at every one of the labs one by one.

I: Right.

R: And, they kind of just do it in that order. Other doctors want to see (and I'm sort of the latter type), I want to see one patient and have all of the data on them, and then take care of everything at once and then I move onto the next patient and start fresh. Those are two fundamentally different workflows and if you try to force somebody to the other workflow, they will become much less efficient and they will be dissatisfied, patients won't get good care. Basically, it is more important to be flexible in the way that you do your work.

I: Right.

R: Other doctors who are doing procedures (myself, if I'm doing procedures), I'll sometimes say, 'Well I want to swing down and see a patient quick before they do another procedure'. I have 5 minutes and if I can go find the family and say hello to them, tell them what we are going to do, write a quick order or not. Sometimes, I will write a note in the chart. I then go back to whatever else I was doing somewhere else. That is different than the Hospitalists that spends a lot of time in the hospital.

I: You bet.

R: So, I think it would not be a good idea to try to adapt everyone's workflow to a system because everybody's jobs are considerably different. However, people who have well defined jobs, then you can kind of change them, but for people who, be it the doctor or the nurse in a lot of the sense, is not really a well defined job. Your job is to take care of these patients completely. The way you do it is based on the way you've been trained and the way things are done your whole life, so try to change that is probably a mistake. Now if the system is adaptable, then it works. Like for example, that example I gave you where I run down to see a patient and quick see them but don't even have time to find the chart, do something, yell something to a nurse, 'Can you make sure this patient gets a [nitro?] before my case is up and go upstairs. That should still be possible. A computerized order entry system might actually be pretty good for that.

I: Unhuh.

R: It might be good, it might be worse. If I could go upstairs to my lab and there was a computer terminal right there and I was waiting for a case to start, I usually have 5-10 minutes before a case starts, I might be able to log into the system, type a quick note in, maybe put the order in and have actually have done the work that I meant to downstairs.

I: Right.

R: So, that could work better. But, that's basically the computer system adapting to my workflow rather than me adapting to the way the system works.

I: Right.

R: Some of the computerized systems are designed for efficiency only if you do it a certain way. For example, ones that depend on a patient list. So, you have a patient's list.

I: Unhuh.

R: ...and you look at the order, and then you have a button that says next patient and you can write orders. That is designed for somebody who, so you have a long time to log in, a long time to log out, but when going from one patient to the next is easy, that is a system that is designed for someone whose workflow is to do all the patients' orders at once. In general, a system that is designed like that does not work well for somebody who does one order at a time.

I: Right.

R: On the other hand, somebody who does one order at a time, which means log into the patient, do all the orders, but then to get another patient they have to come all the way out through the menus and go back into another patient works well for somebody who sees patients one at a time, but not [inaudible].

I: Right.

R: So, the system needs to be flexible enough to work with both modes of operation. There was one hospital that I worked in, while I was in medical school.

I: Okay.

R: It was Graduate Hospital in Philadelphia - it was 1987-88 - that had a marvelous computerized system that I've not seen duplicated anywhere else, and it was useful. What they had is in every patient's room, sort of as you walked in on the wall to your left side, they had a paper chart, but they also had a computer terminal.

I: Okay.

R: And, that computer terminal was meant for writing orders, [I don't...the order was going into it or not then?] (may or may not have been), but they had data on that patient and what you did was that you came in the room and you had to carry your badge.

I: I see.

R: You basically put your badge up there and then that verifies who you are, you don't do any other log in stuff and you basically put your badge up there and what comes up on the screen is basically that patient's information. You don't have to select a patient or anything. Whatever room you are in, that patient comes up and has what recent labs came up, what [inaudible] what x-rays came up, kind of like alerts, that kind of stuff, basically most of the clinical information that you need.

I: Right.

R: Almost no work beyond walking into the room and swiping your badge by.

I: Cool.

R: If that screen also had orders and you clicked write orders, that would actually work well.

I: Good.

R: And then of course, you could actually while you were in one patient's room, you could get to another's patient's orders, but that took a little bit of work because the idea of that system was that you were in that patient's room, you were supposed to be dealing with that patient.

I: Right.

R: Even when I talked to the patient, I could say, 'OK, do you something?' I could type something in there, right there.

I: You bet.

R: And the ID of that was based on your badge rather than having to keep on changing passwords. And, that was in the late 80's and it really...

I: Wow.

R: That, I thought, worked incredibly well. Every other system I've seen has so much, you know the overhead for getting on the system was large enough, you don't feel like using it. I don't feel like going and finding a terminal and even the act of logging on is such a big deal.

I: Right.

R: God, we just don't feel like doing it. You have to come up with such a complex password, that you can't even know to type them anymore.

I: You need to remember them and then they make you change them every six months and that sort of thing. If CPOE were to be phased in here at this facility, would you be one of the first to use it?

R: I don't know. Probably, I don't...you mean is this by choice or by what I think is likely?

I: By choice.

R: Probably not.

I: Okay. And, any particular reasons why?

R: Because, my suspicion is that it would be an impediment to my workflow.

I: Okay.

R: Unless I really knew how it worked. You know, if they piloted out ahead of time and we kind of knew how it worked, then I might.

