PERCEPTIONS OF PERSONAL POWER AND THEIR RELATIONSHIP TO CLINICIAN'S RESISTANCE TO THE INTRODUCTION OF COMPUTERIZED PHYSICIAN ORDER ENTRY

by

Christa Elizabeth Bartos

Diploma in Nursing, Washington Hospital School of Nursing, 1971

Bachelor of Science in Nursing, West Liberty State College, 1985

Master of Science in Information Science, University of Pittsburgh, 1995

Master of Science in Biomedical Informatics, University of Pittsburgh, 2005

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SCHOOL OF MEDICINE

This dissertation was presented

by

Christa Elizabeth Bartos

It was defended on

August 6, 2008

and approved by

Dr. Michael J. Becich, Professor, Department of Biomedical Informatics

Dr. Douglas B. Fridsma, Associate Professor, Department of Biomedical Informatics

Dr. Brian S.Butler, Associate Professor, Katz Graduate School of Business

Dr. Louis E. Penrod, Assistant Professor, Department of Physical Medicine and Rehabilitation

Dissertation Advisor: Dr. Rebecca S. Crowley, Assistant Professor,

Department of Biomedical Informatics

PERCEPTIONS OF PERSONAL POWER AND THEIR RELATIONSHIP TO CLINICIAN'S RESISTANCE TO THE INTRODUCTION OF COMPUTERIZED PHYSICIAN ORDER ENTRY

Christa E. Bartos, RN/MSIS/MS

University of Pittsburgh, 2008

The implementation of computerized provider order entry (CPOE) across the health care system has been slow in realization. In addition to the inherent financial burden, a significant cause for this delay is the high number of system failures resulting from clinicians' resistance. Changes in workflow and communication, time demands, system complexity, and changes to power structures have all been identified as consequences of CPOE systems that can cause resistance among clinicians. Of these, I believe that perceived changes in a person's power in the workplace can be more difficult to overcome than changes in the work routine.

Perception of the power or control that clinicians have in the workplace and their attitudes toward CPOE are precursors to behavior, and if these perceptions and attitudes are negative, can result in resistive behavior. Based on psycho-social theories of power, resistance, and organizational information technology (IT) implementation in business, I applied these concepts to healthcare IT implementation. Qualitative studies have looked at power and resistance, but no previous study has measured the degree or direction of power change, or confirmed that a relationship exists between power perceptions and CPOE attitudes. One reason for this is that no instruments existed to obtain this data.

I developed the Semantic Differential Power Perception (SDPP) survey as an electronic survey to measure power perception and CPOE attitudes, and established reliability and validity of the instrument in a measurement study. The SDPP was used to collect data from 276 healthcare workers in two different hospitals before and after implementation of CPOE. I identified a significant correlation between power perceptions and attitudes toward CPOE. Examining the direction of change by healthcare position, we found that the power perception values decreased for all positions and that attitudes toward CPOE varied based on use of the system. Understanding the relationship between power perceptions and CPOE attitudes is the

first step in determining causative relationships. This understanding will enable system developers to modify implementation processes and training methods to enhance waning power and support positive power changes, therefore minimizing power related resistance.

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PREFACE

I want to acknowledge the many people that had faith in my ability to complete my education, provided emotional support, and encouraged me during these years. It would take a document as long as this dissertation to list them all and the multitude of ways that they helped me achieve my life goal. My heartfelt thanks to you all!!!

1.0 INTRODUCTION

"The dream of reason did not take power into account." [1].

Paul Starr's very first words in "The Social Transformation of American Medicine"

1.1 BACKGROUND

The implementation of computerized provider order entry (CPOE) across the health care system has been slow in realization. Only 4% of hospitals across the United States have implemented CPOE[2], and only slightly more than 20% have implemented an electronic health record (EHR)[3]. A significant cause for this delay is the financial burden encountered[2, 4] and the high number of system failures that result after millions of dollars have been invested[5]. The predominant cause of system failures is clinicians' resistance[6-10]. Some of the consequences of CPOE systems that cause resistance in clinicians are changes in workflow and communication, time consumption, complexity of the system, and changes in power structure[11]. While learning a new method for performing tasks can be temporarily disruptive, it is a common occurrence with relatively short-term consequences. In contrast, changes in one's perceived power in the workplace can be both personal and profound[12, 13], and threats to that perception are more likely to trigger great concern and strong resistance[14, 15]. I believe that resistance to CPOE adoption comes from the clinician's perception that they will relinquish power with the implementation of CPOE.

1.2 DESCRIPTION OF THE PROBLEM

The purpose of this study is to demonstrate that an individual's perception of their personal power within their work environment is influenced by the introduction of CPOE. If the perception is that CPOE is a threat to their power, then they are more likely to resist it. The degree of negativity toward CPOE reflects the level of resistance that the individual exhibits. If the perception is that CPOE is a positive addition to their power, then the person is more likely to become an early adopter or champion of the system and minimal (if any) resistance can be expected (see Figure 1).

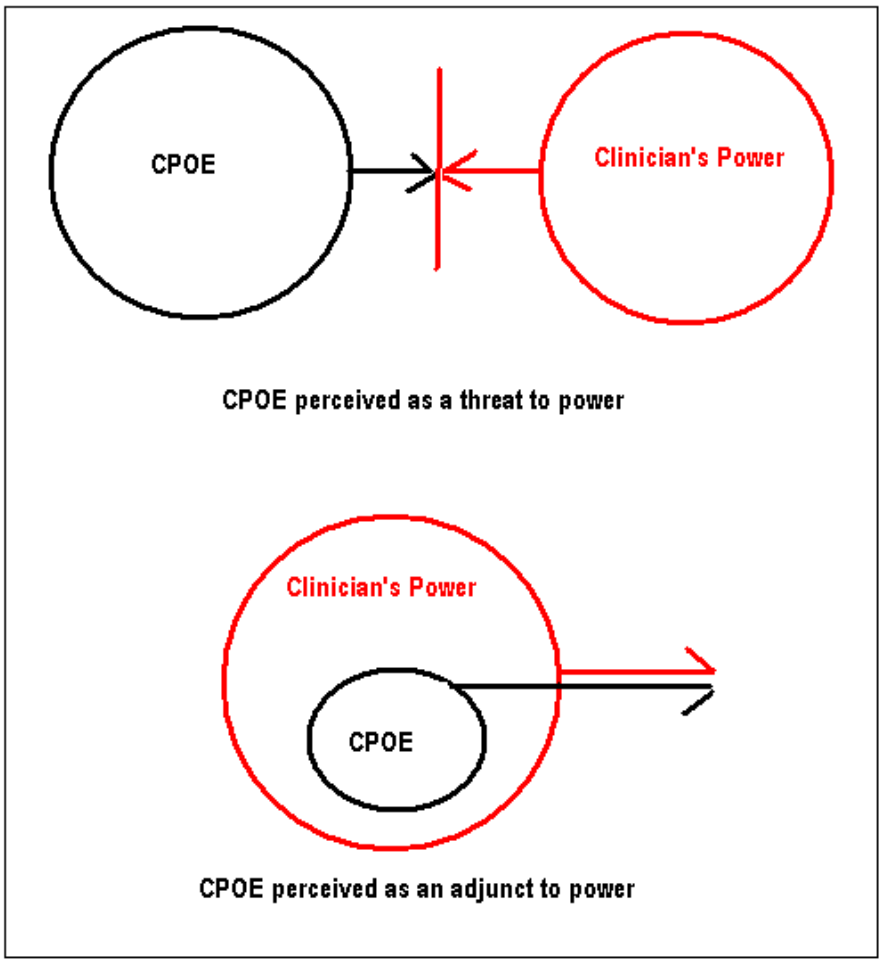

Figure 1: Model of Relationship of Clinician Power and CPOE.

Perception is the key element in this model. Perception is more than just registering information, it is putting an interpretation on it[16]. Perceptions are our beliefs about something and are the precursors to our behaviors[17]. People will accept or resist something because of their beliefs or concerns about it rather than what holds to be the facts[15, 18, 19]. Jasperson in his review of power and information technology research stated, "It is most clearly seen in studies of resistance in which organizational actors are resisting because of power concerns not with the use of power[20]." So, clinicians' perceptions of how something will affect their power are more likely to influence their reactions to the implementation of CPOE than documented benefits.

Undoubtedly, many factors affect perceptions of power within the healthcare organization such as organizational structure, the position the person holds within that organization, and the personal experience that each clinician brings to the table. Therefore, the implementation of information technology has been shown to be a threat to a person's power because of the organizational, positional, and decisional changes that may occur as a result of it[14, 15, 20].

Qualitative studies have identified power changes as an unintended consequence of CPOE implementation, but have relied only on the impressions of hospital representatives that it occurred[21]. No quantifiable measures of individual perceptions were able to be obtained because no instrument existed to provide this information. Previous instruments for measuring power have assumed a superior/subordinate relationship[22-35]. A new instrument was needed to measure a person's perceptions about themselves.

1.3 SIGNIFICANCE OF THIS RESEARCH

There is a symbiotic relationship between power and resistance. Some believe that power cannot exist without resistance and others believe that resistance is a form of power[36]. In relation to CPOE, "resistance" is defined to be a clinician's actions to oppose, retard, or defend against the effects of CPOE on her/his personal power.

This study is significant for these reasons: 1) Power, resistance, and their relationship to information technology (IT) in organizations has been studied predominately in business, but very little has been done in healthcare organizations; 2) Understanding how perceptions of power

and attitudes toward CPOE can precipitate resistance enables the system developers and hospital administration to incorporate that knowledge into selecting champions, designing training, and modifying workflow, thus preventing system failures; and 3) Creation of a new instrument for measuring power in the work domain from the perspective of the individual about themselves.

Determining the relationship between power perceptions and attitudes toward CPOE that may result in resistance is the first step toward developing implementation strategies that will result in more successful CPOE implementations. What is learned from this study will lead to enabling system developers and healthcare administration to understand and encourage the healthcare worker to adapt positively to the power and organizational changes that occur from information technology. Also, I hope to show them how to be open to organizational theories and influence methods that promote the use of positive influence to achieve organizational goals of improved quality of patient care and worker empowerment.

1.4 GUIDE FOR THE READER

Chapter 1 consists of the introduction, background and significance of this study.

Chapter 2 addresses the literature, established failure rates for electronic health records, CPOE, and examples of CPOE system failures and the reasons why.

Chapter 3 describes previous theoretical work on power. Topics include the history of power studies, the six bases of power, the relationship between power and influence, and power people – including early adopters, opinion leaders and champions. It also discusses powerlessness and clinicians' power.

Chapter 4 deals with power and organizations. It includes discussion of the relationship of information technology implementation on power in organizations, and then specifically healthcare IT implementation. Centralized and decentralized authority is also examined

Chapter 5 deals with the relationship between power and resistance. It covers the causes of resistance to IT. The topic of resistance to computerized physician order entry (CPOE) in

healthcare organizations is discussed and an explanation of the differences in resistance between physicians and nurses is examined.

Chapter 6 identifies my research questions, design and methods of the study. A description of the SDPP instrument that I developed is provided along with the measurement study establishing the reliability and validity of the instrument. The selection of settings and subjects for the study is discussed.

Chapter 7 reviews the statistical analysis of the results of my study.

Chapter 8 discusses the results, the limitations of the study and future work.

Chapter 9 presents the conclusions from this study.

2.0 ELECTRONIC HEALTH RECORDS

An electronic health record (EHR) is a generic name for a computerized patient chart. However, computerizing a patient's chart involves more than just having patient information in an electronic form. It also includes the process of getting that information into an electronic form. The area that I focused on in this study is the process within an electronic health record that is the most fraught with failure: Computerized Physician Order Entry (CPOE).

2.1 CPOE AND SYSTEM FAILURE

Prior to CPOE, physicians wrote orders on a paper chart, the Health Unit Coordinator (HUC) – also called a Unit Clerk or Unit Secretary- would transcribe the orders either onto paper or into a computer system, and finally, the nurse would verify the orders and release them to be carried out. CPOE changes this entire process by having the physician enter her patient orders directly into the computer, verify them and release them to be carried out. The HUC is eliminated from the loop and the nurse receives her orders in the same manner as the other departments (see Figure 2).

CPOE is sometimes called computerized "provider" order entry and at other times is called computerized "physician" order entry. Since in almost all implementations where CPOE failure occurs they fail as a result of physician resistance, CPOE will mean computerized "physician" order entry through the course of this study.

Because there is no "middle man", the CPOE process has been shown to prevent medical errors, facilitate patient care, improve patient outcomes, and increase efficiency for the clinicians[37-43]. Negative consequences of CPOE have been identified as changes in workflow,

new work added, changes and ambiguity in roles, changes in communication patterns, changes in power structure and creating new types of medical errors[11, 40].

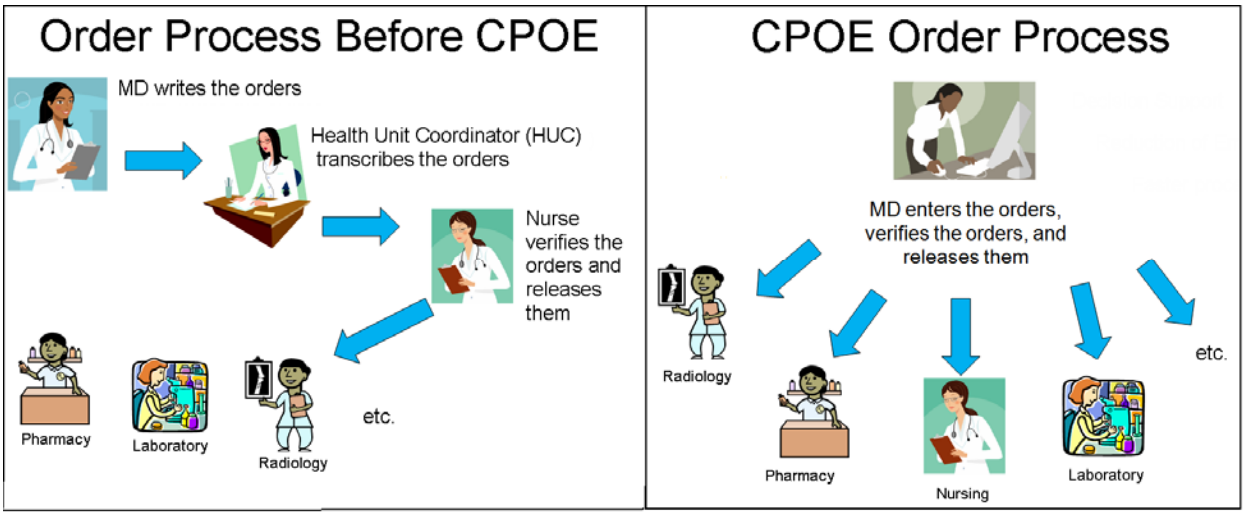

Figure 2: Order Entry Process.

Bates et al. began studying these outcomes in 1998 with his study showing that CPOE decreased the rate of non-intercepted serious medication errors by more than half[42]. More recently, a study conducted in a critical care unit in 2004 looked at how CPOE affected timeliness of laboratory and imaging tests[43]. Time between ordering/obtaining specimens and time between ordering/receiving results were measured both pre-implementation and post-implementation of CPOE. Thompson found that the time between ordering/obtaining the specimens decreased from 77 minutes pre-implementation to 21.5 minutes post-implementation. Also, time between ordering/receiving results dropped from 96.5 minutes to 29.5 minutes. They concluded that this increased timeliness on stat critical care orders was associated with CPOE. Another critical care study conducted in 2005 concluded that for systems designed to meet the requirements of the critical care environment, CPOE can improve the efficiency of workflow for critical care patients[37].

In addition to efficiency, CPOE offers decision support, which provides feedback to the physician when entering an order. This feedback can consist of checks of duplicate orders, checks for incorrect dosages of medications, reminders of existing orders, or the effect that the order being entered can have on existing orders (e.g. upon entering an order for NPO, reminding the physician that this patient is receiving insulin or oral hypoglycemic medications). Decision support is a major factor in preventing medical errors[44, 45].

Evidence-based practice is another process that improves patient outcomes by preventing errors. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) has identified 21 different diagnoses that have proven guidelines for providing better patient outcome.[46]. These are called Core Performance Measures. They have attributes and evaluation criteria with the goal of "protecting and improving the health and/or health care of individuals or populations"[46]. Evidence-based practice combined with decision support can offer alerts to physicians that enable these criteria to be met for the improvement of patient care and for compliance of the healthcare organization with JCAHO standards of care.

In the Institute of Medicine Report in 1999, they extrapolated from two studies that as many as 98,000 Americans die each year as a result of medical error[47]. The Leapfrog Group (a national association of Fortune 500 chief executive officers) was created for the purpose of preferentially directing consumers of healthcare to hospitals that adhere to the patient safety standards specified in that IOM report[48]. The companies involved in this group provide healthcare benefits to more than 37 million Americans. The Leapfrog Group only supports those healthcare organizations that meet their four criteria for quality, which are:

1) Implementation of CPOE

2) Referral to hospitals with evidence-based, greater survival statistics

3) Intensive Care Units staffed by intensivists

4) Utilization of the National Quality Forum's endorsed 30 Safe Practices to reduce risk of harm.

Compliance to these Leapfrog objectives is a criterion for participation with certain third party payers, which acts as a financial incentive to healthcare organizations to implement CPOE.

Even with evidence that CPOE can improve patient care and provide financial incentives, CPOE implementations are not occurring as rapidly as anticipated. In 1998, Ash et al. did a study to determine how many U.S. hospitals had implemented CPOE and to what extent it was being used[39]. She found that most U.S. hospitals had not implemented CPOE, and of those who had, only 20% had more than half of their physicians using it. In an updated study reported in 2004, Ash indicated that only 9.6% of the hospitals that she surveyed have CPOE completely available[3]. The Leapfrog Group also released a study in 2006 of 1263 hospitals surveyed in the United States. They identified that only 7% have fully implemented CPOE with another 7% planning to implement by 2007 [49].

A significant reason for this delay is the high percentage of system failures. A study performed in 1994 by the Standish Group called "The Chaos Report" indicated 31.1% of all information technology (IT) projects will be cancelled before they ever get completed at a cost of over $81 billion [50]. This report covered all types of IT projects, but the statistics today are no different for healthcare IT. In an article in the Washington Post in March 2005, David Brailer, former Nation Health Information Technology Coordinator, stated that up to 30% of electronic health record implementations fail [5].

Even though there is some ambiguity regarding the benefits and drawbacks of electronic documentation, electronic health records often do not fail until the implementation of CPOE[51-62]. With the high percentage of failure and such high costs, it is no wonder that CPOE has been slow to be adopted. Understanding why the introduction of CPOE causes system failure is essential to the adoption of healthcare information technology.

2.2 EXAMPLES OF CPOE FAILURES

EHR failures are rarely published and when they are, it is often under the heading of "issues" or "challenges". So studies that report previous CPOE failures are difficult to identify in the literature. No organization likes to publicly admit failure, especially healthcare organizations as this may reflect negatively to the public on their ability to provide care. As Pratt stated, "we may never know the true rate of system failure in medical organization because the disincentives to publicize failures is so strong"[63]. Instead, they publish the information neutrally as "barriers to implementation" or positively as "determinants for succes.[51, 52, 64-66]. Keyword searches rarely find the word "failure" listed, but instead identify the area that failed, such as "interface design", or "workflow issues". Luckily, a few implementation failures have been published as such and these articles provide a wealth of information and lessons learned to those yet to undertake the project. From a search of almost 250 articles, only 13 system failures were directly identified in the literature[53-62, 67-69].