I: Okay.

R: But, I think the place that it would work the best would be in medical first, you know the way that the cardiac floors are?

I: Yeah.

R: They have these laptop monitors that are on rolling things and you sort of roll them from patient to patient... but there aren't enough of them. So, basically, there aren't enough to have one per patient's room, which is why they have them on rollers. The other floors, I think the third floor medical floor, where they walk outside of each patient's room, right basically there is a little station that you could set up that has all that generally has charts, the terminal, has everything sort of set up.

I: I see.

R: That would be probably a better place to put it, because you need to be able to write orders wherever you are.

I: Right.

R: So, that floor seems to have an adequate number of computer terminals available for trialing it.

I: I see.

R: But, I don't see a lot of patients on that floor, so that ... I think one of the critical things if you are going to have providers do it, you can't have a shortage of terminals.

I: So, lots of access and it has got to be really quick to get in.

R: Right.

I: Good.

R: Right. And navigate...

I: And navigate, for sure. How hard would it be for you to explain the pluses and minuses of CPOE to...

R: Oh, pretty easy.

I: Okay. Because you've had enough experience with that and that sort of thing?

R: Yeah.

I: Okay. How important would it be for physicians to have an opportunity to see a demonstration of the system?

R: Well, we should see it. It is important to see a demonstration of the system before the decision is made as to what system to implement.

I: Okay, because that is really important for us, we want to make sure that in the process, in the implementation process, that we have physician involvement, but we want to have it when it is going to be most beneficial for you and also to the process.

R: But there are some things that just won't work.

I: Right.

R: And, I think it is hard for people who spend a lot of time sitting in front of a computer to recognize that people who don't sit in front of the computer all the time have a very, very different workflow. [inaudible] and that is the subtlety that is missed in a lot of design of electronic medical record systems is that... The people who are designing it, just basically by

their very nature are sitting in cubicles and then their computer logged in and they are basically there all the time.

I: Right.

R: So, it is hard to remember that not everybody is in that same mode, and that is what I think is important before you decide what system to buy, because you have the people who are more likely to be using it.

I: Okay.

R: Like I said, if the model is going to be we, which I would favor, would be that you still have paper, just like we have electronic medical record for HPs but we have paper for the progress notes, you still have paper to write orders on, or you can put it in the computer and all that happened with the paper orders is that somebody else transcribes it into the computer, then it is not that critical, because then the people that it is critical for (the clerk) can view the demonstration to see how easy it is to them when they have a stack of 6 charts in front of them to put all of those orders in.

I: Right.

R: It should be easy for them. But they are lower paid and you can hire more of them pretty easily. You don't necessarily use many computer monitors, and that would be potentially no impediment to workflow for the physician.

I: Right.

R: Now, if as a doctor, you know that if you put the computer...if I as a doctor know that if I write an order for an x-ray, I can find the chart, put the order in, if I want it to be done right away, I have to go find the clerk and have them put it in STAT, you basically have to do all that stuff and I know that I have the option of doing it on the computer (not the requirement, but the option) and I know that if I put it in the computer and it gets done faster, that would be a positive incentive to learn the system and to put it into the computer.

I: Okay.

R: That, I think would be the best way to get acceptance of it, is to have both systems, they both converge on the computer (order entry), but one is going through a clerk and the initial operation is the same.

I: Okay.

R: And the other one is where I could short circuit that and order directly, then you'll learn how to do things more efficiently.

I: So, one other thing that I want to get your opinion on, and that is that as far as the pluses of CPOE, is decreased errors. There is also the concept of a thing called clinical decision support, where once you are at the computer, it is one thing for you to have your mind remember that I have to enter in all of these orders. It is another thing to have the computer sort of present options to you or reminders that, 'Oh, don't

forget to do this, that sort of thing', how important would that be to support your workflow?

R: Those are okay, they have to not be obtrusive. That was actually one of the problems...I do remember that...that was a problem of the order entry of the military is that practically every med that you ordered, some dialogue box came up and some [inaudible] dialogue came up that said, 'Digoxin interacts with beta blockers' and you had to dismiss all these dialogues and actually dismissing the dialogues, I think, took 2 or 3 clicks. You had to say, Okay, Ignore All, Prescribe Anyway, and then go to the next one. That is a way to kind of tick off doctors in a huge hurry.

I: [Laugh]

R: So, it has to be subtle.

I: Right. But you could you think...

R: It could be useful, but you know, if I were designing it in the system, you would have one screen on top where you are doing all the orders and at the bottom, as you type the orders and when you do stuff, it might give you the warnings and the suggestions.

I: Right.

R: But, it is a place where you don't have to pay attention to it if you don't want to.

I: Right.

R: You type it in, you put the order in, at the bottom it might suggest 'This drug is [?] consider this other drug', or 'Patient has heart failure, they should be on a beta blocker', that kind of stuff, but you don't have to, it is kind of a subtle reminder type of thing that occupies the screen, that occupies 20% on the bottom of the screen. Something like that.

I: Okay. Great.

R: That's how I do sometimes, clinical decision support should not impede what you are doing.

I: Right.

R: Because there is an awful lot of stuff that is done that is off label or unusual and as a cardiologist you would see that all the time because we prescribe people four different anticoagulants at a time and each one of them will say 'Interacts with Plavix, interacts with heparin, [inaudible]' every single order I would write, because most of what we treat is poly-Pharmacy. Virtually everything I write will have some warning at some level.

I: Right.

R: That will drive you crazy if you read them all, particularly if you have to dismiss them as they come up.

I: Right.

R: So, Brian, I guess I would probably just have a running scrolling thing at the bottom kind of telling you all the warnings, sort of like a log that you, like when I synchronize, you press the button that synchronizes that does all this stuff, I don't get any buttons, but at the end it says, "Log, would you like to read it?" and they look at the log and it says, error doing this, some sort of thing that always happens, you look it up and say okay that is fine and then we can dismiss them all at once.

I: Okay.

R: Then it would be useful. That is a tool that is potentially useful but does not impede your workflow in any way.

I: Okay.

R: There is a tendency, I think in Pharmacy particularly, to just try to get you to either find warnings and then they force you to look at it, which mean that the dialogues have to pop up on the screen and you have to do something to dismiss it.

I: That's right.

R: And it is too much.

I: Interrupts the workflow.

R: Yes.

I: That is the list of my questions, do you have any other additional comments for me, or for this?

R: No, I don't think so.

I: Well, again, I want to really thank you for your time, and I appreciate your opinions, because I just want to reinforce is that not only is this report for me to finish my research and finish my dissertation, but it is also going to be very useful in designing our implementation strategy for CPOE here. I don't know if you know, but we do have a pilot of CPOE happening at Sacred Heart right now with physiatrists, five physiatrists, for the last three months have been entering in their orders on all of their patients up on the unit and so, anyway, I'm sure you will hear more about the physiatrists. The rehab physicians (physical medicine, rehabilitation, that sort of thing).

R: That would be, there are some different docs in different fields have different modes of operation, but it would be a mistake to try to mold everybody the same way.

I: Right.

R: I think the rehab docs, perhaps the psychiatrists, and, let's see, who else, social workers so they can order stuff, and perhaps the Pharmacy folks would be ones that tend to act in tandem.

I: Yeah.

R: It wouldn't be that, they probably, I don't know how the pharmacists work now, but if I was one of the pharmacists and I was managing

someone's INRs , I would go from patient to patient, I would actually sit and look at all my labs, write them all down, or do something and then figure out what I wanted to order and I could potentially batch it, so its kind of a job that would lend itself to doing it.

I: That's right.

R: And rehab medicine would tend to lend itself to one certain type of mode of operation and wouldn't be that hard to have a computer terminal only where they work. You know they see all their patients, they come over to the office like this, and they sit down and write whatever they need to write.

I: Actually, you know, I was thinking of your comment about the access and up on the rehab floor, they have a lot of the rolling terminals and they as a group, they make rounds on the patients and they take that and are able to see, 'OK, what was...

R: I tried to that, actually when I'm on call on the weekend, and I have to see a bunch of patients. I will sometimes do that, I will take one terminals to myself and sort of roll it around. They are not quite big enough, I need to have a table that I can write on too,

I: Yeah.

R: You've got to take that around.

I: Right. Actually, we sort of solved that because there is a little pull out thing, so anyway, I will have to show you.

R: The problem is when you get called. Rehab docs don't get paged away that often. They can kind of proceed along at a pace and kind of keep their workflow smooth.

I: Right.

R: If I'm in the middle of writing orders on somebody, and I have say 3 of 10 orders that I want to write and I get paged, and there is not a phone right near where the monitor is...

I: Right.

R: I have to decide whether I want to...and I spend all that time logging in, I have to decide whether I want to go away and let it log me off and catch up again vs. ignore the page, or whatever.

I: Right.

R: I think it needs to adapt to docs that work randomly.

I: Right.

R: So, they have a couple of seconds to do something and want to accomplish something that is totally random, I think the overhead of getting into the system is sometimes too much.

I: So, ultimately, it sounds like we need to make sure that the system is flexible enough so that it can adapt to whatever, however, the varying workflows of the physicians

R: That is essentially what I wrote here, the metrics should be, if I need to write one order on one patient, how long will it take?

I: Right. Actually we did some before some observations, again just from a physiatrist's standpoint and we observed them and it took them 36 seconds to write an individual order on the paper using the current way and 41 seconds putting it into the computer.

R: One of the assumptions that the computer is already in front of you and logged in, or..

I: No, logging in, selecting the patient and then writing the order.

R: And the same thing was when they first go to the chart, finding the order sheet, every now and then you don't have a sheet and have to find them...you know there are a lot of [docs?] at the paper too.

I: Oh yeah.

R: You have to find the chart, which assumably an electronic medical record in the military, the best thing about it was you didn't waste all this time looking for charts, which was a pain. And, sometimes the nurses would have report and they would have all the charts in the room when you walked in, so...

I: Oh yeah.

R: And for orders too, it would be really be nice to be able to look at the orders, they could be on the computer on LastWord or something, see what orders are written.

I: Right.