Definitions of failure vary. Failure may be defined as the complete withdrawal of a system, the under-utilization of a system, or a system that did not meet the organizational goals. In a study by Stavri, involving 13 representatives at a conference for establishing implementation

guidelines for CPOE implementation, each participant was asked to tell both a success and failure story about an EMR implementation that they were involved in[54]. The storytellers included clinical leaders, IT implementers, social scientists, and vendors who were all attending a conference on establishing guidelines for implementing CPOE. Basically, success was defined as persistence of the system. Failure was less easily defined and depended on the context of the implementation and the perspective of the participant. Failure stories ranged from system withdrawal to changes in the system design, failure to make an impact, or even a delayed rollout if the system was stopped for a period of time.

Perhaps one of the most interesting and representative studies of CPOE failures is really about resistance to information technology from a business perspective[69]. The only reason that Lapointe and Rivard selected hospitals and EHRs as the setting for the case studies is because of the clearly identified roles of healthcare personnel. Their study consists of three separate case studies of EHR implementations and the effect of physician resistance on those implementations. Two of the systems failed and one managed to succeed with management intervention. In all cases, there was physician and nursing involvement from the very beginning of the project including system selection.

In the first case study, the system was selected by a committee which included physicians, nurses and other professionals. Beginning with results reporting, the physicians were apathetic to the system until they realized that the system would take more of their time each day thus cutting back on the number of billable procedures they could perform in a day. The physicians worked on a fee-for-service basis, so this cut into their income. Their response was not to use the system. With the next phase of implementation which included CPOE, the physicians felt that they were being asked to perform clerical tasks and many of them refused to enter their orders. Nurses however, appreciated the CPOE system and would not enter orders for the physicians who refused to use it. This caused conflict between the nurses and physicians. At this point the opposing physicians formed a coalition and refused to use the system. In order to coerce physicians into using the system, administration denied admitting privileges to the physicians in the resistance coalition. The physicians rebelled against this action by threatening to terminate all association with the hospital, and indeed, several physicians did resign. Because of concern that the hospital might have to close, the Department of Health intervened. They fired

the CEO of the hospital and placed the hospital under trusteeship. The IT project was ultimately abandoned.

The second case involved a university hospital with residents who were paid by the hospital. From the beginning of the project, administration knew that it would be necessary to have physician buy-in, so they consulted with individual physicians and departments regarding the selection of the system. Physicians were very enthusiastic about it. Admission, discharge, and transfer (ADT) functions were the first to be implemented, followed by test results reporting which were both introduced without problems. Once physicians were responsible for entering their own orders, they realized that there was a slow response time, and felt it was a threat to their work organization. Some physicians responded with humor by doing practical jokes on the system which shut it down completely, or by using "bullet wound" as the reason for every test that was ordered simply because it was the first one on the list. Even though they thought that this was funny, using humor is a form of resistance to dominance[70]. Once the pharmacy module was implemented, the system had an even slower response time. At this point, the residents organized a formal protest and wrote a letter to management demanding an improvement in response time and the withdrawal of the pharmacy module because they felt that it was causing the slow down and jeopardizing patient care. In this case, administration acquiesced and withdrew the pharmacy module until improvements in the system could be made.

The third case involved a university hospital with fee-for-service physicians who were very enthusiastic about the implementation of an EHR with CPOE. Within a month, several surgeons felt that the system was taking too much of their time and disrupting their work habits. Within two months, some physicians stated that they considered not using the system at all and they felt that they were doing nurses' work. Nursing had been very satisfied with the system, and when physicians stated that they would not use the system any longer, nurses refused to enter data for the physicians. This situation merely stirred up preexisting conflicts between nursing and physicians which led to heated exchanges of insults. Administration felt the system had upset the balance of power between the physicians and the nurses. To alleviate this problem and satisfy the physicians, administration asked nurses to enter orders for the physicians and even appointed a full time nurse to enter data specifically for the surgeons. Even with these compromises, the physicians appointed a representative to deliver an ultimatum to administration that the system be withdrawn. Administration replied that for physicians that refused to use the

system (who were predominately surgeons) their beds would be allocated to physicians that would use the system. Other physicians supported the surgeons by refusing to admit patients into those beds. Administration withdrew the system from the surgeons units.

There are several questions that arise from these failed implementations. With all of the advantages the CPOE has to offer, why would anyone resist its implementation? Why do the systems always seem to fail with the implementation of CPOE and not with results reporting, ADT functionality, or nursing documentation?

As we can see from these EHR failure studies, in every instance physician resistance and/or satisfaction played a critical role in many EHR failures. Even in Sicotte's case study of nursing documentation failure, it was stated that the nurses were "reluctant to use the system", but it was terminated because the nursing AND medical staff boycotted it[59]. Why then can the physicians alone decide whether a clinical information system will or will not be used? Because they have power that the nurses and clerical staff do not, and ultimately, they can turn that power into resistance and a failed implementation.

3.0 POWER

Just hearing the word "power" brings a wealth of feelings, thoughts and images to mind. We use different, more acceptable words to describe it, like control, influence, strength, authority, politics, or clout. Roget's 21st Century Thesaurus actually has 42 synonyms for "power", and 46 for "powerful"[71]. We criticize those who have it, we feel it's wrong to seek it, yet we always wish we had it. "Powerless" appears to have a similar negative connotation. The 31 synonyms for "powerless" include such words as dependent, weak, gutless, wishy-washy, and chicken. It appears that it is socially unacceptable to want power, and just as socially unacceptable not to have it.

The important realization is that everyone has power in varying degrees, based on the situation they are in, and the position that they hold in that situation. A top hospital executive who believes that he has paramount power in a health care organization will realize when the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) arrives for an audit that there is always someone with a higher level of power. A prominent physician with tremendous power and autonomy at work may be completely dominated by a spouse at home. A nursing care assistant may think that she has little or no power at work, but from the perspective of a very frail and dependent patient lying in the bed, she is a very powerful person. Power is relative to the perceptions of the individuals, and the situations they are in.

Perception of power relates not only to how others perceive an individual, but to how an individual perceives him/herself. If an individual perceives himself to be powerful in a situation, then he will be. Any threats to that perception of power must be removed or manipulated in order to maintain that perception of power. If an individual does not perceive himself to be powerful in a particular situation, then he won't be. This individual must adjust to the threat to their power or remove themselves from the threatening situation entirely[72]. We often call someone who perceives himself to be powerful, "confident," "arrogant," or "in control."

3.1 HISTORY OF POWER STUDIES

Power and its use have been examined since the beginning of time. Historically, studies have shown how power impacts influence strategies, language, gender dominance, and information flow[73-76]. Investigations of power in healthcare are fairly recent.

More than 2000 years ago, Sun Tzu wrote "The Art of War", considered the oldest military treatise in the world. It is still used to train students in strategy, influence and control [77]. In 1515, Machiavelli wrote about ways to use and achieve political power over others [78]. Even today the word "machiavellian" is used to describe ruthless and unscrupulous influence tactics. For the next 400 years, authors continued to write about power and influence. [79] It seems that the perspectives may change but the principles do not.

Historically, power was studied as a political or military strategy and today it is studied as a social psychology theory of influence and social interaction. Philosophers like Nietzsche and Foucault wrote about power extensively. Nietzsche described power in relation to an individual's will[80], while, Foucault described power in relation to prisons, discipline, punishment, knowledge and medicine[81-83].

Not until the twentieth century did theories of influence and power move away from authoritative figures in politics and military, to philosophical perspective and practical applications that included group interactions, and social relationships[84]. In 1938, Kurt Lewin established a relationship between power and resistance within groups[85]. He conceptualized that power from persons in superior positions emanated like concentric circles, or "power fields" from the person with power, and encompassed those who fell within the range of those circles. Resistance comes from the power of the person encompassed who does not wish to be influenced by the more powerful person. He emanates his own concentric circles in the opposite direction. Lewin later proposed that a group held much more power than an individual and could provide a greater resistance to change when group norms were challenged. John French and Lester Coch, working together and with other researchers, expanded on Lewin's theories. They found that standards within worker groups set up opposition to management's requests unless the workers moved out of their own field and into a cooperative arrangement with management - moved into management's power field.[86] Other studies on power in working environments found that people

in a lower power position respond defensively to those in a higher power position whether it is in a work situation or social situation[12, 72].

Working together, in 1959 John French and Bertram Raven identified a framework of five bases of social power, and then revisited and revised these in later papers to become six bases of social power[84, 87-89]. These six bases of social power are as follows:

1) *Legitimate* – power based on one's formal position within an organization, reciprocity for favors performed, equity for suffering incurred, or dependence on someone else for help

2) *Coercive* – power based on the ability to provide rejection, disapproval or physical threats

3) *Reward* – power based on the ability to provide acceptance, approval or tangible rewards

4) *Expert* – power based on one's knowledge and/or experience

5) *Referent* – power based on people's sense of identification or desire for identification with the influencing person, charisma

6) *Informational* – power based on the ability to persuade or provide information to allow someone to make a decision

These six bases of power are the foundation for the power an individual has to influence another person. Later studies have defined categories or types of power in political and organizational instances, but the definitions can usually be successfully mapped back to French and Raven's six power bases.[20, 74, 90]

3.2 BASES OF POWER

French and Raven's six bases of power are the foundation that explains other researchers' categories and interpretations of power and politics. In healthcare information technology (IT) implementation, Lorenzi's sources of political power can be mapped to Raven's power base.[74] (see Table 1). In business, Jasperson et al.'s review on power and information technology looks at the research through "power lenses" that can also be mapped loosely to Raven's work[20] (see Table 2). This indicates that regardless of whether the power or politics being examined is in healthcare or business, the social power bases apply across the board.

Table 1: Lorenzi's Sources of Political Power in Terms of Raven's Power Bases.

Type of Political Power	**Definition**	**Equivalent in Raven's Power Base**
Interpersonal Power	One person's ability to influence the actions of others independent of other variables. (Charisma, ability to negotiate, sell, persuade, etc.)	Personal Reward, Referent
Knowledge-expertise Power	Recognition in a particular skill area	Expertise
Knowledge-information Power	Having information that others do not	Information
Positional Power	Gained from the organizational role. Formal power with authority to reward, punish, allocate resources	Legitimate, Coercive, Reward
Derived Power	Second hand power because they can influence or speak for a powerful person	Informational (because they persuade others) and Referent (because they identify with someone)
Referent Power	People model their behaviors on the behaviors of someone they admire.	Referent

Table 2: Jasperson's Power Lenses in terms of Power Bases.

Lens	Definition	Equivalent in Raven's power bases
Rational	Structural power that focuses on authority, information and expertise as bases of power.	Legitimate Expert
Pluralist	Power that assumes objective definitions of power and conflict is the norm; development, prioritization and execution of organizational goals are a political process involving negotiation on control of resources and information.	Coercive Reward
Interpretive	Reality is socially constructed and the parties involved exert influence by construction of the meaning of what others experience	Referent Information
Radical	Activity involves either maintaining or undermining and ultimately over-throwing existing power structures.	May use any or all of the power bases

3.3 POWER AND INFLUENCE

The terms power and influence are sometimes used interchangeably, but they are really very different. Power is the "potential" to influence someone, but influence is the "actual use" of that power[33, 91]. So for each base of power, there are forms of influence that can be used to effect a change in the target person.

Raven's six bases of social power were further differentiated in 1992 to include forms of influence.[87] With the exception of Informational power, all of these power bases have a social component of influence, meaning that another party is interacting with the target person to achieve their intended results. Informational power is the only method of influence that uses the strength of intellectual content to allow the target person to use their own intellectual skills to elicit a change[91]. Informational power does not require the interaction between two people, but can be achieved by indirect means, such as documentation (see Table 3).

Table 3: French and Raven's Bases of Power and Related Forms of Influence.

Base of Power	Form of Influence	Social Dependence	Example
1. Reward		Socially dependent	
	Impersonal reward		I can give you a raise
	Personal reward		Approval from someone we like or value highly
2. Coercion		Socially dependent	
	Impersonal coercion		I can fire you
	Personal coercion		Threat of rejection or disapproval from someone you value highly
3. Legitimacy		Socially dependent	
	Legitimate position power	Feelings of guilt	I have a right to ask you to do this because I'm your boss
	Legitimacy of reciprocity	Feelings of guilt	I did this for you, so you should feel obligated to do this for me
	Legitimacy of responsibility or dependence	Feelings of guilt	I really depend on you to do this for me
	Legitimacy of equity (compensatory)		You have done things which caused pain or difficulty for me, so you should feel obligated to do this for me
4. Expertise		Socially dependent	
	Positive		I know how this should be done only because I've experienced this before
	Negative		I know more about this than you do so you're dumb and I'm smart
5. Reference		Socially dependent	
	Positive		Wanting to mimic or model ourselves after someone
	Negative		Due to unattractive actions or negative feelings toward someone, wanting to do the opposite of what they do or recommend.
6. Informational		Socially independent	I will explain the reason this is the case to help you understand
	Direct		Persuading someone to an action using logical arguments
	Indirect		Overhearing conversation or mentioning a similar case

Because the choice of influence has social implications, it is important to understand how we chose the type of influence to use. In an article by Bruins, she named Kipnis' 1976 previously unnamed theory on influence, "The Power Act Model." The Power Act Model states that we make a choice regarding the type of influence to use based on certain features of the situation. These features are 1) the resources (i.e. power) the individual has at their disposal, 2) their inhibition to actually use a power base and 3) the amount of resistance that they expect from the target if they attempt to influence them[79]. The eight categories of tactics that can be used in this model (assertiveness, ingratiation, rationality, sanctions, exchange, upward appeal, blocking and coalition) once again can be mapped back to Raven's power bases. Bruins' condensed Kipnis' approach into her own "Power Use Model", which identifies influence tactics only as "soft" or "hard" based on the amount of freedom that the target has in responding. Bruins also discovered that people use soft tactics within their own group, and hard tactics with a group outside of their own[79].

Social sciences have studied influence in relation to family relationships[72], treatment of psychiatric patients[92], education[91], and religious control[93, 94]. Because interpersonal and group dynamics had a definite relationship to business practices and management, social and behavioral sciences expanded to include business organizations. The use of influence in the business processes of achieving goal,[95], making decisions[96], managing people and conflict[97, 98], and exercising control[99] has been a major topic in studying power in organizations. Because healthcare is a complex and unique type of organization, the six power bases have a somewhat different relationship with clinicians than with business relationships (see Table 4).

Table 4: French and Raven's Six Power Bases and Their Relationship to Healthcare.

	Definition of the Power Bases	**Power Relationship in Healthcare**
Informational	Ability to persuade or provide information to allow someone to make a decision	Clinicians as the source of information for patient care and patient-made decisions
Expert	One's knowledge and/or experience	Clinicians as holders of specialized knowledge and experience regardless of position

	Definition of the Power Bases	Power Relationship in Healthcare
Referent	Sense of identification or desire for identification with the influencing person	Clinicians as mentors, exemplars and confidants
Legitimate	One's formal position within an organization	Clinicians with legal authority to order and plan care, but not with organizational authority over other healthcare providers
Reward	Ability to provide acceptance, approval or tangible rewards	Clinicians as benefactors of respect and positive recognition
Coercive	Ability to provide rejection, disapproval or threats	Clinicians as detractors to co-workers, or impediments to ideas or practice

Many surveys and questionnaires have resulted from attempts to examine and measure leadership and management styles of influence[22, 25-28, 30, 33, 35, 100-103]. In all cases, these studies involved superior/subordinate relationships, not peer relationships or personal perceptions of power. I will discuss this aspect of prior studies in more detail when I describe the Semantic Differential Power Perception (SDPP) survey that I developed for this study.

3.4 POWER PEOPLE

People, whether as individuals or as a group, utilize their power by exerting influence on other people or groups. Some people have power granted by position which would be considered formal power and some people achieve power only by their ability to influence other people or groups which is considered personal or informal power[104]. Raven's six power bases can be mapped to formal/positional and informal/personal power also.

Positional power is considered legitimate power that accompanies a particular role that a person holds within a hierarchy. A "legitimate power" role often includes the coercive and reward power bases and the authority to utilize these types of influence. Personal power is not associated with a role, but with a person's referent power, which may be a product of their

charisma, their expertise (expert power), and/or the information (informational power) that they bring to the situation[104].

The people within an organization that we most often think of as powerful are managers. They control subordinate people, resources, and the goals of the organization by making decisions. They are the people with formal positional power. However, the informal power structure within an organization based on personal power can have a greater impact on people, resources and goals than formal power[105]. These influential people with personal power are the opinion leaders or early adopters of a new idea. In most organizations it is beneficial to choose someone with high personal power to influence the people when a major change is expected within the organization. These people are called "champions" and may or may not be an opinion leader[106]. In healthcare, the appointed champion of CPOE systems is often referred to as the Chief Medical Information Officer (CMIO) and is a clinician by background.

3.4.1 Early Adopters, Opinion Leaders, and Champions

Three influential roles that an individual can have in any organizational change is early adopter (influences others by adopting the change first), opinion leader (influences others by being a role model and providing information about the change), and champion (influences others by actively recruiting them to adopt the change while supporting and defending it)[105]. The role that a person holds is dependent on the change. No person is necessarily in the same role for all types of changes. These roles are not dependent on the industry or the organization. A social organization or club will have the same types of influential people.

Rogers Diffusion of Innovation theory defines the first 16% of a group to embrace a change as innovators and early adopters[107]. Early adopters embrace the change for personal reasons or social context. Early adopters are the first people to cope with the uncertainty resulting from a change which increases their centrality in an organization and their expert power in the eyes of others[22]. An early adopter may also be considered an opinion leader[105].

Opinion leaders may have positive or negative opinions about the change, which they share with others by word or by deed. Opinion leaders do not have to have experience or expertise with the change to have an opinion about it. If the person has referent power, others may follow his/her example based purely on trust[105].

Sometimes, a champion is appointed by the organization and may or may not have legitimate authority over people, resources or decisions in relation to the change, although it is recommended. Sometimes, the role of champion is an informal one and comes about because of the champion's enthusiasm to see the change implemented. The champion is the individual who actively supports and campaigns for the change. (S)he must be thick-skinned in order defend the change against its opposition. In most cases, the best choice for a champion is to make sure that they are a positive opinion leader first[97, 106].

Undertaking one of these power roles can change an individual's power base or even the power structure within an organization. If adopting a change will enhance an individual's power base, they are more willing to adopt that change. If helping the change be diffused across the organization will enhance an individual's power base, they are more willing to take on opinion leader or champion roles. If an individual perceives that diffusion of this change will diminish their individual power base, they will be more likely to hinder its diffusion throughout an organization and may become a negative opinion leader. If an individual is not very powerful to begin with, they may enlist with others to form a coalition, since groups are stronger than individuals[34]. Forming this coalition can also increase each individual member's power base[105].

Therefore, those people who hold power as an opinion leader or champion can influence their peers or other groups in either a positive or negative way. This informal referent power can be more effective than the legitimate power of management.

3.4.1.1 Powerlessness

As we consider influence and gaining power, we must also consider diminishing power. It is necessary to think about how people and/or organizations react when they feel they are becoming powerless. Uncertainty resulting from change can present opportunities for others with less uncertainty, to obtain powe.[22]. Some people believe the zero-sum concept, that there is only so much power to go around and if someone gains power, then someone else will lose power[108]. When people feel that they are in a position to lose power, they become defensive and attempt to control the others threatening that power [72].

As stated before, groups tend to have more power than individuals, but there are groups within organizations that are powerless. According to Sieloff's Theory of Group Power within Organizations, if a group feels powerless, their dynamics change[34]. They have a fear of

retaliation from those more powerful or higher in the hierarchy of an organization than they are, and tend to turn their negative feelings toward the members of their own group because the other members cannot retaliate. Organizations foster this behavior in order to maintain control and keep the group oppressed[34].

In healthcare, nursing has been a group caught in that hierarchy and has been struggling for empowerment for a very long time[109-111]. Until recently, their role in the healthcare environment has been one of professional dominance by powerful physicians[76, 112, 113].

3.4.1.2 Power and Clinicians

Power is manifested in our language[73] and by our gender[75]. Healthcare is ripe with terminology that reflects both of these influences.