R: But, I get worried because LastWord is not that great of an interface and I still don't know how to figure out what meds my patients are taking, as opposed to before when I could look at the MEDX and I could see all the meds they were taking. So, now, here's what my approach of this is, maybe it should be off the record. My approach is that I basically when the patient comes in, I tell them I'm not going to change your medicines at all. I actually go through I'm a procedurist, so I don't actually manage medicines very much, otherwise, I might sort of say, you are on these two medicines, you might pick them up, you know I might look at the medicines more, unless I'm specifically asked about medicines, because it is so hard for me to figure out what medicines they are on.

I: Right.

R: I tend to just ignore them. I don't even pay attention to what medicines they are on anymore, which is potentially prone to error. If it is important for me to know what medicines they are on, I generally just ask the nurse, just because I don't have the MEDX to look at, that was easy to figure it out.

I: Right.

R: Some of the floors, like on the ICU, they print up the list of medicines and put it at the front of the chart.

I: Right.

R: Each day I can see what medicines the patient is on and that actually works fine. They don't do that everywhere.

I: No.

R: It would be, I think for orders, one thing that would be nice would be to print up the list of active orders at any given time, which would include medicines.

I: Right.

R: That would kind of help you not have to dig through what is undoubtedly going to be kind of a not very intuitive interface in LastWord.

I: Right. Actually, there is one screen that you can get that allows you to look at all the active orders and from some of the comments that we've gotten from some of our physicians that are doing that, they feel that is a big benefit for them is that they have a better feel for what is the therapy of the patient.

R: Yeah. Right.

I: Current therapy.

R: That I think might even take care of some of the problems we have with meds.

Interview with Dr. L

I: I'm here to find out more about your perceptions about computerized physician order entry. Have you heard about PeaceHealth's plans to implement computerized physician order entry?

R: Yes.

I: Okay. What have you heard thus far?

R: Actually, just what they sent to me in the brochure.

I: Okay. All right.

R: So I don't have a whole lot of information about it.

I: Okay. Great. And, again, I'm just going to take a few notes just to augment the tape.

R: Umhmmm

I: How do you feel about the plans to implement computerized physician order entry?

R: Well, a little frightened, to be honest, because you know, will I be able to get up to the skill level necessary? Honestly, one of my biggest worries since we don't admit as often to the hospital is that I will be able to do it and get the information I need. So far, I've been able to access it, but should they go...if I can't, I can always ask somebody.

I: Right.

R: I assume I will still be able to ask somebody.

I: You bet. And that's one of the key things that we're finding is that not only do we need to design the system for like the Hospitalists that are doing...entering in orders frequently, but also we need to make sure that it has the same qualities that it is intuitive enough so that physicians that admit infrequently or use the computer system infrequently, such as yourself, it's...

R: Yeah, because sometimes the Hospitalists will call us on a complex...they've admitted a patient and they actually want us to come in and see a patient, then I have to access and enter stuff, it's like, "Oh my God," you know it's like 3 times a year.

I: Right.

R: And, it's like, [inaudible] when we are trying to look up lab results, you know, that actually has helped ever since we've had access in the office. That has actually helped me become more familiar with it, because before it was only when I went over to the hospital.

I: Oh, right.

R: And, so being able to access information about patients, or their x-rays, so that when we have a consult, is like when I had a cat scan done with this...that makes it...then we have to type in our same numbers to get information out, now I know my codes, but...

I: Great. Good.

R: [laughter]

I: Do you think that computerized physician order entry will affect patient care?

R: Eventually it will. I mean, I know that sounds like... why I'm hedging is that at first, I think we will sort of overwhelmed with trying to get all the information and some of the old records might not be online right away.

I: Okay.

R: So, newer patients, things that are current, will obviously be there, but eventually, you know, it will brought out to the forefront drug reactions, multiple admissions...

I: Right.

R: What they did have done at previous admissions, we won't have to wait for that chart to come up.

I: Right.

R: And that is huge, I think. I would think that for dealing with multiple health problems, it would be especially helpful.

I: Great. And again, it's being able to access the information and also being able to have you, instead of writing, or handwriting your orders, being able to enter in your own orders right into the computer.

R: Umhmm.

I: Any benefits, perhaps any ways that that might affect patient care for you to actually enter in your orders into the computer rather than writing them on a piece of paper?

R: Make sure that the nurses actually understood them [laughter]

I: Okay.

R: I have pretty good handwriting, but when it comes it's choppy [laughter] and I think there would probably be less errors then.

I: Right. Great.

R: With errors it would be huge too, I'm sure.

I: How do you think that CPOE would affect your workflow as a physician?

R: I...hmmmm...you mean when I had to admit?

I: Yeah.

R: I don't think it...I think it might be easier because then...you know would just be able to punch in stuff I do...I assume it is going to be really easy access.

I: Right.

R: Because there will be just so many people having to do it.

I: Umhmm.

R: It would have to be pretty fairly straight forward and you know, it would have really easy access. So, I would think that it would make it easier...

I: Okay.

R: And I, in some respects, I could order the stuff from here.

I: You bet.

R: Because right now I'm sending out the forms to send over to the hospital and then it has to be transposed and...

I: Right.

R: And all that. So now I could actually just sit here at the office and enter this stuff and then go see the patient later that evening.