The words that we use reflect power, create power, depoliticize (mask or hide) power, and reinforce power or dominance[73]. In healthcare, physicians write "orders", and nurses make care "plans". Whether by patients or co-workers, physicians are addressed formally as "doctor.", while nurses are usually addressed informally by their first name[76]. We automatically use the masculine pronoun "he" when speaking of physicians and the feminine pronoun "she" when speaking of nurses or unit secretaries, even though none of these roles are gender specific. Undoubtedly, part of the reason for this has been that historically physicians were predominately male, and nurses were predominately female. That is not the case today, yet this personal pronoun use is almost a reflex response in us. Not only is it the conditioned response, but language also influences us to associate the more powerful position with "he" and the less powerful position with "she"[75, 76].

Not just language use, but gender itself has been shown to be a factor in power and influence. Regardless of the organization, men and women utilize different types of influence. In a study done by Carli, men have more expert and legitimate power while women have more referent power and if both genders held the same position, subjects perceived the male as more powerful[75]. She found that this is based on stereotyping of gender roles more than anything else. Physician-nurse interaction is affected by this stereotype also because historically it has been predominately a male-female interaction [76, 114]. However, in a 2003, the American Association of Medical Colleges reported that there are more females applying to medical school than males.

[115] It is possible that we may see a shift in this tendency in the future as more women take on roles with expert and legitimate power.

The relationship between clinicians (of all types) and administration reflect power struggles also. Rothman states that occupational groups work to protect their autonomy and their social and economic rewards, while groups outside of their occupational group, such as management, will attempt to impose constraints and standardization[112]. He also indicates that the autonomy of professional status is what occupations aspire too, and part of that status is the ability to delegate tasks. The return of the task of entering orders with CPOE, which long ago was delegated away to the level of unit clerk, poses a threat to the physician's professional status.

Interaction between physicians and nurses reflect the professional disparity and the power differences between the two groups. Duties and responsibilities of nurses have come from the delegation of those tasks from physicians, not because of a nurse's power to initiate control. Physicians delegate responsibility, not power[76].

Professional disparity includes social and economic disparity. Physicians have higher incomes, have a higher social standing, and can receive third party reimbursement for their services. Nurses, regardless of their level of education, are held at employee status and are not recognized by third party payers for their services[76].

Time as a resource is highly symbolic of power. Powerful people give little time to those less powerful and tend to share time equally with peers[76]. This hierarchical relationship of power is reinforced by whose time is more valuable and whose work routines are more important. Time and workflow are critical factors in the acceptance or resistance to the implementation of CPOE because their value reflects the clinician's power status.

4.0 POWER AND ORGANIZATIONS

Organizations are based on the concepts of achieving goals (organizational and/or individual), within an organizational decision structure (centralized or decentralized), using power (formal and/or informal), based on a corporate culture (internal or external belief systems)[108]. Obviously, organizations are much more complex than this, but these four concepts – goals, structure, power, and culture - summarize the foundation of how an organization is designed to operate.

Rational system organizations believe in very specific goals, utilizing formal power with a hierarchical, centralized authority structure to achieve those goals, within a corporate culture of internalizing the belief that "what is good for the organization, is good for me"[108]. The military or very old or very large organizations often reflect this kind of design.

Natural systems are concerned with the complex behavioral structures of organizations as a social system that utilizes a decentralized decision structure with a great deal of informal power. Achieving the worker's personal goals will then achieve higher organizational goals. The culture is based on the individual's beliefs and values external to the organization[108]. Smaller, knowledge-based businesses may practice this type of organizational design.

Open systems have changing boundaries based on their interaction with the external environment. Therefore, they may utilize decision structures and power in any way that is necessary for the given situation based on loosely coupled subgroups. They focus on the process of organizing rather than the organization itself which makes them very flexible and adaptable to change[108]. Many entrepreneurial businesses function in this manner to be able to quickly adapt to the marketplace.

Contingency theory then tells us that, "The best way to organize depends on the nature of the environment to which the organization relates" and so encompasses all three systems. Even within one organization rational, natural and open systems can occur at different levels[108]. For example, even though the United States Navy is a very structured, hierarchical centralized

organization, the flight deck crew on aircraft carriers functions as an open system in emergent situations. For immediate and emergency decisions, the distribution of power changes from the person with rank to the person with the information[116].

Most studies on organizational power deal with the behavioral and social relationships of individuals. However, Hickson developed the Strategic Contingencies Theory of Intraorganizational Power that "explains differential power among subunits in complex work organizations" [117]. In a healthcare organization, a subgroup might be considered a patient unit, comprised of multiple types of care providers, or a subgroup may consist of care providers by role (e.g. physicians, nurses). He says that the ability to handle uncertainty is what gives a subgroup power within an organization. The interdependence of other subgroups on the group handling the uncertainty changes the power flow from top-down to lateral within an organization[117, 118].

Uncertainty is defined as "lack of information about future events so that alternatives and outcomes are unpredictable."[117] Organizational power does not come from uncertainty but from the ability to cope with it. Hickson's theory has four hypotheses on a subunit's level of power within an organization. They all end with "...the greater its power within the organization":

1. The more a subunit copes with uncertainty...
2. The lower the substitutability of the activities of a subunit...
3. The higher the centrality of the workflows of a subunit...
4. The more contingencies are controlled by a subunit...

Many of these power factors can be controlled by routinization, which eliminates contingencies by eliminating uncertainty from a task.

These variables mixed in various ways create a subgroup's organizational power[117]. Introduction of new technology within an organization creates the opportunity for a subgroup to increase or decrease their organizational power based on how that technology is incorporated into their workflow and the amount of routinization it provides.

As we look at the subgroups within a hospital, we see that the principles apply to either the patient unit or care provider subunits. The end product of the organization is quality patient care which is planned and coordinated from the patient unit (centrality), where problems and issues are dealt with and resolved (coping with uncertainty), requirements of the patient unit are

what the ancillary areas must schedule around (contingency), and no other type of subunit within the organization can provide these same services (substitutability).

From the care provider's perspective, each role in the organization has specific responsibilities that are dependent on educational and credentialed requirements (substitutability). This training and legal authority are the foundation of the ability to deal with emergent situations (coping with uncertainty), their direction guides the work of other care providers (contingency), and their services cannot be provided by those unlicensed or unauthorized to carry out these processes (centrality).

From these viewpoints, we can see how an individual may perceive their power based on their affiliation with the subunit of patient unit or the subunit of their role within the healthcare organization, perhaps both. For either type of subunit, the introduction of CPOE into the healthcare organization is the technology that can provide routinization of the organization's services.

4.1 INFORMATION TECHNOLOGY

We must be careful when using the term "technology" when referring to organizations because it has not always meant "computers". In 1967, Perrow defined technology as "the actions that an individual performs upon an object, with or without the aid of tools or mechanical devices, in order to make some change in that object"[119]. Using Perrow's framework, we could define Information Technology (IT) as actions that a computer performs on pieces of data, in order to change that data into information. Wikipedia goes on to define IT to include "...to convert, store, protect, process, transmit, and retrieve information"[120].

The implementation of IT allows information to cross back and forth within and across the boundaries of an organization. These changes in boundaries change the environment in which the organization operates. It would be safe to say then that Contingency Theory would indicate that information technology innovations may require changes in the goals, decision structure, power distribution, and/or culture within an organization if they are to adapt and operate successfully.

Business process redesign (BPR) is an example of a method for implementing successful changes within an organization. According to Broadbent, the implementation of IT in an organization is fundamental to BPR and involves implementing IT across business boundaries to external environments rather than just within an organization[121]. BPR is considered to be one of the most powerful ways to raise business performance and increase customer satisfaction [122, 123] and is being used to redesign all types of organizations, including healthcare[124]. The impact on a subgroup's power within an organization is influenced by the fact that workflows and information flows change with IT. Jasperson et al. state, "expectations regarding changes to power structures and power can serve as an important factor in decisions to adopt, promote or develop IT even if the actions that result are not themselves particularly power-laden or political"[20].

4.2 POWER, ORGANIZATIONS, AND INFORMATION TECHNOLOGY

One view of formal organizational power is based on the possession, control, and availability of resources[108, 125]. Maas says having and controlling resources allows an organization independence, and independence represents power[125]. Information is one of the most powerful resources that organizations have today[105] and how this resource is obtained, and who has control over its distribution has huge implications for "who has the power" in an organization[105].This resulted in studies on how IT would impact organizations before IT was even implemented.

By the mid-twentieth century, the realization that computers would impact work and power relationships triggered studies on these relationships. Kling developed two theories on the relationship of computers and organizational impact[126]. They are "systems rationalism" and "segmented institutionalism". System rationalists believe that organizational or economic efficiency for society as a whole is the predominant impact that computers can bring to the world. Segmented institutionalists believe that the consequences or importance of what a computer can bring to an individual supersedes organizational or economic values.

In the 1950's and 1960's, researchers looked at potential benefits and issues since computers were not routinely implemented in business organizations. System rationalists looked to computers to provide computer assisted instruction, management information systems,

automated decision systems and transaction processing – all with the goal to make managers and organizations more efficient. Segmented institutionalists saw computers as causing social problems from individuals losing privacy, having their jobs de-humanized, and jobs being lost as a result of automation[126].

Once computers were introduced in organizations, studies found that people accepted computer technology very much like they have other technology (e.g. telephones, cameras). They found that jobs were not lost, but more often were just changed. Jobs were enlarged or constrained, made interesting or dull, but in general were not eliminated. Kling conducted a study in the 1970's in which he found that computers did not have a potent impact on people's jobs[126]. However, at that time, computer use was often discretionary. Those who had to use it, adapted to it, and those who wanted to use it, found it beneficial.

In the 1970's, other studies began to show how computers changed the management of information and decision making which caused changes in the patterns of power and influence in an organization[101, 112, 117, 118, 127, 128]. System rationalists focused on the authority role - the person in the role of authority has the say about what happens (legitimate power). Segmented institutionalists focused on the power of groups - the person or group controlling a resource is the person or group controlling the organization (informational power).

As we moved away from the industrial revolution into the age of "computer evolution", studies on IT implementation and its influence on organizational change were able to be done looking at real organizations[15, 22, 74, 99, 102, 105, 121, 129-131]. By the third millennium, Orlikowski stated that the studies of organizations and information technology are overlapping fields and that more benefits can be achieved by researching them as related fields[132].

4.2.1 Power, Healthcare Organizations and Information Technology

Today, studies in healthcare information technology and power are where business organizations were 30 years ago. This is because healthcare organizations have changed from organizations that were reimbursed by insurance companies for all of the money that was spent to care for a patient, to capitated reimbursement systems that pay a set amount per patient for their care regardless of the treatment required[133]. Healthcare organizations attempt to work within a

monetary boundary for each patient, much like businesses have to work within a budget for each project.

The processes of implementing information technology within a healthcare organization are interchangeable with the implementation of information technology within any business. In Markus' case study of the relationship between power, politics and IT implementation, if you were not told this was a manufacturing firm, you could easily substitute an EHR implementation[15]. Lapointe actually used hospital case studies of CPOE implementation to demonstrate her points in relation to IT implementation for a business[69]. Business Process Redesign (BPR) is being applied to processes within hospitals as they attempt to achieve improvement in time, cost, quality and flexibility, just like any other business[124]. A review of the studies on BPR use in healthcare covered process-related parameters (e.g. length of stay, waiting times, number of visits), or outcome measures (e.g. cost reduction, resource utilization, satisfaction, and medical outcomes)[134]. The IT involved in healthcare BPR is an electronic health record.

Because of the similarity of healthcare to other organizations, we can apply Hickson's theory regarding the power of subgroups in an organization[117]. A subgroup in a hospital can be defined geographically as an individual patient unit or can be defined as the type of healthcare worker – physician, nurse, unit clerk, nursing assistant. Since staff can move from patient unit to patient unit, perhaps it is best to consider the power of the subgroups in a healthcare organization based on their role.

Referring back to Hickson's theory of organizational power, coping with uncertainty, substitutability, centrality, and routinization[117] all have an effect on the power of physicians and nurses. Coping with uncertainty is part of the job on a daily basis when it comes to patient care. However, routinization of many processes and procedures enable them to be delegated down from the physician through the ranks, and evidence-based medicine is standardizing the prescription of care. Substitutability is not as absolute as it used to be for physicians with the advent of onsite hospitalists and physician extenders (nurse practitioners and physician assistants), but with the shortage of nurses, lack of substitutability can be an asset to their power. Centrality is a key power factor to both physicians and nurses within any hospital, but more so for physicians because of the unique responsibilities they still control and their historically unchallenged status[1].

The advent of CPOE with built in decision support and standardization of ordering practices also influences the professional status of the physician. According to Rothman, "the more esoteric and circumscribed the knowledge base of an occupation, the more likely it will be able to resist external control and define its own work"[112]. If physicians are forced to follow prescribed guidelines for patient care, this diminishes their freedom of practice thereby diminishing their expert power base.

4.3 POWER AND ORGANIZATIONAL AUTHORITY

Scott suggests that there are three variables that can determine the authority structure that an organization may take[108]. They are:

1) Complexity or diversity = the number of different things that the organization must deal with simultaneously

2) Uncertainty or unpredictability = how variable those things are and how many exceptions there are

3) Interdependence = how these things relate to one another, or the workflow.

Bounded rationality would tell us that authority structure would depend on the timeliness and criticality of the decisions that must be made. Meaning, the decision process should go to the level that has the best information available for a decision at the earliest opportunity, even though the decision may not be perfect[135].

Strategic, long range decision making can be handled by a centralized authority when there is time and resources to deal with the complexity of the issues. When decisions must be made regarding dynamic, high uncertainty issues in an immediate time frame, decisions should be made in a decentralized manner at the level closest to the implementation of that decision, as the case of the aircraft carrier flight deck crew mentioned earlier. Both centralized and decentralized decision authority can exist within the same organization.

4.3.1 IT and Centralized vs. Decentralized Authority

There was great debate as to whether IT affects the centralization/decentralization of power within an organization[136]. George and King identify just as many studies showing IT promotes centralization as IT promoting decentralization. Their conclusion is that it depends on the individual organization's context, managerial intent, power structure, and history[136]. If the organization has had decentralized authority, but they wish to have more centralization and standardization, they would indeed push to purchase systems designed to enhance centralization and vice versa. It is possible that a healthcare organization implementing a CPOE system with evidence-based ordering guidelines could take medical decision making to a more centralized authority level. This would take much of the decision process away from the discretion of the physician but generate better compliance with JCAHO performance measures.

As specialization increases in the working world, knowledge becomes specific to areas distributed throughout an organization. IT provides the opportunity to communicate the information and knowledge required for decisions to the smallest unit of specialty in an organization. Thinking in terms of bounded rationality, IT can expand the options that workers have to make their decisions, which we would assume makes for better decisions[108, 135].

In terms of healthcare organizational authority, let's consider the patient unit as the smallest organizational subgroup responsible for a patient's care. The patient unit includes at the very minimum the physician, the nurse, and the clerical and support staff responsible for an individual patient while in the hospital. Each patient unit is specific in what their work domain includes, such as cardiology, oncology, or rehabilitation. According to bounded rationality[135], decisions on that patient's care should be made at the subgroup closest to the patient, by those who have the best information available, and can make the best decision possible in a critical time frame. In this case, a CPOE system with decision support is promoting decentralization of decision making to the patient unit level.

With the incorporation of core performances measures, and evidence-based outcomes, IT can communicate rules and rigid requirements determined at a much higher level in the organization down to the subgroup closest to the patient and enforce their compliance. This centralized authority becomes a threat to the autonomy of the patient unit subgroup and can then set up a cycle of resistance to the IT sending the mandates[101].

So, from an organizational standpoint, system failure would be less likely to come from the implementation of decision support which helps clinicians prevent errors, but more from the mandatory rules and requirements passed down through the IT system that threaten autonomy.

5.0 POWER AND RESISTANCE

Power cannot exist without resistance.[93] According to the French philosopher Michel Foucault, power and resistance create a balance. Resistance to change ensures that those with influence or power must strive harder to make things better[36]. Resistance can be an indicator that there is a problem to be solved[15]. Lewin's relationship between power and resistance using "power fields" of concentric circles that were mentioned earlier can even be expressed in a formula:

Power = Max Force A -> B / Max Resist B

This is read as "Power equals the maximum force that person A can induce on person B, divided by the maximum resistance that person B can offer[79].

This power/resistance relationship has been studied in psychology, sociology, and business for more than 50 years [25, 86, 89, 137, 138]. The effects of power on social relationships and organizational change were the motivators for these studies because of the interconnectedness of social behavior and business practice. As early as 1983, business was able to identify that information technology had the capacity to change an organization's power structure, and that resistance to those power changes was actually able to cause the failure of the information technology being implemented[10, 15, 20, 69, 90]. As indicated earlier by the number of EHR and CPOE failures, we can see that healthcare organizations face issues of information technology generating resistance also.

5.1 COMBINING THEORIES ON POWER AND RESISTANCE

Since Lewin's power fields suggest that resistance is simply the act of the target person exerting their own power back at the influencer, we may assume that resistance to influence is to be

expected. An important thing to know would be if the type of power or influence the influencer exerts on the target can affect the amount of resistance that the target exerts back.

Models and theories of power, influence, and resistance have all been proposed, but have not been combined into a single relationship. Combining French and Ravens model of social power bases[89], Bruin's[79] and Kipnis'[139] models of influence and Lapointe and Rivard's definitions of types of resistance[69], I propose the Ranked Levels of Influence Model, as a guideline for influencing system users (see Figures 3 and 4). This model can help influencers know at which point the targets may be pushed from passive resistance into active resistance. These models have been discussed earlier, but now I want to discuss how they interrelate.

The Influencer's use of a power base makes a "statement" to the target. If they use Informational power, they are saying, "Do this because of these reasons." This is a very rational statement which lines right up with Kipnis' Rationality tactic which says to "Write a plan and explain the reasons." As Bruin indicates, this would be a "soft tactic" meaning that the target has more freedom of decision and allows the target the option to either yield or resist. To use soft tactics, the influencer is considering the target part of his own group or is attempting to make the target part of his group. If the target is not accepting at this point, the level of resistance at a minimum level is just "apathy". As originally defined by Coetsee, these levels of escalating resistance ultimately ended in death and destruction[140], but Lapointe and Rivard clarified them into terms appropriate for information technology[69]. As you can see in Figure 4, these models continue to come together to show an escalating interaction between power and influence. While "Soft" tactics are used, the influencer is attempting to include the target in his group and treating him like a peer, but as soon as "Hard" influence is used, the relationship changes to more of a superior/subordinate and the influencer no longer considers the target part of his group. As mentioned previously, coalitions are much stronger than individuals, so with soft tactics, the influencer is attempting to form a coalition with the target, but when hard tactics are used, the target begins to form a coalition against the influencer. The critical point in using influence is at the point where soft tactics and hard tactics meet. The lower the level of the influence used, the more likely the target will comply and the less resistance will be encountered; the higher the level of the influence used, the less likely the target will comply and more resistance can be expected (see Figure 4).

French and Raven's Six Bases of Social Power

Legitimate	Position or credentials
Coercive	Threats or punishment
Reward	Giving something desired
Expert	Knowledge or experience
Referent	Charisma or identification with someone or some group
Informational	Ability to persuade or provide information

Kipnis' "Power Act Model": Eight Influence Tactics

Assertiveness	Demanding, ordering, setting deadlines
Ingratiation	Make the other person feel important
Rationality	Write a plan, explain the reasons
Sanctions	Threaten job security, financial coercion
Exchange	Offering an exchange of favors, personal sacrifice
Upward appeal	Invoking the influence of higher levels in organization
Blocking	Stop target person from carrying out some action
Coalition	Steady pressure for compliance by obtaining support

Bruin's "Power Use Model"

Soft Tactics	Used for persons perceived to be within your group	Leaves group members more freedom for decision
Hard Tactics	Used for persons perceived to be outside of your group	Leaves non-group members less freedom for decision

Resistive Behavior defined by Lapointe and Rivard

Type of Resistance	Coetsee	Lapointe and Rivard
Apathy	Neutral zone – Passive resignation	Inaction, distance, lack of interest
Passive Resistance	Mild or weak opposition	Delay tactics, excuses, persistence of former behavior, withdrawal
Active Resistance	Strong, but not destructive opposing behavior	Voicing opposite points of view, asking others to intervene or forming a coalition
Aggressive Resistance	Destructive behavior	Infighting, making threats, strikes, boycotts, or sabotage

Figure 3: Four Models Used.

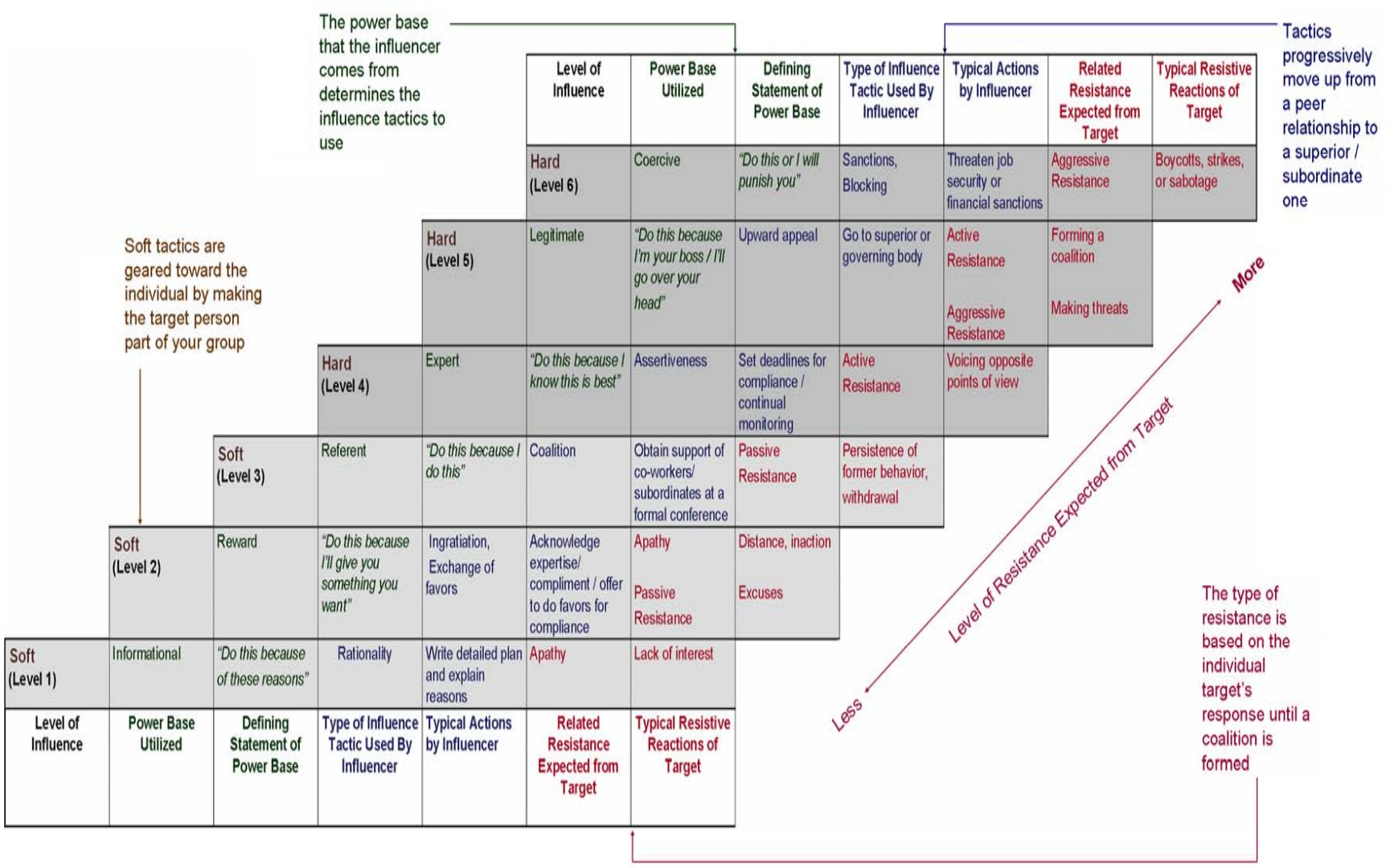

Figure 4: Ranked Levels of Influence.

To illustrate my point, I will go back to the three case studies presented by Lapointe and Rivard in the EHR failures section reviewed earlier. In the first case, the physicians were apathetic to the system from the beginning because it took too much of their time (Level 1). Then conflict between the physicians and nurses arose over the system and at that point the physicians boycotted its use. The hospital administration responded by moving immediately to coercive power (Level 6) by not allowing resisting physicians to admit patients. This pushed the resisting physicians into destructive behavior by threatening to terminate all association with the hospital (Level 6). This ended in disaster with the hospital nearly going bankrupt, removal of the hospital CEO, and ultimately abandoning the system. Looking at the Ranked Levels of Influence, administration may have been able to save the system if instead of moving to Coercive power (Level 6) as their first move, they had intervened early on with information on the benefits to patient outcomes (Informational power – Level 1) and then offered both nurses and physicians some incentives for using the system (Reward power – Level 2). Once influence and resistance levels move into the range of Hard Tactics (Levels 4-6), it is very difficult to salvage the system.

The second hospital case study moved through the levels of influence by first incorporating the physicians in the system selection (Level 1). When the physicians' had problems with the system, they wrote a formal letter of protest (Level 1) and administration ultimately gave the physicians what they wanted (Level 3) by backing out the Pharmacy module. By everyone using soft influence tactics, this hospital was able to save at least a portion of the system until improvements could be made. By keeping the interactions within the Soft tactics range, the hospital was able to save the system and move forward.

In Lapointe's third case study, conflicts arose between the surgeons and the nurses about entering orders. Administration attempted to appease the unhappy surgeons by having nurses perform the tasks for the physicians. I am sure that this escalated the conflict between the two groups because the nurses had hospital administration using a "hard" level of influence (Level 5) on them. The fact that nursing was "told that they had to do it for the physicians" contributed to the conflict. This still did not satisfy the surgeons who delivered an ultimatum to administration that the system be withdrawn (Level 6). Administration responded by reallocating the surgeons beds (Level 6). The power of the coalition came into play when other physicians supported the surgeons by refusing to admit into those beds (Level 6). The system was withdrawn[69], once again indicating that Hard Tactics usually will not be successful.

This combined theory of ranking can be applied to any type influence/resistance situation because the associated theories are not specific to any particular situation. The examples provided do show how this theory can apply to situations of the implementation of information technology within an organization, especially a healthcare organization. By using this Ranked Level of Influence as a guideline, an information officer, system developer, or hospital administrator can determine what types of power and influence tactics will minimize the amount of resistance from the target and at what point actions will push the target into active resistance. I believe that this model warrants further study.

5.2 RESISTANCE TO INFORMATION TECHNOLOGY

There are many theories of resistance to IT. Lapointe and Rivard summarized four of the major theories by Markus, Joshi, Marakas and Martinko[69]. Markus states that if a system supports a group's position of power they will use it, if it causes a loss in a group's position of power they will resist it[15]. Joshi states that acceptance/resistance comes about from the individual's evaluation of the equity of the system change.[19] Marakas and Hornik explain resistance as passive-aggressive responses to threats or stresses that an individual perceives are related to the system,[14] and Martinko et al. explain resistance to new technology in terms of, internal and external variables, and a person's past experience with similar technology[18]. All of these theories indicate that the result of resistance can be either positive or negative.

Focusing first on Markus's work, she states that there are three theories of why people resist IT. First, they resist for reasons internal to the person, second for reasons inherent in the system and third because of the interaction theory which is an interaction of the first two. The interaction theory indicates that if you resolved resistance by having users participate in the design and development, and resolved resistance by improving the system's performance and design, you will still have resistance if the underlying cause of the resistance was generated by interactions among competing groups[15]. This brings us to Joshi's Equity Implementation Model.

Joshi's model suggests that people evaluate the inputs and outcomes of every change and determine if it is positive or negative for them.[19]. They determine the "fairness" of their equity

status by comparing their equity status with the equity status of the organization and of other users. The formula is:

$$\text{Equity status} = \Delta \text{ Outcomes} - \Delta \text{ Inputs}$$

If a person feels that the changes in the outcomes they experience are greater than the amount of input they must put into getting them, there is acceptance. However, if the change in the outcomes is less than the amount of inputs or effort that they must put into it, there is resistance. Table 5 (taken directly from the article[19]) is a list of the types of outcomes and inputs Joshi indicated that effect the equity status of an IT implementation.

Table 5: Possible Changes in Outcomes and Inputs on Account of Implementation.

INCREASE IN OUTCOMES	**INCREASE IN INPUTS**
More pleasant work environment	More work in entering data
Less tension, more job satisfaction	More tension
More opportunities for advancement	Bringing higher level skills to the job
Better service to customers	Effort in learning a new system
Recognition, better visibility	Assignment of additional tasks
Salary increase, grade increase, or higher-level title	More effort in performing tasks in view of increased monitoring
Increase in power and influence	Need to spend more time
Learning a marketable skill	Fear of unknown (e.g. failure) and the resulting anxiety
Reduced dependence on others	
Usefulness of the system	
DECREASE IN OUTCOMES	**DECREASE IN INPUTS**
Reduced job satisfaction	Ease of usage
Reduced power	Less effort
Reduced bargaining power relative to the employer or others	Reduced search for solutions or information
	Reduced manual effort
Threat of loss of employment	Reduced cognitive effort
Loss of value of marketable skills	Less rework due to fewer errors
Reduced importance, control	
Increased monitoring	

Reduced scope for advancement More role conflict and ambiguity Potential failure in learning and adopting of the new system	

These specific outcomes and inputs could be included in the general categories of causes of resistance in studies done by Ford[141] and by Trader-Leigh[10] also.

Lapointe identifies the five components of resistance as behaviors, object, subject, threats and initial conditions. Behaviors consist of escalating reactions of apathy, passive resistance, active resistance and aggression by someone (subject) on something (object) because there is a change (threat) to a the way things are (initial condition)[69].

Theoretical explanations regarding types of resistance are constrained to a few factors, but how it is expressed is highly variable. How an individual expresses resistance can vary based on their position in the hierarchy[15], the level of the threat to their condition and amount of formal and/or informal power they possess. It can be expressed as background conversations (meaning how a person speaks about the system to others),[141], social sabotage, absenteeism, work avoidance, theft or playing dumb[13]. System sabotage is also possible, such as the earlier example of the residents entering "bullet wound" as the reason for every procedure. The residents thought that it was funny, but it was willfully entering incorrect information into the patient record. This was system sabotage, but luckily, it is not a common occurrence. The causes and expressions of resistance vary according to a person's position in the work domain, especially in healthcare.

5.2.1 Resistance to Healthcare Information Technology

In the very early 1900's, American physicians were resistant to the introduction of the blood pressure cuff[142]. They felt that their long standing expertise with the process of "pulse palpation" provided much more valuable information about the patient's condition than this tool could. The cuff was minimally accepted when it was offered as a tool for the use of subordinates to gather information for the physician's later interpretation. Once it was determined that there was interpretive knowledge and a skill involved in using a stethoscope in conjunction with the blood

pressure cuff, physicians accepted it as a tool they should use and took back the delegation of its use. Their expert status was no longer threatened by a tool that anyone could use, but enhanced by the realization that this tool provided another method of establishing their expertise. This demonstrates the initial resistance, and ultimate acceptance of technology in the field of medicine. Information technology can ultimately follow the same path if presented appropriately.

Physicians have long ago "turned their authority into social privilege, economic power, and political influence."[1]. Anything that they perceive influences their income, autonomy or level of influence is worthy of their concern. Condensing Joshi's list of Outcomes and Inputs[19], Table 6 shows only those outcomes and inputs that would be causes of physician resistance as it pertains to the implementation of CPOE.

Table 6: Outcomes and Inputs Influencing Physician Resistance.

Decrease in Outputs for a Physician	Increase in Inputs for a Physician
Reduced power Loss of value of marketable skills Reduced importance, control Increased monitoring More role conflict and ambiguity Potential failure in learning and adopting the new system	Assignment of additional tasks More effort in performing tasks in view of increased monitoring Need to spend more time Fear of unknown (e.g. failure) and the resulting anxiety

Studies on CPOE failures have shown that physicians have resisted CPOE because it attempts to control how they practice medicine, it takes away from their time and income by influencing how many patients they can see in a day (including both the time it takes to learn and use), disrupts their workflow, has them performing clerical work, undermines their authority by monitoring what they do, produces performance anxiety because they don't want to appear stupid by not knowing how to use it, and decreases necessary face-to-face communication (which removes a control factor)[11, 53-62, 67-69, 143]. The items in Table 6 encompass all of these reasons for physicians' resistance to IT. The manifestations of resistance by physicians vary

according to whether they are employed by the hospital or are an independent practitioner even though the causes for the resistance are the same.

As mentioned earlier, the amount of power that a person possesses influences how they can apply resistance to IT. If physicians are considered independent of the hierarchy of the organization, in other words an independent practitioner who functions as an external business entity, they control a resource that is critical to the healthcare organization. Since control of resources is considered a very strong source of power[125], the physician can resist by withholding that resource (e.g. refusing to admit patients to that hospital). This is a very effective resistance method as shown in Lapointe's first case study[69].

If physicians are employed by the hospital, such as residents, hospitalists, or intensivists, they are part of the organizational hierarchy. Their power related to the organization then resides in their centrality, substitutability, and ability to deal with uncertainty as identified by Hickson[117]. Their role in the organization is critical to its functionality and therefore enables them to resist using the same methods as are available to nursing[9], which are refusal to use the system, minimize use the of the system by workarounds, and criticize the system (by use of background conversations[141]). However, because of the physician's expert power and the higher level of legitimate power assigned by the organization, they can exert more influence than nurses when using these methods.

In a study by Kirkley, the causes of resistance for nursing are not to the technology itself, but the impact that the technology has on their workload, the fact that they were used to paper because it was convenient, discreet and tangible, and resentment that system use was mandated[6]. However, Kirkley's study was in regard to clinical documentation and not CPOE. In a study by Weiner in 1999, nursing perceived more positive outcomes with CPOE than physicians[17]. The nursing staff expressed satisfaction with CPOE and felt it was beneficial, identifying legibility and ability to view active orders as significant benefits to their work. In this study they also felt that CPOE increased their time with patients and decreased errors in ordering. Physicians believed CPOE decreased their time with patients, caused more tests to be ordered, and caused more errors in ordering.

A study of nurses and EHRs in 2008, surveyed nurses to identify the enhancements and hindrances EHRs imposed on their work and found some differing results[144]. As enhancements, nurses believed it provided increased access to patient care information, improved efficiency and

organization. On the other hand as hindrances, they identified decreased time with patients similar to the physicians in the earlier study, increased time spent retrieving or documenting information, interference with written interdisciplinary communication, and obstruction to their critical thinking.

As shown, there are obviously time and workflow issues for both nurses and physicians which are responsible for resistance to CPOE. But as mentioned earlier, changes in methods for performing tasks, much like the introduction of the blood pressure cuff, are temporarily resisted until those changes are incorporated into the workflow. Resistance from changes in power perceptions is personal and not easily overcome.

5.2.2 Hierarchically-Based Patient Units vs. Team-Based Patient Units

We commonly think of "power" as a supervisor/sub-ordinate relationship, and that the supervisor receives her/his power by being hired into that position within the organization (legitimate power). In a healthcare organization, sometimes the ones at the top of the hierarchy are not granted their power by being hired by the organization, but are powerful based on long standing traditions and perceptions of expertise. The traditional patient unit has a hierarchical relationship between clinicians where control passes from the doctor down to the nurse and then down to the unit secretary. Hierarchical structures tend to be the most stable, with less uncertainty[117]. This hierarchical power relationship is what most studies on power examine[24, 27, 30, 34, 145].

New organizational structures within healthcare break away from the traditional hierarchy and utilize team approaches that recognize expertise in new and different areas of healthcare. These clinicians have a team relationship instead of hierarchical[146].

Team approaches are relatively new on clinical units. They move away from rigid tradition and are more flexible in relation to recognizing expertise in disciplines other than medicine. Because team approaches are already changing the long standing status quo, they may be likely to be less resistant to a change in the work environment. However, teams tend to increase non-physician importance while decreasing physician autonomy[147]. This causes shifts in roles and may also cause resistance[148, 149].

6.0 RESEARCH HYPOTHESES

The goals of this research are to identify and measure perceptions of personal power and CPOE attitudes of clinicians, demonstrate the impact of CPOE implementation on those perceptions and attitudes, demonstrate a relationship between power perceptions and attitudes toward CPOE, and create a measurement tool to measure these relationships.

Motivation: Joshi's equity status model[19] suggests that physicians can perceive an "unfair" equity status resulting from CPOE based on the decrease in outputs and increase in inputs suggested in Table 6: Outcomes and Inputs Influencing Physician Resistance. Their equity status in power, expertise, autonomy and even economic status could be diminished.

Nurses may perceive positive outcomes from CPOE (legibility, active orders, less errors), but they may also experience negative outcomes (less time with patients, more time on the computer, decreased communication and critical thinking). Their equity status may go either way because they perceive both benefits and hindrances, but their organizational role in the CPOE order process changes from being integral to ancillary, which may impact their perception of power causing an "unfair" equity status.

Unfortunately, the effect on the role of the unit clerk/secretary cannot be estimated as no previous power studies have included the effect on their role. They will be losing the major task of order entry in their work, but how integral that is to their perception of power in the workplace is yet to be determined. They may feel relieved to have this task removed. Because they are often experienced users of healthcare computer systems, they may take on expert status on the patient unit as people refer to them for help.

If positive outcomes are attributed to CPOE, they may reflect a positive change in perceptions of power and if negative outcomes are attributed to CPOE, they may reflect a negative change in perceptions of power. The following hypothesis will be tested:

Hypothesis 1: Introduction of computerized physician order entry (CPOE) affects a clinician's perception of her/his personal power within the healthcare environment. Different types of clinicians will experience different directions of change, and individuals' characteristics and experience will influence their baseline perceptions and attitudes.

Sub-hypotheses to this hypothesis are:

- Pre-implementation of CPOE, power perceptions and attitudes may be correlated with some personal characteristics and experiences. This provides the baseline power perceptions and attitudes for each individual.
- Post implementation of CPOE, perceptions of power and CPOE attitudes will change.
- Post-implementation of CPOE, the changes in the scores for the six power bases will vary according to the subject's role in the work domain.

To determine if perceptions of power are increased or decreased by CPOE, it is necessary to measure baseline power perceptions before CPOE becomes part of the work environment. Then to determine if there is a change in perceived power, it is necessary to measure the same individuals after CPOE has been implemented at a time interval beyond the usual learning curve and once the system has settled down. In a study on post-implementation evaluation of computer-based systems, Kumar suggests that this interval is ideally between three and 12 months[150]. Based on this, the post-implementation data collection was scheduled for six months post-implementation because of time constraints for the study.

Since we are all a product of our experiences and everything that we do is influenced by who we are and what came before, it is important to determine if previous experiences, characteristics, or job status have an effect on perceptions of power and attitudes toward CPOE prior to the implementation of CPOE. Tversky and Kahneman's theory of framing[151] indicates that people's decisions are framed within the context of their knowledge, personal experiences and how information is presented to them.[152] It is necessary to gather that type of information and determine if perceptions are influenced by other factors. Martinko and Markus both explain negative reactions to IT as a product of a person's internal beliefs[15, 18]. It is necessary to correlate perceptions of power with personal characteristics and work experience, and attitudes toward CPOE with previous IT experience.