I: Right. Exactly. How would you think that CPOE would affect the productivity of other hospital personnel?

R: Well, I think it would help them because it would all be in the same chart, in the same area and they would be able to access it more easily.

I: Okay.

R: I've always...I have a lot of [inaudible]I've always worried, people who are not very good typists and are not computer literate. I think the nurses are sort of caught in that right now.

I: Right.

R: Is that, I've thought, you know, sometimes you get so involved with making sure that you've checked everything off, that they really don't have as much time for patient care.

I: Right.

R: And, I almost thought they would need more ward clerks, and the people who could data entry. They could just do the routine data entry and let the nurses take care of the patients.

I: Right.

R: You know, that's what they're good at. They didn't go into nursing for data entry.

I: Right.

R: I didn't go into medicine for data entry. [laughter]

I: Right. Very good.

R: So, I think they need to make it so easy that it's not time consuming, because you know, young people will end up about spending two hours a day sending emails.

I: Right.

R: You don't have two hours a day to spend on emails as a nurse and answering those petty things between departments it's really garbage stuff.

I: Right.

R: You know the focus still has to be patient care.

I: Right. Okay. Great. One reason that hospitals implement CPOE is because it is supposed to reduce medical errors. Do you think that it might help here?

R: It could, especially if an order is outside the norm.

I: Okay.

R: You know, we'll get upset, but we may actually would have to override so while they are doing it, it be easy enough [inaudible] is why it's going outside the norm.

I: Okay.

R: But, you know, I don't want to have to request a committee, or something.

I: That's right.

R: It's like, I'm aware that I'm ordering something different.

I: Right.

R: And then, then it would be approved, but there would be some way of double-checking...

I: Right.

R: Remind you your dose if something is 10 times higher than something else.

I: Right.

R: I mean, I don't think that's going to happen, but...

I: You never know.

R: You never know. You know you have the patient on 5 pain meds and somebody might do that...

I: Right.

R: [laughter] you never cancelled this other thing.

I: When it's sometimes...you know that the orders...you haven't written 5 medication orders, but sometimes there are 5 different physicians on the case.

R: That's right. Or, they come in on the weekend, and, you know.

I: Yeah. Umhmm.

R: [laughter]

I: Do you have any personal experience with a CPOE system?

R: No.

I: Okay. We're all used to the current paper method. Do you think that CPOE will be an improvement over the paper method? Why or why not?

R: Hmm. Well, I think part of it...well, right now, is that I feel like it is sort of half and half.

I: Right.

R: If I want to see something from respiratory therapy, I have to look it up on the computer.

I: Right.

R: Or, it may not be listed there and then other stuff is in the chart and it would simplify it if you knew that it was all there.

I: Yeah.

R: And, so that you could actually look at it and get data over several days. You know...

I: Right.

R: You could look at the respiratory therapy notes, you know, is something that I would be doing...so, it would be helpful to have it all in one place.

I: Okay.

R: But now, I feel like it is split. I don't know if you think it is split, but it is split.

I: Yeah.

R: Actually, in [inaudible], about a year ago, I went to a meeting at Washington University in St. Louis. They built a brand new hospital and they were going to have a paperless hospital.

I: Right.

R: And they were ready to go, they've been, you know, going...they've apparently had a CPOE for awhile, but it's one huge, huge mistake because they did not build room in this hospital for charts.

I: Oh wow.

R: And they found out they couldn't go completely paperless because there was too much old data.

I: Right.

R: And, I thought well, that's interesting.

I: Yeah.

R: I thought it would be nice to have a place to put a piece of paper.

[laughter]

I: That's right.

R: And, it was like, they made a huge mistake. And, this is actually from a big "mucky-muck" who was in charge of all of your immunology department and he's very computer literate and he just...he gives talks, he's an expert.

I: Right.

R: I'm going, "Oh, my God", I could see that...what a mistake, because you could see it, they should think there is still going to be room for the paper. [laughter]

I: You got it. You got it now.

R: Or, easy to print out. I mean, I think it would be annoying if you wanted to take data back to the office. You would want to have a piece of paper that you could then carry around and maybe dictate at another place that...

I: Great.

R: That you are having it there so you can actually...I can't, I guess I would be a little frustrated, because right now, I'm actually flipping

through the chart and then I'm actually then dictating with what I know is first, you know, is a summary. And, I have to be punching up screens so I can dictate to find out what's gone on?

I: Right.

R: Because I'm probably going to want to print out some of that data, so I can actually have my flow of thought when I'm dictating.

I: Okay.

R: So, it's like, okay, this is going to take another dictating skill and I can't see changing screens fast enough for me to talk as fast as I talk.

I: Right.

R: [laughter] And, so, and medical records, I would sort of have a flash on that one. Because, how doctors dictate and record their data for the note and do they want a visual image, and are they going to be able to put that on the screen fast enough for them to be able to dictate from.

I: Unhunh

R: Or, are doctors are going to have to sit there while you get one little printer to spit out all of the notes. So then they can dictate from home or wherever they dictate now.

I: Okay. Good point. Some hospitals require the use of CPOE and others make it optional or just strongly encourage. What do you think would be best for this hospital? Make it mandatory or make it be voluntary for physicians?