Motivation: Perceptions and attitudes influence behavior[18-20]. Threats to power are met with resistance[15, 19, 69]. Threats to perceived power would be reflected in a negative attitude toward the item that they perceive as the threat. If CPOE is a perceived threat to power, attitudes toward CPOE will be negative. If not a threat, they will be positive or neutral. Negative changes in perception of power and attitudes toward CPOE would be precursors to resistive behavior. Positive changes or no change in perception of power and attitudes toward CPOE would be precursors to acceptance or apathy. Therefore, my hypothesis regarding resistance to CPOE would be,

Hypothesis 2: There is a positive correlation between changes in perception of personal power, work organization structure, and the change in CPOE attitudes. Assuming decreasing CPOE attitudes are reflective of resistance, this would indicate a negative correlation between power perceptions and degree of resistance to the introduction of CPOE.

Sub-hypotheses to this hypothesis are:

- Post-implementation of CPOE there will be a positive correlation between the direction of change of the perception of power and the direction of change of attitudes toward CPOE for all levels of clinicians.
- Negative attitude scores for CPOE pre-implementation indicate CPOE is a perceived threat, and if clinicians' power perceptions decrease, the CPOE attitude score will also become more negative representing a resistive attitude.
- Post-implementation of CPOE, hierarchically-based patient unit physicians will have a more negative power perception score and a more negative attitude score toward CPOE than team-based physicians.

The relationship between a diminishing attitude toward CPOE and a decrease in the perception of power reflects the individual's perception that CPOE negatively impacts or threatens their power. This threat to their power can generate resistance to CPOE.

Authority structure within an organization is based on how decisions are made[108]. Bounded rationality tells us that decisions should be made at the level where the best information is available for timely, critical decisions[135]. Since the overriding objective in healthcare is providing quality patient care, this is the patient unit. As mentioned previously, different patient

units can function with different methods of authority structure, such as hierarchically-based or team-based[153].

Authority in a hierarchical structure is associated with legitimate power and is generally reflected in a chain of command. The person at the top of the patient unit hierarchy has the most power because their role has centrality[117]. This person may lose some centrality power if patient care decisions are moved to a more centrally controlled source such as CPOE. Team-based units share patient care decisions with multiple sources of expert power already, so their power may not be as threatened by CPOE but may be considered as yet another expert source on patient care.

6.1 RESEARCH DESIGN AND METHODS

This is a correlational study that used quantitative methods to obtain the data. The study was conducted in the field by administering the Semantic Differential Power Perception (SDPP) instrument to clinicians, pre-implementation of CPOE and then administering it again six months post-implementation. On the second administration, personal data was not collected again. The entire study was conducted electronically. Subjects included clinicians directly involved with the CPOE process and others not directly involved with the CPOE process. They were contacted via email, the survey was completed online, and the results were fed back into a file that I exported into an Excel© spreadsheet.

The dependent variables in the study are the value of the clinician's perceptions of her/his personal power within the work environment and the CPOE attitude value. The intervention is the introduction of CPOE into the work environment. The results for each individual were compared pre- and post-implementation. The comparisons pre- and post-implementation were examined by the structure of patient unit in which the clinicians work and their position (see Figure 5.) The pre- and post-implementation data was also examined by the person variables of gender, age, length of time in position, education level, employed by the hospital or not, area of specialty, previous experience with an EHR, and whether that experience was positive or negative.

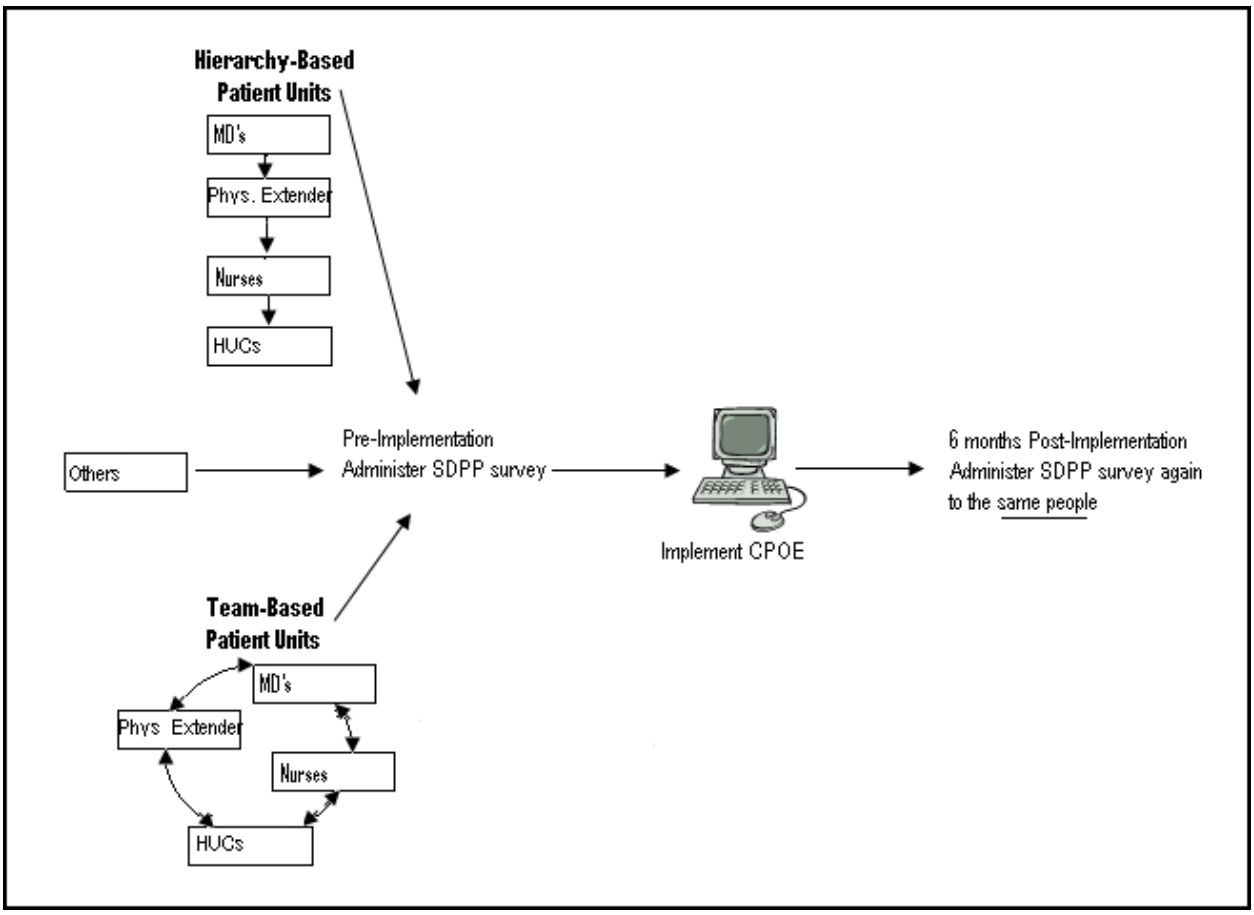

Figure 5: Model of the Study.

6.2 SDPP SURVEY INSTRUMENT

Studies on power/resistance in healthcare have been conducted[21, 34, 154-157] to encourage the acceptance of clinical information systems, or to determine perceptions of empowerment. These power studies use either (1) healthcare specific questionnaires using qualitative measures[154, 156, 157] or (2) quantitative questionnaires designed for business practices[34, 155]. A significant barrier to researchers looking at power changes in healthcare is the absence of an appropriate measurement instrument for power perception. Previous instruments used to measure perceptions of power have been structured to analyze superior/subordinate relationships, not an individual's perception of his/her own power[24, 25, 27, 30, 32, 33, 104, 145, 158, 159].

Qualitative studies provide important insights and richness of understanding, but there are also some significant limitations[160]. When responding to surveys or in interviews, people will often slant responses to appear more positive than they really are[161]. This is because people fear that answers indicating any negative perceptions relating to power may get back to co-workers or superiors. Also, qualitative studies do not provide measurable comparisons across individuals or over time.

Existing instruments for measuring power were developed for business organizations and were designed to gather information from someone about someone else's power or how someone else perceived their power. They deal with leadership roles, job satisfaction and management abilities. Even though healthcare and business have similarities, the social and working relationships are typically very different. Clinical work relationships are more complex, and include clinicians that have legal authority but not management authority over co-workers. Also, in healthcare, power relationships are often based on informal power of knowledge, experience and respect, not just on the formal power of position. Another requirement of the instrument is that it must translate perceptions into measurable values and encompass as well as differentiate the various power bases.

To overcome the self-censor bias and to obtain measurable data in a non-threatening manner, I developed the Semantic Differential Power Perception (SDPP) survey instrument[162]. It is designed to measure an individual's perception of his/her own power in the healthcare workplace in an indirect, unbiased manner (see Appendix A).

The SDPP survey is based on Osgood's semantic differential methodology developed in 1957[158]. This method uses bipolar, paired adjectives (i.e. word pairs) to map identification and localization of attitudes in a subject's thought processes[158, 163, 164]. This method was used by Singleton in a study in 1981 to measure physician and nurses perceptions of styles of power usage in an influence situation[165] and by Burkhardt in a similar study of superior/subordinate power relationships in business organizations[22].

The survey measures each subject's perception of their power based on the connotative meaning of pairs of words related to the six bases of social power. The word pairs are representative of extremes (positive and negative), and the subject identifies where on the continuum between those extremes their perceptions lie. It allows a subject to express a degree of attitude toward separate aspects of a concept rather than a single belief or judgment about it.

Another advantage of the semantic differential methodology is that it is non-reactive in nature[164] and does not promote socially acceptable responses. Also, because the semantic differential questions look at individual aspects of a concept, they can isolate and measure different types of power instead of just overall power.

A major issue in developing the word pairs is to ensure that the selected words have the same meaning for the subject as they do for the researcher. Establishing that the stimuli are interpreted consistently was an important consideration for performing a measurement study of the instrument.

On the SDPP Survey, the word pairs regarding power perceptions were presented under two questions. They were:

1. "At my work, I have...."
2. "At my work, I feel...."

To manage central tendency bias, word pairs representing each power base were randomly intermixed under each question and varied according to whether the positive or negative word was presented first. The scores obtained from the SDPP instrument were evaluated relative to a midpoint of zero (0), with five points on one side indicating incremental positive values and five points on the other side indicating incremental negative values. No values were presented on the survey itself to reduce bias toward positive or negative responses (see Figure 6).

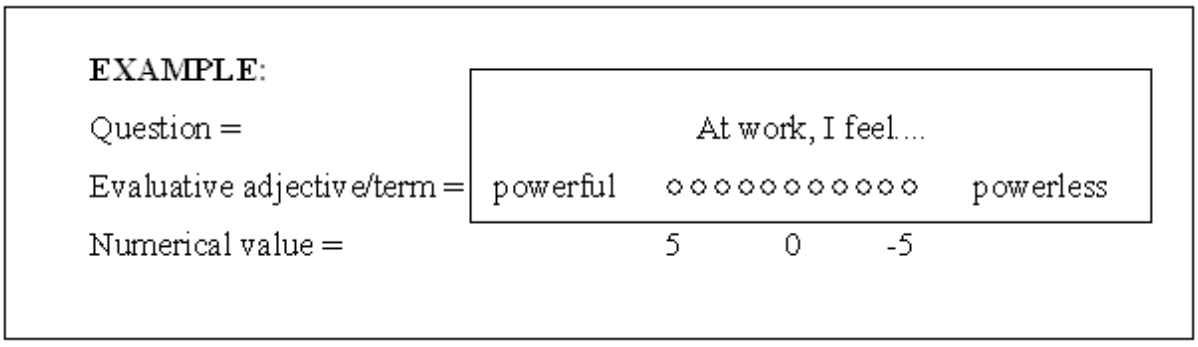

Figure 6: Example of a Semantic Differential Question.

The word pairs used in the survey for power perceptions were based on French and Raven's power bases[28, 75, 79, 89, 105], and word pairs for CPOE attitudes were based on terms found in descriptions of CPOE qualities and characteristics. The opposites of the words chosen as

descriptive of CPOE and the power bases were identified as antonyms from Roget's Thesaurus[71]. The readability of the words used in the survey score were set at approximately a 10th grade level using the Dale-Chall Word List for readability of words[166].

As an example of how a word pair was selected, I will use informational power. The French and Raven concept for informational power means the power agent shares information or reasoning for a change so that the receiving agent can then make a decision[93]. "The imparting or interchange of thoughts, opinions, or information by speech, writing, or signs" is the definition of "communication". So because of the similarity of the definitions, one aspect of informational power is communication. Using a thesaurus, the antonym or opposite of communication is "secret". So, a word pair selected to represent informational power is "Secrets (-) and Communication (+)".

The SDPP instrument uses the same methodology for gathering data on CPOE attitudes. Thirty word pairs representing CPOE attitudes were placed under the following questions:

"Computerized Physician Order Entry (CPOE) is...."

"CPOE information is...."

"What CPOE does...."

In addition, it gathered information on individual characteristic information, which included gender, age, position, education, employment status, patient unit specialty, previous experience with CPOE, and patient unit structure. Because it was necessary to pilot the method of distribution of the surveys via email, it was an opportunity to also ensure the reliability and validity of the SDPP instrument by performing a measurement study from the resulting pilot data[162].

6.2.1 MEASUREMENT STUDY

The measurement study was conducted at a university medical center on four patient units. The units were selected based on the diversity of the medical environments (Rehabilitation Medicine, Orthopedics, and Cardiology). The Unit Directors gave permission to approach their staff for the study, but did not encourage or discourage participation. All resident physicians, nurses, and HUCs (a total of 96 possible subjects) on those units were recruited to participate in the pilot study. They were recruited by posting sign-up sheets in various areas around the patient

unit (e.g. break room, kitchen, nurse's station) asking them to provide their email address if they were willing to participate.

Each subject received and email containing a URL link to two web-based surveys. The surveys were the SDPP survey and the validated Sources of Power (SOP) Audit developed by Slevin and Velthouse[104] (see Appendix B). The SOP Audit was used to establish criterion-validity for the SDPP. This survey was selected even though it focuses on perceptions of why subjects think <u>others</u> comply with their influence, not what the individual perceives their own power to be. Because the SOP Audit is not strictly superior/subordinate based and deals with the same six power bases, it was considered an acceptable instrument to use to measure criterion-validity for the SDPP survey. The total time to take both surveys online was approximately 10 - 15 minutes and could be done from any computer from which the subject could access the World Wide Web. All subjects who participated received a $5 gift card.

Reliability is the degree to which a measurement is consistent or reproducible[167]. For the SDPP instrument, it was necessary to determine that the word pairs used to represent each power base did indeed measure the same power base. For example, if a subject scored very negatively for one word pair representing expert power, they should also score very negatively for the other word pairs representing expert power. Reliability for each group of word pairs was computed using Cronbach's Alpha using SPSS 14.0[168], and based on commonly accepted practice, 0.70 was used as the acceptable threshold of these reliability scores[167].

Validity is the degree to which the factor that the researcher wants to study is actually what is being measured[167]. In addition, it was necessary to know that each group of word pairs was measuring the same power base. Correlating the score for each power base from the SDPP with the score for each power base from the SOP Audit was how the validity was determined. For example, if a person had an overall high score for referent power in the SDPP survey, one would expect that they would have a high score for referent power in the SOP Audit. Using SPSS 14.0[168] once again, Pearson correlations between the scores of the two instruments were calculated. A value greater than 0.40 was determined to be an acceptable, but low correlation strength[167], a strength between 0.50 and 0.69 was considered moderate, between 0.70 and 0.89 was considered strong, and between 0.90 and 1.00 was considered very strong[169].

Faculty and clinicians provided content or "face" validity of the instrument by examining the word pairs prior to administration in the pilot study. Pilot subjects were also asked for their

feedback on the word pairs. To ensure that all subjects would understand the words used, faculty suggested that the words chosen should be at the level of understanding of the HUC. Clinicians provided input as to what their perceptions of the word pairs represented and adjustments were made until a mutual understanding of what the word pairs represented was achieved between me and the clinicians. Feedback was received from only one pilot participant, who stated that the instrument was easy to follow.

Of the 96 possible subjects, 19 completed the SDPP survey (response rate = 20%). Of those 19, only 13 completed both the SDPP and SOP Audit, because six subjects closed their web browser after completing the SDPP survey and before they completed the SOP Audit. Because these subjects did not complete the validity testing, their results could only be included in the reliability testing. Reliability was calculated on all 19 of the subjects, and validity was calculated on the 13 that completed both the SDPP and SOP Audit.

Because it is necessary to have reliability before one can have validity[167], calculations of reliability for the 19 subjects were performed on all of the 26 original word pairs used in the SDPP survey. In order to achieve optimum reliability, word pairs that did not contribute positively to the reliability of the power base to which they were assigned were removed from the survey. In one case, a word pair's assignment was changed from one power base to another rather than just removed. The original word pairs used to represent each power base and those that were removed are shown in Table 7. None of the individual words used in the word pairs were changed as this would require re-piloting the instrument. Once the unreliable word pairs were removed, all the power bases achieved an acceptable reliability value with a range of 0.76 – 0.89.

Table 7: Word pairs that reliably identify each power base and word pairs that were removed to improve reliability.

	Word Pairs (The word representing the negative extreme is on the left and the word representing the positive extreme is on the right)	
	Reliable (Used)	**Removed (Not used)**
Informational	Secrets/Communication Arguments/Discussions	Rules/Ideas

	Word Pairs (The word representing the negative extreme is on the left and the word representing the positive extreme is on the right)	
	Reliable (Used)	**Removed (Not used)**
	Ignored/Asked	
Expert	Inexperience/Experience No Education/Education Ignorance/Knowledge A student/A teacher	Self doubt/Confidence
Referent	Dishonesty/Honesty No say/Influence Resistance/Cooperation Looked down on /Respected Criticized/Complimented	Conflict/Agreement A follower/A leader
Legitimate	No authority/Authority Disorder/Goals Supervised/In control Restricted/Permitted*	Dependent/Independent Obedient/In charge
Reward/Coercive	Nowhere to go/Opportunities Uncertainty/Security Punished/Rewarded Discouraged/Encouraged	Restricted/Permitted*

*** Moved this word pair from the Reward/Coercive Power Base to the Legitimate Power Base to improve the reliability of the Legitimate Power Base.**

The method for selecting the reliable word pairs was done by first calculating the reliability for all of the original word pairs for each power base. For those power bases whose reliability was not greater than 0.70 (Informational, Referent, and Legitimate), one word pair at a time was removed and the reliability was re-calculated. Cronbach's Alpha was calculated for all combinations of the word pairs to determine which subset of word pairs provided the highest reliability.

In this process, it was discovered that the word pair "Restricted/Permitted" used to represent Reward/Coercive actually represented the Legitimate power base better. Moving the word pair from Reward/Coercive did not cause that power base's reliability to drop below the acceptable level and greatly improved the reliability of the Legitimate power base. Cronbach's alpha using the original word pairs and then after removing the unreliable word pairs is shown in Table 8. Once the "reliable" word pairs were determined, all the power bases achieved an acceptable reliability value (range of 0.76 – 0.89).

Table 8: Cronbach's alpha calculations for reliability of the Semantic Differential Power Perception (SDPP) Survey.