R: Anyone that's been out in practice for less than 7 years, make it mandatory [laughter]

I: Okay. That's the cut off, hunh?

R: Okay, if you're young you better be using it.

I: Yeah.

R: Actually, if you could phase it out in about 10 years [laughter]

I: Okay. Just when you retire, right?

R: Yeah, right. Get rid of the old fogies. [laughter] I think it's going to be...I don't think they could make it mandatory right at the very beginning because it is going to take a transition time.

I: Unhunh.

R: I think if I projected that maybe we could get to it.

I: Right.

R: I mean, [inaudible] would probably make my business partner retire right away. [laughter] I don't mind doing that.

I: But it is amazing that there are some of the older physicians that are just really computer nerds and then there are some...

R: There are...some of the younger ones that...

I: Yeah, they just say, "Computers, get it away from me, I don't want to have anything to do with these computers."

R: Computers can be time sucking individuals and I've actually sort of look at them that way, because there's a lot of, I think the information you get from the hospital is definitely having that chart anyway. So, it's not unnecessary information, but you can get caught up in unnecessary information...

I: Right.

R: And I think that is one of the problems that a lot of people are caught with.

I: You bet.

R: And actually, like you said, it actually gives you a better record when you get to that point, but it doesn't necessarily make it easier.

I: Right.

R: And, so, I think that is the thing, is it definitely is not easier and sometimes it takes more to enter it.

I: Right.

R: So, depending on how... you can get more data that way.

I: Right. How important do you think that it would be for a CPOE system to be easy to use?

R: Extremely.

I: Okay. And, how important is it that you have the ability to try out the system before it was implemented?

R: I don't think that's important, because you just have to trust that you are going to do this stuff.

I: Okay.

R: I mean there will be some trial with somebody.

I: Right.

R: I think you get...you know definitely try it on computer literate individuals first, but...

I: Right.

R: Not the people who want to be high techy; the high techy people, you might have ways of simplifying it so they can actually work at a different level.

I: Unhunh

R: If they have ways of making it faster or something, or you know, speed dialing, or something.

I: Right.

R: If they can function at that level, but I know they are going to get bored if you have too many steps from what I understand.

I: Right.

R: Scanners, you know, I know voice recognition things are supposed to be better and better. I know they have newer ones. I've always had problems with those because of my speed of speech and another one is

my accent which gets worse when I speak quickly, so they've had a hard time understanding, I haven't saw anything that actually could pick up voice recognition...

I: Right.

R: So, I could see that would be really helpful in the future too.

I: Great. Most people feel that there needs to be a balance between adapting the computer system to the physician workflow and adapting the physician workflow to the computer system. What are your thoughts on this?

R: I'm sorry, what do you mean?

I: Okay, so should we design the computer system to match your current workflow step by step, or should we alter your workflow to match the way the computer does things?

R: If it would make it easier for me, I could do it the way the computer wants. [laughter]

I: Right. Excellent point.

R: If I wouldn't have to have such a long letter and everybody could access it and get the information, you know one of the things that takes so much more time is dictating the history, or getting the information in and now they could actually say, "Well, the patient was admitted for similar things", and you have the data right there, and then you have all the lab results, so you look at the lab data from the hospital record to see the flow then it's like, you know, it's there and everybody should have access to it...

I: Right.

R: It wouldn't be like you'd have to say as much, I would think.

I: Right. There are some physicians that, for instance, that have said, "You know, it's a computer and you can make it do anything. Make it do things exactly as I do things currently." Whereas, others are saying that, "Well, there are just certain things that the computer does better."

R: Umhmm.

I: For instance doing drug calculations and reminders of, "Gee, it's time for them to have their pnuemovax now or some preventative maintenance preventative medicine type of issue," or, golly, you know, those sorts of things, where computers work better than the human mind...

R: Right. That's right.

I: ...Sometimes to remember things. So again, that's sort of what we're trying to achieve, or to focus in on, is that, you know, there sort of is a balance there. You know, we want things to be ultimately as efficient and effective as possible for physicians and it's probably going to be little bit of both. We're going to be able to go with processes that you do in your workflow that are really highly efficient for you, we want to make sure that the computer systems adapt to that, but in those areas where, you know,

that maybe your process is not quite as efficient as it could be given some of the capabilities of the computer, we would want the physician to adapt.

R: Probably an example, I was just thinking, if you have like a, I wanted to order anti-reflux medicine and the hospital has Prilosec that you could order Nexium if you really thought that was the only one. But, you would actually have to...you could actually type in Nexium and it would say, "Well, these are the top tier ones," and then that would just like...you could put like pre and it would [inaudible] Previcid and would tell you the dose and that's it, you don't have any choices, you like changing the diet.

I: Yep.

R: Because you know, I really [inaudible] Nexium, [inaudible] other's tried not used, or whatever, just check a box. So, it's like fine, if they want to know why you won't use the preferred ones, these are the ones the insurance companies will pay for...blah, blah, blah.

I: You bet.

R: So, I could see where the computer would know and I wouldn't really have to be typing out Previcid every single time, or whatever.

I: Right. Exactly. That's a perfect example of what it is that we're talking about, sort of taking advantage of what computers do best.

R: Yeah right, they recognized that that the drug is, you know, that category, and it's PRE, or whatever, I don't need to type the whole thing out.

I: Right.

R: So, it minimizes my time...

I: you bet.

R: You said if they can remind, like, you know, "Geez this person needs physical therapy." And then physical therapy order flashes up and if there would be surgery on something, and in so many days they actually should be going to PT is there a reason why they are not.

I: Absolutely.

R: And if you were going to do a social service consult when they are admitted for whatever,

I: Right.

R: But, you know,

I: Those are all excellent examples of how I think that the computer might help workflow. If CPOE were to be phased in, would you like to be one of the first to use it?

R: No.

I: Okay. That's fine.

R: [laughter] I have to wait around, get the patient.

I: Okay.

R: I think, I prefer to wait for the admissions or the allergy department, you know, I don't think so, but...

I: How hard would it be for you to explain the pluses and minuses of CPOE to your colleagues?

R: I guess if I understood it, I probably could explain it. I seem to explain things in fairly simple terms.

I: So, do you...you're saying that you don't really understand it at this point.

R: Yeah, right. Not completely. {laughter}

I: Okay. That's fine. And, how important would it be for physicians to have an opportunity to see a demonstration of the system.

R: I think that's real important.

I: Okay.

R: I mean, I guess because this is really different. I know that actually since they've upgraded, I've done some of the upgrade things here in the office and that's been really nice, because it just points it out here.

I: Right.

R: Because if they have a really good program like that that you could go back to, whenever you needed a reminder of how to do things, because the booklets, I actually probably have a series of booklets sitting here, because I can't find something, but it would really be nice, other than the little Word things, like if you could type in and say, "How do you find this?" and it tells you, "Go to this, this, this," right there on the screen.

I: Right. Good. Let's say we're implementing physician order entry, sort of at what point do you think that it would be most important to do this demonstration? I mean, far in advance or close to when it was going to be implemented? Or, when do you think?

R: Well, obviously, it's most helpful if it's close to when it's going to be implemented.

I: Okay, right, because again what we are trying to get at is not only are your comments important for my research, but also we're trying to plan this implementation and things like this will help us decide, you know, when to communicate and how to communicate and when to get physicians involved in the process and that sort of thing. That's the end of my questions. Do you have any other additional comments? Or, anything that you want to make sure that I either include in my research or include in our implementation strategy for computerized physician order entry?

R: No, I think it sounds interesting and I think it would be helpful once...it's come a long way from what you can access now, from just a few years ago...

I: You bet.

R: So, I think it will be helpful in the future for everybody, I mean, so you have all that information...

I: Right.

R: Because patients obviously get frustrated that we don't have the results [inaudible].

I: Right.

R: They've been in the hospital, sometimes with another physician, but we could still pull up the x-rays or lab result and that really helps us so that we don't have to call the other physician's office to find out what that result was.

I: Right.

R: Because then I have to pull a chart, find things, sometimes I don't even have access to the chart.

I: Right.

R: I mean, [inaudible]

I: You bet.

R: That's totally useless.

I: Yeah.

R: And, so, because actually we're small, [inaudible] like PeaceHealth clinic or OMG.

I: Right.

R: They don't have immediate access to the patient's record; even if the doctor sees the patient, it's a week since they last saw them, they don't have their last visit there yet, in the chart.

I: Right.

R: I think that's horrible.

I: Right.

R: Because, I do it's right there.

I: You bet.

R: I don't need assurance that that patient got seen in between, you are relying on the patient to tell them that. That would be really inefficient.

I: You bet.

R: So, I could see in the big clinics, that is going to help them tremendously, just being able to pull it all up on the screen.

I: Right.

R: I think that part is going to be really good.

I: As far as CPOE is concerned, really, one of the main reasons that it is being considered and implemented at hospitals across the country is that certainly from a medical error perspective, you know decreasing the errors and the other really big reason is that because, again, computers remember things and can give you alerts or reminders and that sort of thing. They call that clinical decision support, giving you the additional

information or reminders and that sort of thing at the time you are making the decisions.

R: Umhmm.

I: So, those are really two things that we are really focusing in on with our implementation within PeaceHealth.

R: I think you should be.

I: Yeah.

R: Medication errors and stuff.

I: You bet.

R: I think it would be really helpful and when I think about the other stuff that you raise like the orders and I've seen handwriting that there was absolutely no way I could read it.

I: Right.

R: And, what are they talking about here, is that what this really says, and you know...

I: Right.

R: I mean, I don't know what that says.

I: Right.

R: And, I wonder why they ordered it that way. [laughter]

I: Yeah. Exactly.

R: And, so and actually if there is some little way, as you know, when Dr. [T] went to practice, I thought you know, they are only trying it one university, they always did it the Baylor way. Well, I did it the Tulane way, the Baylor way I did it the University of Colorado way. [laughter]

I: Right.

R: And, actually, the University of Colorado vs. the City of Denver vs...because we were considered as an Army Hospital it was like every place we wrote formulas, it was different for antigens. And, so there wasn't a way.