Reliability of the SDPP Survey (n = 19)			
		Original	**Reliable**
Informational	**# of Word Pairs**	4	3
	Cronbach's Alpha	0.62	0.78
Expert	**# of Word Pairs**	5	4
	Cronbach's Alpha	0.89	0.89*
Referent	**# of Word Pairs**	7	5
	Cronbach's Alpha	0.68	0.89
Legitimate	**# of Word Pairs**	5	4
	Cronbach's Alpha	0.50	0.76
Reward/Coercive	**# of Word Pairs**	5	4
	Cronbach's Alpha	0.85	0.77**

***Even though reliability remained the same for the Expert Power Base, one word pair was dropped to improve the validity.**

**** Moved a word pair from the Reward/Coercive Power Base to the Legitimate Power Base to improve the reliability of the Legitimate Power Base even though it decreased the reliability and validity of Reward/Coercive. However, Reward/Coercive remained above the acceptable threshold for both reliability and validity.**

For criterion validity, the scores for each group of word pairs representing a power base in the SDPP survey were correlated with the score of that same power base from the Sources of Power Audit using SPSS 14.0[168]. Validity was acceptable (correlation threshold greater than

0.40) for all the power bases using the original word pairs (range of 0.63 – 0.81, moderate to strong correlation). However, since some of the word pairs had been removed to achieve reliability, correlations were then re-calculated using only the word pairs that represented an acceptable reliability. Validity for all power bases remained acceptable (range of 0.51 – 0.81, moderate to strong correlation). The Pearson correlation value for each power base and the strength of those correlations between the SDPP survey and the SOP Audit are shown in Table 9.

Table 9: Pearson correlation for validity between the Semantic Differential Power Perception (SDPP) Survey and the Sources of Power (SOP) Audit.

Validity of the SDPP Survey (n = 13)			
		Original	**Reliable**
Informational	**# of Word Pairs**	4	3
	Pearson Correlation	0.79	0.57
	Correlation Strength	Strong	Moderate
Expert	**# of Word Pairs**	5	4
	Pearson Correlation	0.66	0.68
	Correlation Strength	Moderate	Moderate
Referent	**# of Word Pairs**	7	5
	Pearson Correlation	0.72	0.74
	Correlation Strength	Strong	Strong
Legitimate	**# of Word Pairs**	5	4
	Pearson Correlation	0.63	0.81
	Correlation Strength	Moderate	Strong
Reward/Coercive	**# of Word Pairs**	5	4
	Pearson Correlation	0.81	0.51*
	Correlation Strength	Strong	Moderate

*** Moved a word pair from the Reward/Coercive Power Base to the Legitimate Power Base to improve the reliability of the Legitimate Power Base even though it decreased the reliability and validity of Reward/Coercive. However, Reward/Coercive remained above the acceptable threshold for both reliability and validity.**

The previous results examined the reliability and validity of the survey in relation to the six power bases. Looking at power perception overall, the SDPP survey showed a strong reliability and validity ($r = .854$, $p<.001$, and $\alpha = .937$) and for CPOE attitudes, it showed a strong reliability ($\alpha = .940$). Reliability of the instrument in the study itself shows power perceptions at $\alpha = .901$, and CPOE attitudes $\alpha = .965$.

6.3 SETTINGS

The settings for the study were two mid-western hospitals that were scheduled to implement CPOE in the spring of 2007. The hospitals varied as shown in Table 10.

Table 10: Participating hospital characteristics.

	Community Hospital,	**Pediatric Hospital**
Location	Minnesota	Nebraska
Hospital Type	Community	Pediatric
Number of Beds	500	144
System Implemented	Epic	Eclipsis
Implementation Strategy	Big Bang (everything at once)	Phased-In (done in stages)
Resident physicians	No	Yes
Implementation date	May, 2007	May, 2007 – Nov 2008
Number of Attending MD's	1053	600
Number of Nurses	1239	285
Number of Health Unit Coordinators	131	14
Number of hospital staff that received initial email contact regarding study	1661	1140

The hospitals did not have any previous type of EHR functionality in place prior to the implementation noted above. They were both implementing CPOE as part of the initial EHR system.

6.4 SUBJECTS

Subjects included those health workers directly involved with the use of CPOE and those that were indirectly involved with the outcomes from CPOE. Those directly involved included Health Unit Coordinators (HUCs), sometimes also called Unit Clerks or Secretaries, Nurses, Attending Physicians, and Physician Extenders, which include Nurse Practitioners and Physician Assistants. The group indirectly involved was identified as "Other" and includes Certified Nursing Assistants, a Social Worker , a Chaplain, Medical Coders, Medical Records Clerks, Admitting Clerks, an Administrator, Quality Management Director, Operations Manager, Pre-Certification Clerk, a Receptionist, Health Information Assistants, Account Specialists, a Scheduler, and a psychology fellow.

Physician extenders were not mentioned in the original plan, but a few did respond to the recruitment email and are clinicians that also interact with the CPOE system. Resident physicians are not subjects for this study because of the likelihood of their unavailability for the six month post-implementation administration of the survey. The pediatric hospital specifically asked that their residents be included in the pre and post implementation survey, but only two residents responded both pre and post implementation. Therefore, they were not included in the analysis and discussion of the results.

The racial, gender and ethnic characteristics of the proposed subject population reflects the demographics of the population of the participating hospitals. There was no exclusion criteria based on race, ethnicity, gender, or age.

6.5 PROCEDURE

I contacted the Chief Information Officer (CIO)/Chief Medical Information Officer (CMIO) at each participating hospital and requested a letter stating that they know what the research is, that they know what is expected of their staff, and that they are permitting their staff to participate. IRB approval was also required at the pediatric hospital and my collaborator at that hospital completed the IRB forms and was listed as a co-principle investigator at their site and at ours.

One month pre-implementation, the subjects received a recruitment email containing electronic access to the consent information and survey (see Appendix C). The recruitment email was sent from a representative at the hospital so that the subjects would not think that the email was spam. The hospital had no idea who responded to the survey, but the email address of subjects who participated was sent to me so that the subjects could be contacted for the post-implementation survey.

Upon clicking on the link to the survey in the email, the subject was presented with the consent information (see Appendix D). After reading the consent information, the subject could select either "I agree to participate in this research study" in which case they were taken to the 23 item SDPP survey and entered into a drawing for a $50 cash gift card. Or they could select "I do NOT want to participate in this research study", the form would close and no record of the subject was recorded anywhere. The $50 cash gift card drawing was held at each hospital participating in the research study at the completion of the pre-implementation data collection at their hospital. The survey could only be completed once by each subject and took approximately 10 minutes to complete.

Six months post implementation of CPOE, the subjects who completed the SDPP survey pre-implementation were contacted again by the principal investigator via email to take the post-implementation SDPP survey (see Appendix E). Post-implementation, the SDPP survey will not collect patient unit information, demographic information or history information again (see Appendix F). The time to complete the limited, post-implementation SDPP survey was estimated at 5 minutes. Another drawing for a $50 cash gift card was held at each participating healthcare organization.

The email address of those subjects that select "I agree to participate in this research study" were assigned an ID number which was recorded as an identifier for their submitted

survey. Only I had access to the completed survey information and identification of the subjects, which means that no one at the subject's healthcare organization had access to any identifiable information. All records related to the subject's involvement in this research study were stored in a locked file cabinet. The subject's identity on these records was indicated by an ID number rather than by a name or email address, and the information linking these case numbers with the subject's identity was kept in a locked file cabinet separate from the research records. The subjects were not and will not be identified by name or email address in any publication of the research results.

7.0 RESULTS

A total of 2801 pre-implementation emails were sent between the two hospitals (1661 from the community hospital and 1140 from the pediatric hospital). I received 257 responses from the community hospital and 416 responses from the pediatric hospital. Ten responses were not identified by hospital, but were associated with a hospital during the post-implementation emailing for a total of 683 (24.4% response rate) pre-implementation responses. Those 683 subjects were contacted for the post-implementation survey from which I received 276 responses (40% response rate). Due to delays in implementation, data from the pediatric hospital was only collected from those units that were using CPOE, which happened to be only ICUs. Therefore, I collected data from only approximately 25% of the total pre-implementation subjects from the pediatric hospital. Once the hospital is completely implemented, I will collect data from the remaining subjects six months post-implementation (estimated to be March 2009).

Data was analyzed using SPSS© v. 15 and Microsoft Excel© v. 2003. Detailed frequency information and related histograms on the demographics and personal characteristics are presented in Appendix G. A summary of the frequency information is contained in Table 11.

Table 11: Summary of frequency values of characteristic variables.

Category	**Sub-Category**	**Community Hospital**	**Pediatric Hospital**	**Total**
Subjects		178 (65.5%)	98 (35.5%)	276 (100%)
Gender	**Female**	153 (86%)	90 (92%)	243 (88%)
	Male	25 (14%)	8 (8%)	33 (12%)
Age	**25 years or less**	8 (4%)	13 (13%)	21 (8%)
	26-25 years	40 (22%)	38 (40%)	78 (28%)
	36-45 years	43 (24%)	23 (23%)	66 (24%)

Category	Sub-Category	Community Hospital	Pediatric Hospital	Total
	46-55 years	58 (33%)	17 (17%)	75 (27%)
	56-65 years	27 (15%)	7 (7%)	34 (12%)
	>65 years	2 (1%)	0 (0%)	2 (1%)
Position	**HUC**	14 (8%)	10 (10%)	24 (9%)
	Nurse* Pre	115 (65%)	61 (62%)	176 (64%)
	Post	115 (65%)	63 (64%)	178 (65%)
	Attending MD	27 (15%)	15 (15%)	42 (15%)
	Physician Extender	5 (3%)	1 (1%)	6 (2%)
	Other* Pre	17 (10%)	11 (11%)	28 (10%)
	Post	17 (10%)	9 (9%)	26 (9%)
Length in Position	**< 1 year**	14 (8%)	9 (9%	23 (8%)
	1-3 years	29 (16%)	26 (27%)	55 (20%)
	4-6 years	32 (18%)	28 (28%)	60 (22%)
	7-10 years	23 (13%)	16 (16%)	39 (14%)
	11-15 years	23 (13%)	7 (7%)	30 (11%)
	16-20 years	17 (10%)	7 (7%)	24 (9%)
	>20 years	40 (22%)	5 (5%)	45 (16%)
Level of Education	**High School Diploma**	6 (3%)	3 (3%)	9 (3%)
	Vocational Diploma	4 (2%)	2 (2%)	6 (2%)
	1-2 years college	23 (13%)	15 (15%)	38 (14%)
	3 or > years college	41 (23%)	13 (13%)	54 (20%)
	Bachelor's Degree	61 (34%)	41 (42%)	102 (37%)
	3 or > years Graduate	2 (1%)	2 (2%)	4 (1%)
	Master's Degree	17 (10%)	7 (7%)	24 (9%)
	Doctorate Degree	24 (13%)	15 (15%)	39 (14%)
Employment Status	**Employed by Hospital**	162 (91%)	92 (94%)	254 (92%)
	Independent Practitioner	16 (9%)	6 (6%)	22 (8%)

Category	Sub-Category	Community Hospital	Pediatric Hospital	Total
Patient Unit Type	**ICU * Pre**	38 (21%)	77 (79%)	115 (42%)
	Post	38 (21%)	77 (79%)	115 (42%)
	Non-ICU * Pre	107(60%)	0 (0%)	107 (39%)
	Post	99 (56%)	3 (3%)	102 (37%)
	Not on patient unit *			
	Pre	33 (19%)	21 (21%)	54 (20%)
	Post	41 (23%)	18 (18%)	59 (21%)
Unit Structure	**Team* Pre**	108 (61%)	63 (64%)	171 (62%)
	Post	111 (62%)	66 (67%)	177 (64%)
	Hierarchy* Pre	37 (21%)	17 (17%)	54 (20%)
	Post	41 (23%)	19 (19%)	60 (22%)
	Not on patient unit*			
	Pre	33 (19%)	18 (18%)	51 (18%)
	Post	26 (15%)	13 (13%)	39 (14%)
Prior EHR Experience	**Yes**	81 (46%)	68 (69%)	149 (54%)
	No	97 (54%)	30 (31%)	127 (46%)

*** Values changed from Pre-Implementation to Post-Implementation.**

The SDPP survey was constructed so that if you indicated that you do not work on a patient unit, you would not be taken to the questions asking about patient unit type and patient unit structure. On the post-implementation SDPP survey, they were given the opportunity to change their patient unit type and unit structure only if they indicated that they had changed patient units since the pre-implementation survey. Therefore, from pre- to post- implementation the numbers are slightly different regarding patient unit type and patient unit structure.

7.1 STAFFING RATIOS OF THE HOSPITALS

As mentioned, the community hospital is larger than the pediatric hospital not only in bed size (almost four times as many beds), but also in staffing. For comparison, the hospitals were only able to provide staffing data regarding the number of HUCs, Nurses and Attending MDs with admitting privileges. The pediatric hospital also has a unique role called a Child Care Partner (CCP). Because the CCP functions in a role similar to a cross between an LPN and a HUC, they were included in the count for HUCs. The pediatric hospital has 600 physicians with privileges, but only about 30% of those physicians actively admit to the hospital. Based on those staffing numbers, the community hospital has twice as many HUCs as the pediatric, five times as many nurses and twice as many physicians.

Since the pediatric hospital has such a critical shortage of nurses compared to the community hospital, they experienced delays in their phased-in implementation mainly due to the inability of nursing staff super-users to adequately divide their time between implementation tasks and providing nursing care. The community hospital expressed no delays in their implementation.

As mentioned before, no more comparisons between hospitals will be done until the pediatric hospital has completed their implementation and data collection is completed. In work to follow this dissertation, additional data will be collected and all data will be aggregated into one group and analyzed predominately by position and by hospital.

7.2 ANALYSIS OF HYPOTHESIS 1

Hypothesis 1: Introduction of computerized physician order entry (CPOE) affects a clinician's perception of her/his personal power within the healthcare environment. Different types of clinicians will experience different directions of change, and individuals' characteristics and experience will influence their baseline perceptions and attitudes.

7.2.1 Influencing Factors Prior to CPOE Implementation

To determine what characteristic variables might influence power perceptions and CPOE attitudes prior to CPOE implementation, statistical analysis was done between characteristic variables and pre-implementation scores for power perception scores and CPOE attitudes. Characteristic and experience data included gender, age, position, length of time in their position, education level, employment status (employed by hospital or independent practitioner), type of patient unit (ICU, non-ICU, or not on patient unit), patient unit structure (team, hierarchical, or not on patient unit) and previous experience with EHR.

Pearson correlations were performed on the dichotomous, nominal variables of gender, employment status, and previous EHR experience (see Tables 12 and 13) to determine if there are any significant relationships. Data was analyzed by position for comparison.

Table 12: Pearson correlation and significance of pre-implementation power perception scores and dichotomous, nominal variables.

		HUC (n=24)	***Nurse (n=176)***	***Physician (n=42)***	***Physician Extender (n=6)***	***Other (n=28)***
Gender	Correlation	-.353	-.147	.144	-.202	.151
	Significance	.091	.051	.364	.792	.444
Employment Status	Correlation	**	.085	.043	.444	-.162
	Significance	**	.262	.785	.377	.411
Previous Experience with EHR	Correlation	-.182	.013	-.005	**	-.267
	Significance	.394	.860	975	**	.170

***Values are considered significant if p <=.05 (two-tailed)**

****One of the variables is constant**

Table 13: Pearson correlation and significance of pre-implementation CPOE attitude scores and dichotomous, nominal variables.

		HUC (n=24)	***Nurse (n=176)***	***Physician (n=42)***	***Physician Extender (n=6)***	***Other (n=28)***
Gender	Correlation	-.155	.026	.148	.296	.194
	Significance	.468	.735	.351	.569	.321
Employment Status	Correlation	**	-.057	-.115	.034	-.028
	Significance	**	.451	.470	.949	.887
Previous Experience with EHR	Correlation	.033	.029	-.159	**	-.248
	Significance	.877	.699	.315	**	.204

***Values are considered significant if p <=.05 (two-tailed)**

****One of the variables is constant**

As can be seen in Tables 12 and 13, the variables of gender, employment status, and previous experience had no significant relationship with power perceptions or CPOE attitudes pre-implementation for any position.

Because age, length of time in the position, and education were spread over such a wide range, they were placed in literal, ranked categories of ranges to make them ordinal data. Spearman correlations were performed on these variables (see Tables 14 and 15). Data was analyzed by position for comparison.

Table 14: Spearman correlation and significance of pre-implementation power perception scores and ordinal variables.

		HUC (n=24)	***Nurse (n=176)***	***Physician (n=42)***	***Physician Extender (n=6)***	***Other (n=28)***
Age	Correlation	.107	.096	.226	.062	.138
	Significance	.620	.207	.150	.908	.483
Length of time in position	Correlation	.078	-.020	**.333***	.000	-.150
	Significance	.717	.795	**.031***	1.000	.447

		HUC (n=24)	***Nurse (n=176)***	***Physician (n=42)***	***Physician Extender (n=6)***	***Other (n=28)***
Education	Correlation	-.282	.108	.048	-.131	-.074
	Significance	.182	.156	.764	.805	.708

***Values are considered significant if p <=.05 (two-tailed)**

Table 15: Spearman correlation and significance of pre-implementation CPOE attitude scores and ordinal variables.

		HUC (n=24)	***Nurse (n=176)***	***Physician (n=42)***	***Physician Extender (n=6)***	***Other (n=28)***
Age	Correlation	.238	**.155***	.032	-.309	.236
	Significance	.263	**.040***	.841	.552	.226
Length of time in position	Correlation	.194	-.057	.135	-794	-.268
	Significance	.365	.449	.393	.059	.168
Education	Correlation	.087	-.005	.112	.655	.216
	Significance	.686	.944	.481	.158	.270

***Values are considered significant if p <=.05 (two-tailed)**

The Spearman correlations in Tables 13 and 14 show the only significant correlation with power perceptions is with the length of time that physicians have been in their position (r = .333, p<.05), and the only significant correlation with CPOE attitudes is with age for nurses (r = .155, p<.05). To test these relationships, a One-way ANOVA was run (see Table 16).

Table 16: One-way ANOVA testing significant Spearman correlations.

		HUC (n=24)	***Nurse (n=176)***	***Physician (n=42)***	***Physician Extender (n=6)***	***Other (n=28)***
Age with CPOE attitudes	F	.615	1.616	.603	.111	.567
	Significance	.690	.158	.617	.899	.689
Length of time in	F	1.780	.331	.592	.904	1.107

		HUC (n=24)	***Nurse (n=176)***	***Physician (n=42)***	***Physician Extender (n=6)***	***Other (n=28)***
position with power perceptions	Significance	.168	.920	.735	.563	.337

Comparing the means using a One-way ANOVA shows that there is no significant relationship between age and CPOE attitudes, or length of time in their position and power perceptions.

Nominal variables with more than two categories (position, patient unit type, and unit structure) were analyzed using a One-way ANOVA (see Tables 17 and 18). Data was analyzed by position for comparison.

Table 17: One-way ANOVA and significance of pre-implementation power perceptions scores and nominal variables with multiple categories.

		HUC (n=24)	***Nurse (n=176)***	***Physician (n=42)***	***Physician Extender (n=6)***	***Other (n=28)***
Patient Unit Type	F	1.320	1.190	.373	2.458	.004
	Significance	.288	.307	.691	.233	.952
Unit Structure	F	1.648	**9.868***	.162	.618	.081
	Significance	.216	**.000***	.851	.596	.922

***Values are considered significant if p <=.05 (two-tailed)**

Table 18: One-way ANOVA and significance of pre-implementation CPOE attitude scores and nominal variables with multiple categories.

		HUC (n=24)	***Nurse (n=176)***	***Physician (n=42)***	***Physician Extender (n=6)***	***Other (n=28)***
Patient Unit Type	F	.163	**5.905***	.431	2.398	.003
	Significance	.850	**.003***	.653	.239	.953
Unit Structure	F	.077	.561	2.425	3.417	.094

		HUC (n=24)	*Nurse (n=176)*	*Physician (n=42)*	*Physician Extender (n=6)*	*Other (n=28)*
	Significance	.926	.572	.102	.1168	.911

***Values are considered significant if p <=.05 (two-tailed)**

The ANOVA's show that the only significant relationships are for nurses. They show a significant relationship between power perceptions and Unit Structure ($F = 9.868$, $p<.001$) and a significant relationship between CPOE attitudes and Patient Unit Type ($F = 5.905$, $p <.005$).

Because a characteristic may not have an effect by itself, but can have an effect when combined with other characteristics, a multiple regression was run to determine if these factors when combined produced a larger effect (see Tables19 and 20) on power perceptions and CPOE attitudes.

Table 19: Linear Regression Model Summary of pre-implementation power perceptions and characteristic variables.

Dependent variable = Power perceptions	**R^2**	**F**	**Significance**
Predictors = Gender, Age, Position, Length of time in this position, Education level, Employment status, Pt unit type, Unit structure, Previous EHR experience	.083	2.675	.005*

***Values are considered significant if p <=.05 (two-tailed)**

Table 20: Regression Coefficients for Power Perceptions.

Dependent Variable: Overall Power Ave	**Unstandardized Coefficients**		**Standardized Coefficients**			**95% Confidence Interval for B**	
	B	**Std. Error**	**Beta**	**t**	**Sig.**	**B**	**Std. Error**
(Constant)	1.502	0.570		2.633	0.009	0.379	2.625
Gender	-0.335	0.302	-0.074	-1.109	0.268	-0.930	0.260
Age	0.201	0.094	0.162	2.148	**0.033**	0.017	0.385
Position	0.167	0.120	0.097	1.385	0.167	-0.070	0.404
Length in Position	-0.078	0.058	-0.101	-1.348	0.179	-0.191	0.036
Education	0.066	0.049	0.096	1.352	0.178	-0.030	0.163
Employ Status	0.347	0.374	0.064	0.928	0.354	-0.389	1.083
Patient Unit Type	0.332	0.164	0.169	2.023	**0.044**	0.009	0.655
Unit Structure	-0.506	0.153	-0.270	-3.304	**0.001**	-0.808	-0.204
Previous Experience	-0.132	0.195	-0.045	-0.677	0.499	-0.515	0.252

Table 21: Linear Regression Model Summary of pre-implementation CPOE attitudes and characteristics variables.

Dependent variable = CPOE attitudes	R^2	F	Significance
Predictors = Gender, Age, Position, Length of time in this position, Education level, Employment status, Pt unit type, Unit structure, Previous EHR experience	.088	2.843	.003*

***Values are considered significant if p <=.05 (two-tailed)**

Table 22: Regression Coefficients for CPOE Attitudes.

Dependent Variable: Overall CPOE Ave	Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
	B	Std. Error	Beta	t	Sig.	B	Std. Error
(Constant)	2.498	0.586		4.266	0.000	1.345	3.651
Gender	0.215	0.310	0.046	0.692	0.490	-0.396	0.825
Age	0.262	0.096	0.205	2.721	**0.007**	0.072	0.451
Position	-0.222	0.124	-0.125	-1.799	0.073	-0.466	0.021
Length in Position	-0.138	0.059	-0.175	-2.332	**0.020**	-0.254	-0.021
Education	0.007	0.050	0.010	0.136	0.892	-0.092	0.106
Employment Status	-0.612	0.384	-0.109	-1.593	0.112	-1.367	0.144
Patient Unit Type	0.495	0.168	0.245	2.940	**0.004**	0.164	0.827
Unit Structure	-0.404	0.157	-0.210	-2.571	**0.011**	-0.714	-0.095
Previous Experience	-0.193	0.200	-0.064	-0.968	0.334	-0.587	0.200

Of these characteristics, the individual variables that were statistically significant for power perceptions were Age (t = 2.102, p = .036), and Unit Structure (t = -3.064, p= .002). With CPOE attitudes, the individual variables that were statistically significant were Age (t = 2.681, p=.008), Length of Time in the Position (t =-2.241, p = .026), Patient Unit (t = 2.726, p - .007), and Unit Structure (t=-2.185, p = .030).

7.2.2 Comparison of Means Pre-Implementation and Post-Implementation

A direct comparison between the overall pre-implementation scores for power perceptions and CPOE attitudes and the post-implementation scores was done to determine if the individual

subject's perception of power and CPOE attitudes increased, decreased or remained the same. Grouped by position, mean scores and individuals' results were analyzed. This was done to determine the overall direction and amount of change by position and for each individual. To determine if the difference in these mean scores is significant, paired t-tests were done (see Tables 23and 24.

Comparisons of the pre- and post-implementation means aggregated by all of the characteristic variables are shown in Appendix I. This includes the power bases, overall power perceptions and overall CPOE attitudes

Table 23: Mean Power Perception Scores and Paired t tests by Position.

Position	**Power Perceptions**				
	Pre-Implementation Mean	**Post-Implementation Mean**	**Mean Difference in Scores**	**Paired t-test**	**Significance**
Overall (n = 276)	2.23	1.50	- .73	11.415	.000*
Physician (n= 42)	2.72	1.78	- .94	5.497	.000*
Nurse (n=178)	2.13	1.45	- .70	9.365	.000*
HUC (n = 24)	1.88	1.07	- .82	2.577	.017*
Physician Extender (n = 6)	2.19	1.54	- .65	2.806	.038*
Other (n = 28)	2.46	1.84	- .60	2.928	.007*

***Values are considered significant if p <=.05 (two-tailed)**

Table 24: Mean CPOE Attitude Scores and Paired t tests by Position.

Position	**CPOE attitudes**				
	Pre-Implementation Mean	**Post-Implementation Mean**	**Mean Difference in Scores**	**Paired t-test**	**Significance**
Overall (n = 276)	1.85	1.57	- .27	3.217	.001*
Physician (n= 42)	1.50	1.02	- .48	2.416	.020*
Nurse (n=178)	1.94	1.64	- .31	2.948	.004*
HUC (n = 24)	2.06	1.84	- .06	0.637	.530
Physician Extender (n=6)	1.84	1.68	- .17	0.298	.778
Other (n = 28)	1.59	1.74	+ .11	-0.407	.687

***Values are considered significant if p <=.05 (two-tailed)**

The overall mean scores show a decrease in power perception and CPOE attitudes overall. By position, we see that all groups showed a significant decrease in power perception scores, physicians having the largest decrease. CPOE attitudes scores also decreased for all positions except for the Other group which actually showed an increase. The only significant difference in CPOE attitudes were found among Nurses and Physicians. Note that all subjects perceptions and attitudes began and ended within the positive end of the scoring scale (between 0 and +5). Because outliers can affect the mean values, box plots were created in SPSS© because it identifies the specific records that are considered outliers (see Appendix I). Comparing the mean difference for all subjects with the mean difference of subjects without the outliers is shown in Tables 25 and 26. Paired t-tests were calculated for the revised mean differences to determine significance of the differences in the means.

Table 25: Comparison of Mean Differences of Power Perceptions for All Subjects and Mean Differences with Outliers removed.

Position	Power Perception Differences			
	Mean Difference All Subjects	**Mean Difference without outliers**	**Paired t-test for without outliers**	**Significance for without outliers**
Overall	-.73 (n=276)	-.73 (n= 268)	13.60	**.000***
Physician	-.94 (n= 42)	-.87 (n= 41)	5.432	**.000***
Nurse	-.70 (n=178)	-.70 (n=174)	9.870	**.000***
HUC	-.82 (n=24)	-.48 (n=22)	2.090	**.049***
Physician Extender	-.65 (n=6)	-.65 (n= 6)	2.806	**.000***
Other	-.60 (n=28)	-.76 (n= 27)	4.774	**.000***

***Values are considered significant if p <=.05 (two-tailed)**

Table 26: Comparison of Mean Differences of CPOE Attitudes for All Subjects and Mean Differences with Outliers Removed.

Position	CPOE Attitudes Differences			
	Mean Difference All Subjects	**Mean Difference without outliers**	**Paired t-test for without outliers**	**Significance for without outliers**
Overall	-.27 (n=276)	-.23 (n=271)	2.893	**.004***
Physician	-.48 (n=42)	-.48 (n= 42)	2.241	**.020***
Nurse	-.31 (n=178)	-.21 (n=169)	2.241	**.026***
HUC	-.06 (n=24)	-.06 (n=24)	.637	.530
Physician Extender	-.17 (n=6)	-.17 (n=6)	.298	.778
Other	+.11 (n=28)	+.41 (n=26)	-1.489	.149

***Values are considered significant if p <=.05 (two-tailed)**

With removal of the outliers, the same scores remained significant, but their values became slightly less negative with the exception of the Other group. Their power perception decreased further but their CPOE attitude increased.

Prior testing of power perceptions and CPOE attitudes shows that there was no significant relationship with previous experience with an EHR. Because the type of previous experience with an EHR or CPOE may impact power perceptions and especially attitudes toward CPOE, comparisons of means between subjects with positive and negative experiences were done (see Table 27).

Table 27: Comparison of Means of Past Negative and Positive EHR Experiences.

	Previous Negative Experience mean difference (n= 11)		**Previous Positive Experience mean difference (n= 138)**	
	Mean Difference	**Paired t-test (Significance)**	**Mean Difference**	**Paired t-test (Significance)**
Overall Power Perception	-.46	1.95 (p=.80)	-.81	9.65 (p =.000)*
Overall CPOE attitude	+.07	-.24 (p= .82)	-.41	3.50 (p= .001)*

***Values are considered significant if p <=.05 (two-tailed)**

The decrease in power perceptions for those with a positive experience was larger than those with a negative experience. The change in CPOE attitudes was positive for those with a prior negative experience and negative for those with a prior positive experience. With such a small negative experience group, it would be very unlikely to show any statistical significance, as did the much larger positive experience group.

7.2.3 Comparison of Individuals Grouped by Position

Because each group will be comprised of individuals who may have an increase in a factor while others exhibit a decrease, the direction of change of scores from pre-implementation to post-implementation for each individual in the study was reviewed. Subjects were sorted by position and then sorted again by whether their power perception and CPOE attitude scores increased or decreased after the implementation of CPOE. Then, the percentage of subjects whose scores increased and decreased for each position was calculated (see Table 28).

Table 28: Increases and Decreases of Power Perceptions and CPOE attitudes By Individuals.

Subjects by Position	**Power Perceptions**		**CPOE Attitudes**	
	Increased	**Decreased**	**Increased**	**Decreased**
Overall (n = 276)	**53 (19.2%)**	**223 (80.8%)**	**120 (43.5%)**	**156 (56.5%)**
Physician (n= 42)	7 (16.7%)	35 (83.3%)	19 (45.2%)	23 (54.8%)
Nurse (n=178)	35 (19.7%)	143 (80.3%)	72 (40.4%)	106 (59.6%)
Health Unit Coordinator (n = 24)	5 (20.8%)	19 (79.2%)	12 (50%)	12 (50%)
Physician Extender (n = 6)	0 (0%)	6 (100%)	3 (50%)	3 (50%)
Other (n = 26)	6 (23.1%)	20 (76.9%)	14 (53.8%)	12 (46.2%)

I found that overall 80% of all subjects experienced a negative change in their power perceptions after CPOE was implemented. Sorting by position, a range of 77- 100% of the subjects, in all groups, experienced a decrease in their power score. Slightly over half of all

subjects experienced a negative change in their CPOE attitudes, with the split being very close to 50% within each position.

Figures 7 through 10 show histograms of the percentage data shown in Table 24 and scatter plots showing individuals' differences. Histograms and scatter plots are sorted by position. Just to note, for all scatter plots, the x axis has no significance other than expanding the data away from a straight line so that it is easier to view the individual data points.

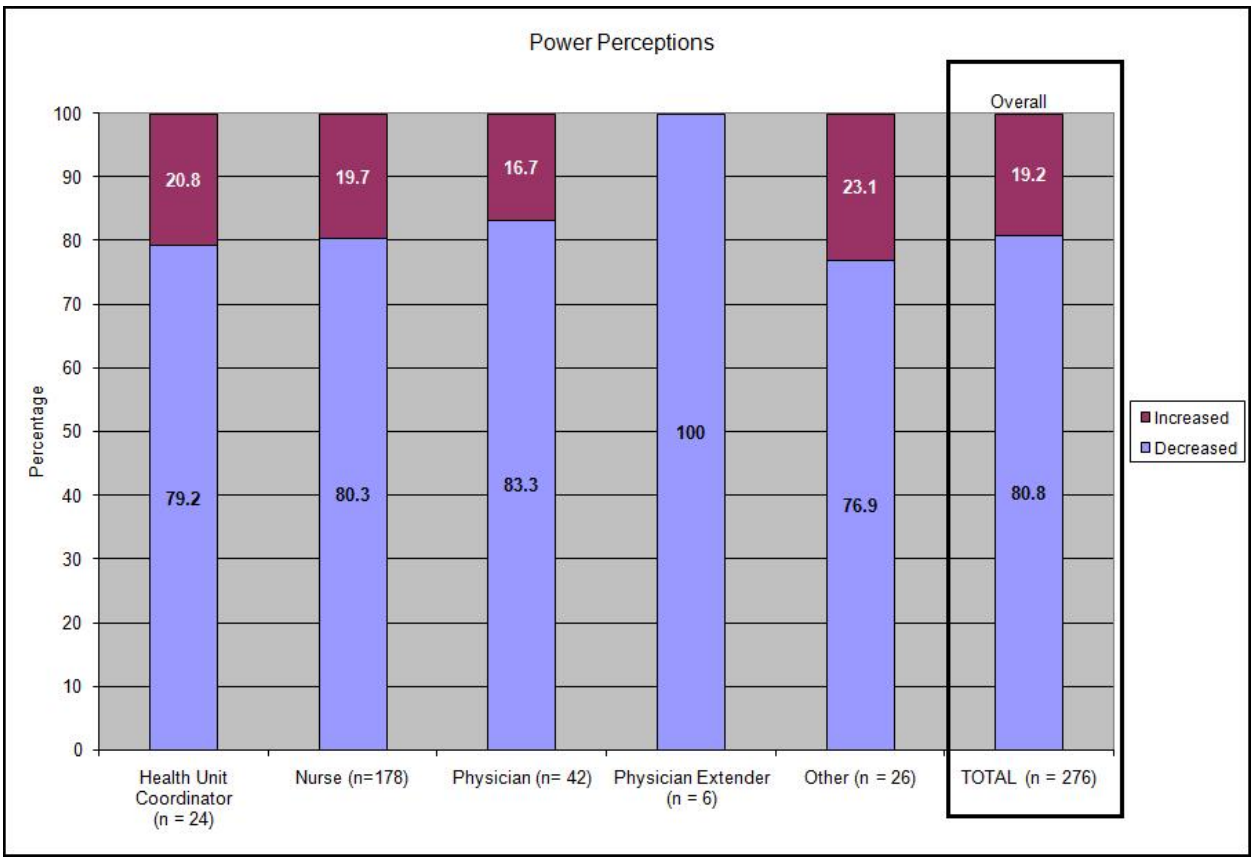

Figure 7: Histogram of Power Perception Data from Individual Subjects Grouped by Position.

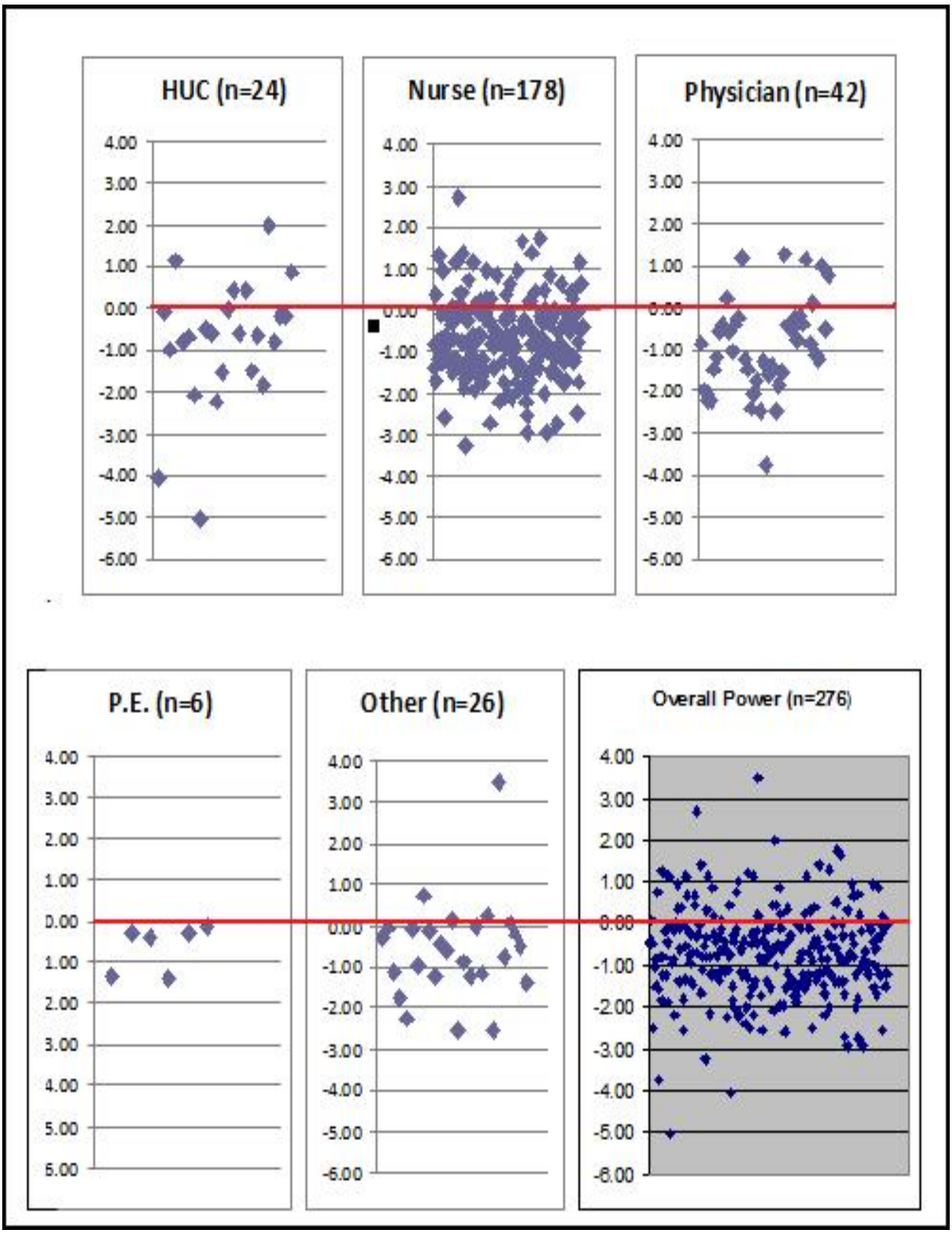

Figure 8: Power perception scatter plots of individual subjects grouped by position.