I: Unhunh

R: And, we managed renal failure was a bit different between Tulane and Baylor and the nephrology staff.

I: Right.

R: I mean, you know, give me a break, no ones going to do it the same because we are all different.

I: Right.

R: If you have a set protocol and you know the ultimate goals, it's like why aren't you doing this, or something.

I: Right. And, especially when you can capture that data and say, okay, these guys are doing it this way and these guys are doing it that way, and the patients get better quicker when they do it this way, you know being able to have that data that you can then share with them and then say,

"Gee, you know it really is compelling that we really ought to be standardizing and doing it this way."

R: Yeah, that's right. That would be great to have that information, like you said, shorten the hospital stay, but having a more effective hospital stay so that the patient does feel or get better sooner.

I: Right, you bet.

R: I helped with a patient only a few weeks ago [inaudible] had nightmare stories of hospital errors.

I: Yeah.

R: I know it's there; people make them, but...

I: Yeah, and hopefully you're not involved in them. That's right, yeah.

R: [laughter]

I: Yeah.

R: [inaudible] It's really there. Sometimes I actually...and it usually has been because someone misread an order and they didn't check it out.

I: Right.

R: And, it's like, okay, now I had to learn, actually because of my accent a long time ago that 15 and 50 sound an awful lot alike. I started to say 1-5, 5-0...

I: Right.

R: Because 15 mg of prednisone is a lot different than 50 mg of prednisone.

I: You bet.

R: And, I wasn't ordering something really toxic, like morphine or something. [laughter]

I: You bet.

R: You know, I wasn't doing horrible drugs here.

I: You bet. Even to the point of making sure that it's complete as well because you know we do some analysis of medical errors now, you know, you think that a drug order would always have a route associated with it, but, you know, they don't always write a route and then, you don't want to be guessing sometimes and...because even the difference between intramuscular or intravenous

R: Huge difference...

I: Can make a huge difference and it's...if it's illegible or if it's incomplete, it leads to people trying to guess and that's when medical errors really are caused.

R: I didn't think that you would give it that way.

I: Yeah.

R: [laughter]

I: Well, again, thank you for your time. I just want to let you know, as far as our implementation is that we currently have the rehab physicians (5

independent rehab physicians) are and have for the last 4 months have been entering in all of their orders into the computer on the patients in the inpatient area.

R: [inaudible]

I: And, they really like it. Obviously, there are some bumps as far as changing the way that they do things, etc., but again there has been a lot of efficiencies. Dr. Annette Weller, in particular, has really enjoyed being able to enter in orders from the office or from the home and we've done some time studies, because that's one of the big things that physicians are afraid of is that it will take you longer to do it in the computer than on writing it on the piece of paper and we did some time studies with them and we did find that it took a little bit longer for an individual order, if you want to just write one order, that it took 41 seconds for them to enter it into the computer compared to 36 seconds to write it on a piece of paper.

R: Amazing..

I: However, when they admitted... when we did time studies with them upon an admission, in the paper process it took them 14 minutes to write out all of the admission orders and in the computer it only takes 7. So, again, every physician practice is going to be a little bit different.

R: [inaudible] because I assume that it just has like 'Admission', you type in what you are admitting, and it would actually have things like Diet, Vital Signs...

I: Right, already laid out there and you just sort of click the ones that you want.

R: So, let's say they had asthma, were there [inaudible] things like, you know asthma, say, inhalation therapy and you picked it, or would it automatically flare up inhalation therapy, in other words, like have sort of a standard one where you'd have the protocols for asthma and then say...

I: Right. Diagnosis specific protocols on things, so it's right there, presents it right there on the screen and you can either have things automatically selected in, because these are the things that I always do, or have them set up so that you can...

R: I can see where that would be like...you know this is how my standards orders are for asthma, and this is sort of what you do, then..

I: Click, click, click, click.

R: So that would immediately come up as soon as you typed in your little name...

I: That's right.

R: It would know that's how you want to do it.

I: That's where the efficiency has come from as far as the rehab physicians, because they were writing out a lot of handwritten notes about specifics about the therapy and we just sort of analyzed their orders and

said, "Well, gee, you always order...or you usually order it this way," and so we have it all spelled out and so they can just hit the little check mark and, BINGO, it goes out.

R: That's great.

I: So, anyway.

R: If it could be just as easy [inaudible] want PTBO, PBO or PE, or whatever...

I: That's right.

R: And, click, click, click and [inaudible]. It actually should almost be like a TV, I mean know that sounds so incredibly simple, but...

I: No.

R: It hardly takes any time whatsoever, and you call it done, you know, spending hours typing is not my...

I: Well, see, the reason why you use that as an example is that the people that were designing it said, "OK, these are the logical steps and this is the logical workflow and the thought processes that people use when they are about to program their VCR, or do anything, and so it just follows the logical thought processes and that's what we are hoping to be able to do as well, is to, again, we have some flexibility with the computer and we're going to try to adapt it to physician workflow as much as possible, but yet, still take advantage of those sorts of things like reminders and alerts and templates, protocols and that sort of thing to take advantage of increasing your efficiency.

R: That would be good.

I: So, again, thank you very much for your comments.