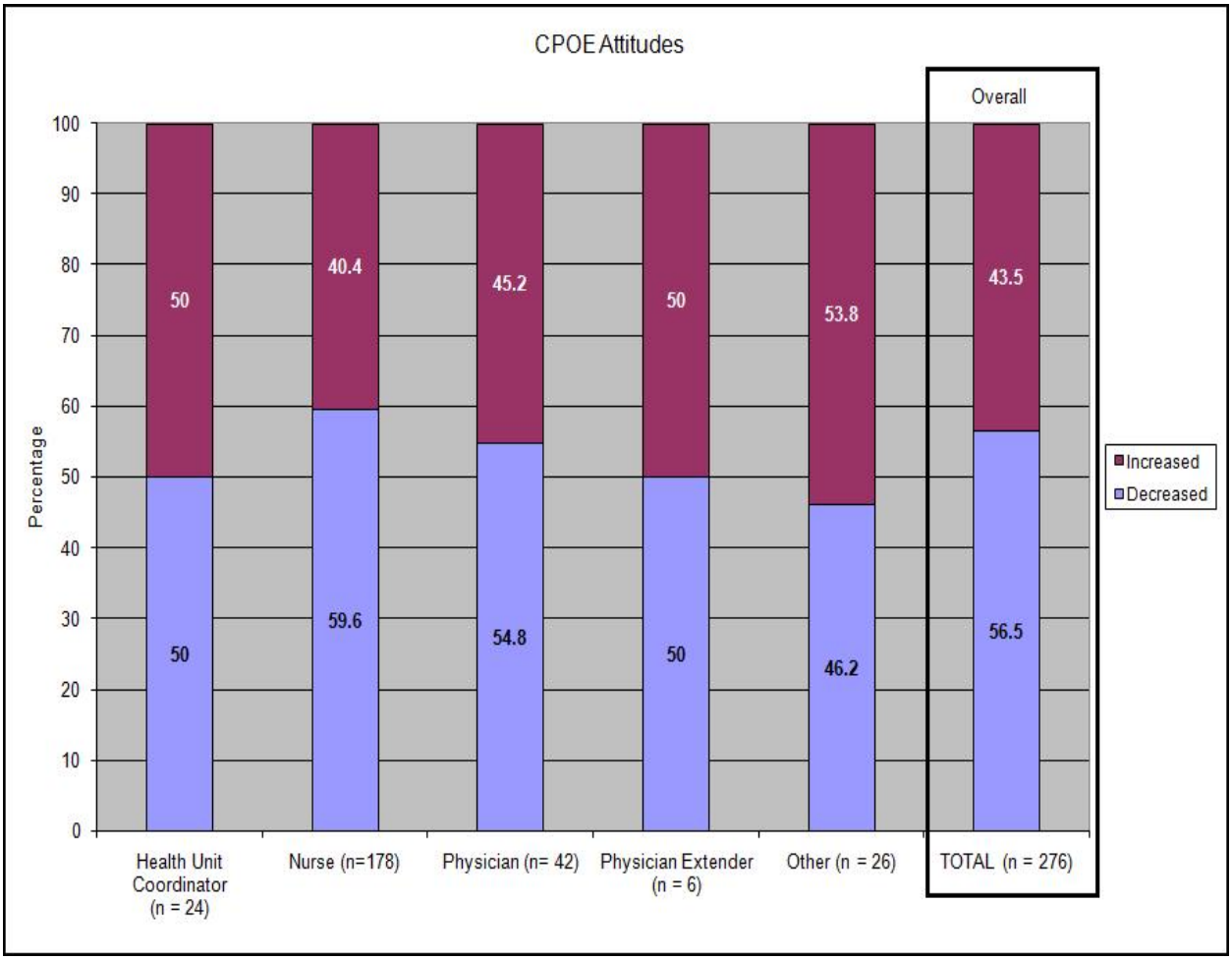

Figure 9: Histogram of CPOE attitude data from individual subjects grouped by position.

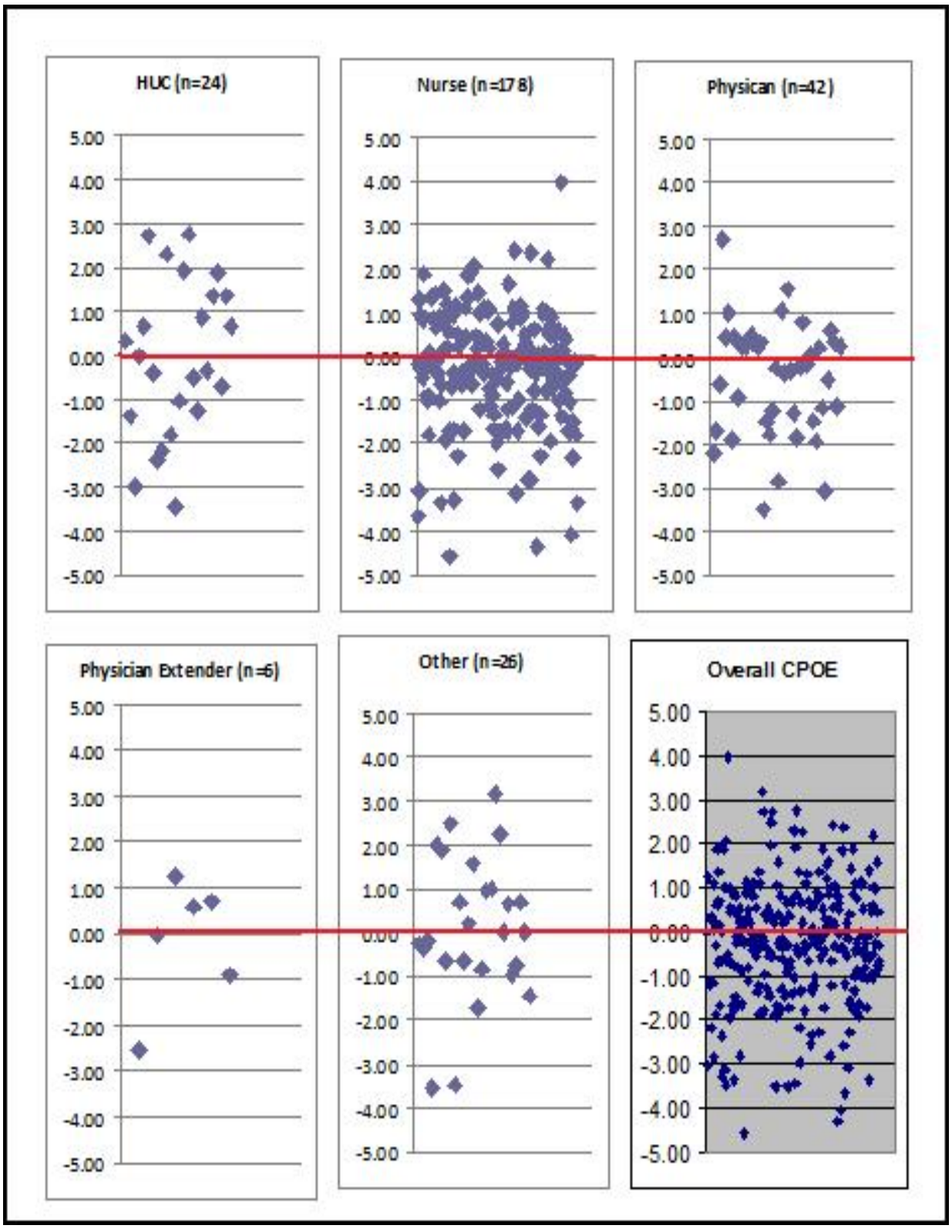

Figure 10: CPOE attitude scatter plots of individual subjects grouped by position.

7.2.4 Comparison by Power Bases

Each subject's pre and post implementation scores were compared by using paired t tests for each of the six power bases. The data was divided based on the subjects' position (see Table 29).

Table 29: Comparison of mean scores pre and post implementation using paired t tests.

Position	Power Base	Pre-Imp Mean	Post-Imp Mean	Mean Difference in Scores	Paired t-test	Sig. (2-tailed)
Physician	Reward/Coercive	2.55	2.08	-0.46	1.889	0.066
(n=42)	Expert	3.44	2.20	-1.24	4.749	**0.000***
	Informational	2.52	0.83	-1.69	6.029	**0.000***
	Legitimate	2.51	1.04	-1.47	6.334	**0.000***
	Referent	2.57	2.38	-0.19	0.818	0.418
Nurse	Reward/Coercive	2.07	1.73	-0.33	2.954	**0.004***
(n=176)	Expert	2.91	1.72	-1.20	13.798	**0.000***
	Informational	2.19	0.64	-1.56	13.171	**0.000***
	Legitimate	1.47	0.88	-0.59	4.785	**0.000***
	Referent	2.04	1.91	-0.13	1.172	0.243
HUC	Reward/Coercive	1.31	0.17	-1.15	2.555	**0.018***
(n= 24)	Expert	2.85	2.02	-0.83	2.097	**0.047***
	Informational	2.60	0.92	-1.68	3.347	**0.003***
	Legitimate	0.93	0.92	-0.01	0.024	0.981
	Referent	1.90	1.28	-0.63	1.273	0.216
Physician Extender	Reward/Coercive	2.04	1.75	-0.29	1.234	0.272
(n= 6)	Expert	3.04	1.92	-1.13	1.964	0.107

Position	Power Base	Pre-Imp Mean	Post-Imp Mean	Mean Difference in Scores	Paired t-test	Sig. (2-tailed)
	Informational	2.28	1.00	-1.28	1.913	0.114
	Legitimate	1.63	0.79	-0.83	2.370	0.064
	Referent	2.03	2.00	-0.03	0.117	0.911
Other	Reward/Coercive	2.51	1.73	-0.78	2.025	0.053
(n= 28)	Expert	2.58	2.26	-0.32	1.436	0.162
	Informational	2.60	0.98	-1.62	3.935	0.001*
	Legitimate	1.97	1.07	-0.90	2.671	0.013*
	Referent	2.65	2.59	-0.06	0.237	0.815

***Values are considered significant if p <=.05 (two-tailed)**

Because once again, outliers can affect the mean, box plots were prepared that identified the outliers (see Appendix I) and the means were re-calculated and compared for significance (see Table 30).

Table 30: Comparison of Power Base Means By Position with Outliers Removed.

Position	Power Base	Mean Difference All Subjects	Mean Difference without outliers	Paired t-test of without outliers	Sig. (2-tailed)
Physician	Reward/Coercive	-0.46 (n=42)	-0.46 (n=42)	1.889	.066
	Expert	-1.24 (n= 42)	-1.38 (n=41)	5.974	**.000***
	Informational	-1.69 (n=42)	-1.93 (n=40)	8.241	**.000***
	Legitimate	-1.47 (n=42)	-1.58 (n=41)	7.521	**.000***
	Referent	-0.19 (n=42)	-0.19 (n=42)	.818	.418
Nurse	Reward/Coercive	-0.33 (n=176)	-0.28 (n=167)	2.906	.004*

Position	Power Base	Mean Difference All Subjects	Mean Difference without outliers	Paired t-test of without outliers	Sig. (2-tailed)
	Expert	-1.20 (n= 176)	-1.21 (n=175)	14.395	.000*
	Informational	-1.56 (n=176)	-1.61 (n=172)	15.202	.000*
	Legitimate	-0.59 (n=176)	-0.56 (n=173)	4.893	.000*
	Referent	-0.13 (n=176)	-0.05 (n=169)	.552	.582
HUC	Reward/Coercive	-1.15 (n=24)	-0.92 (n=23)	2.423	.024*
	Expert	-0.83 (n=24)	-0.83 (n=24)	2.097	.047*
	Informational	-1.68 (n=24)	-1.65 (n=24)	3.347	.003*
	Legitimate	-0.01 (n= 24)	-0.16 (n=24)	.024	.981
	Referent	-0.63 (n=24)	-0.30 (n=21)	.783	.443
Physician	Reward/Coercive	-0.29 (n=6)	-0.29 (n=6)	1.234	.272
Extender	Expert	-1.13 (n=6)	-1.13 (n=6)	1.964	.107
	Informational	-1.28 (n=6)	-1.28 (n= 6)	1.913	.114
	Legitimate	-0.83 (n=6)	-0.83 (n=6)	2.370	.064
	Referent	-0.03 (n=6)	-0.03 (n=6)	.117	.911
Other	Reward/Coercive	-0.78 (n=28)	-0.93 (n=27)	3.186	.004*
	Expert	-0.32 (n=28)	-0.45 (n=27)	2.176	.039*
	Informational	-1.62 (n=28)	-2.2 (n=22)	10.998	.000*
	Legitimate	-0.90 (n=28)	-1.0 (n=27)	3.780	.001*
	Referent	-0.06 (n= 28)	-0.17 (n=26)	.470	.642

***Values are considered significant if p <=.05 (two-tailed)**

After removing the outliers, the same power bases experienced significant decreases for each position with the exception of the Other group which now added Reward/Coercive and Expert power base changes as significant.

Even though Tables 26 and 27 show the mean differences for each position to all be in a negative direction, not every subject in each group had a negative change. Subjects varied between negative and positive changes in power. Graphs and scatter plots illustrate variance in power scores (see Figures 11 – 20). Once again, for all of the scatter plots, the x axis has no significance other than expanding the data away from a straight line so that it is easier to view the individual data points.

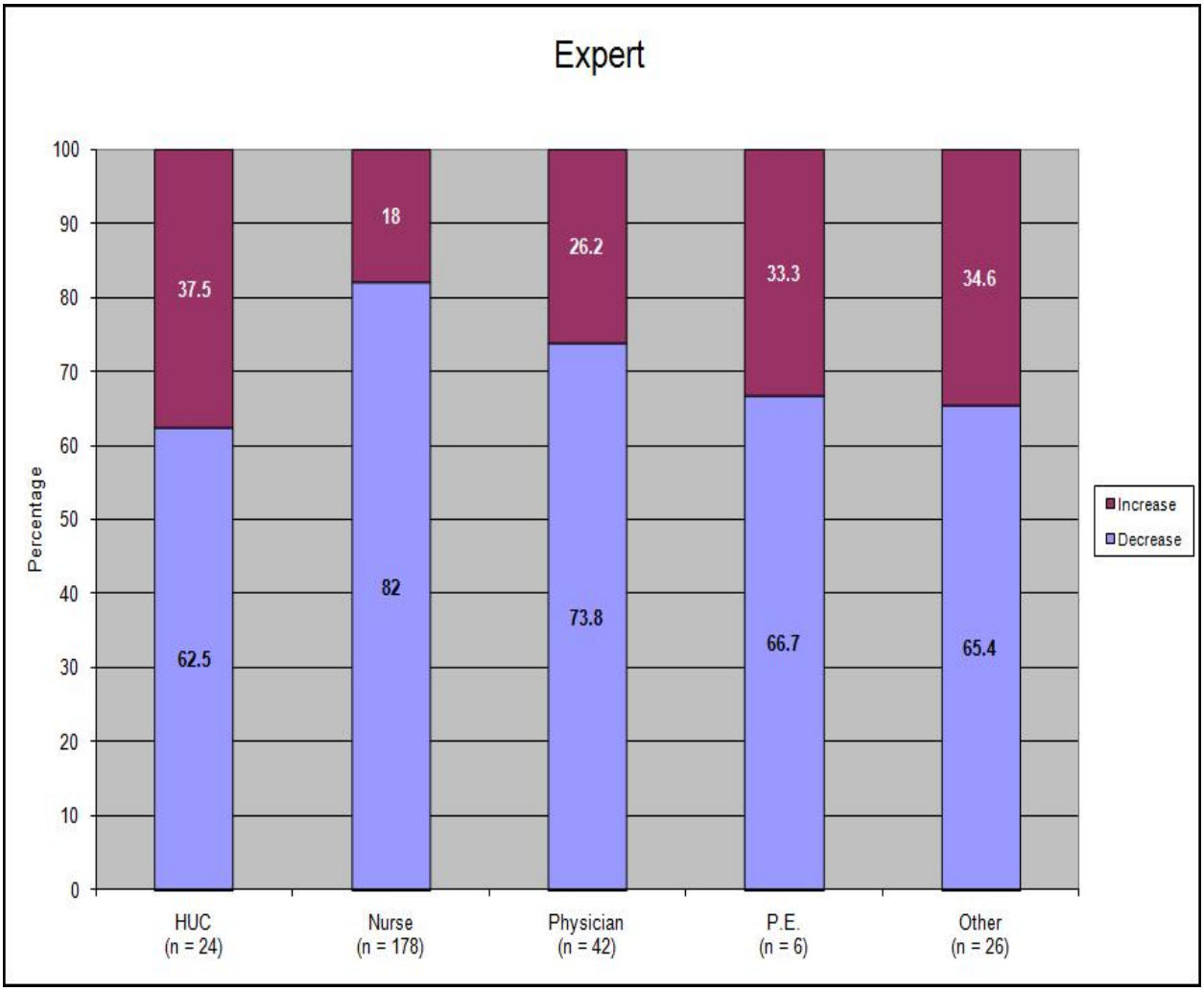

Figure 11: Changes in Reward/Coercive Power Base By Position.

The decrease in Reward/Coercive power is comparable for all groups with a range between 55-67%.

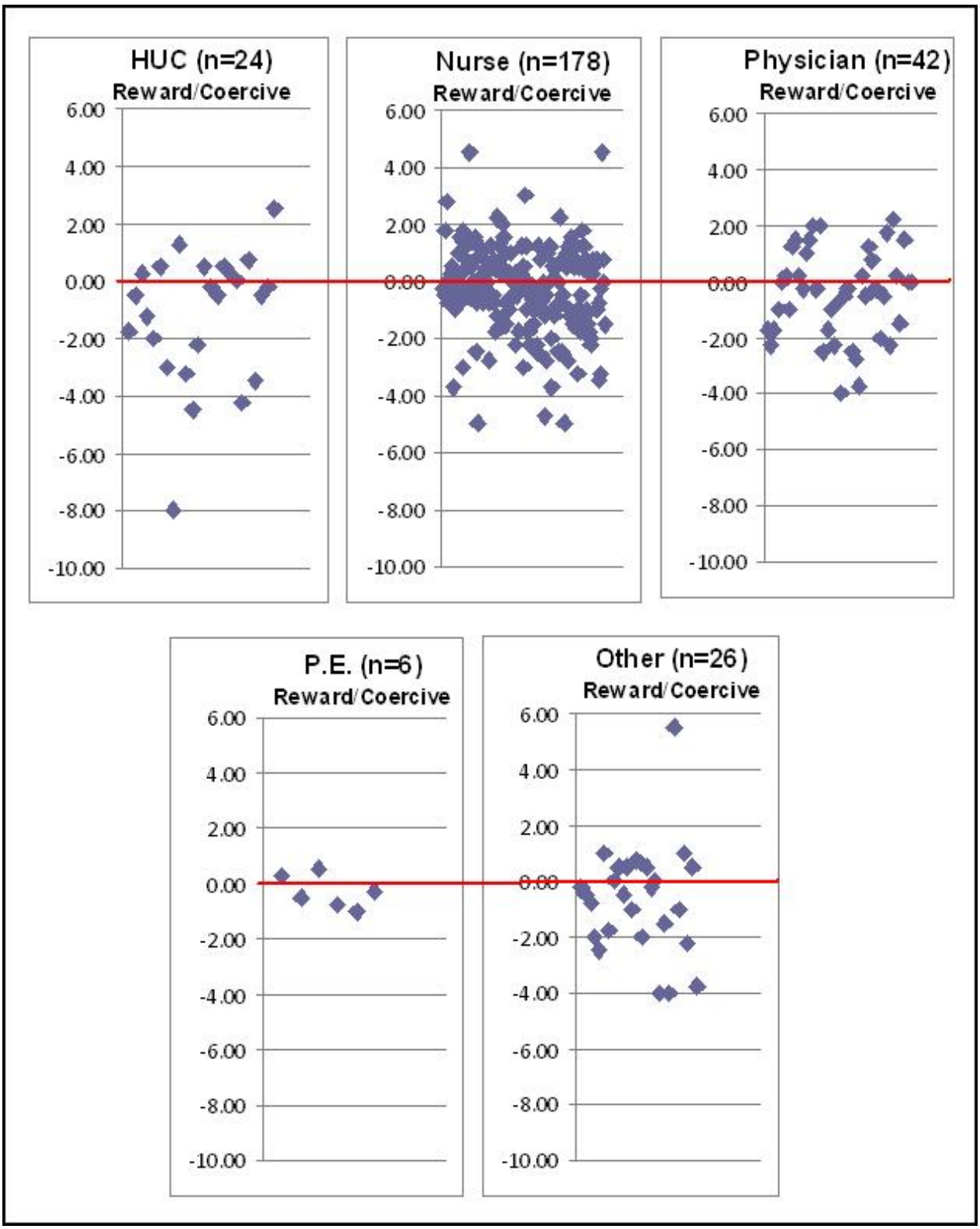

Figure 12: Scatter plots of Individuals and Reward/Coercive power base.

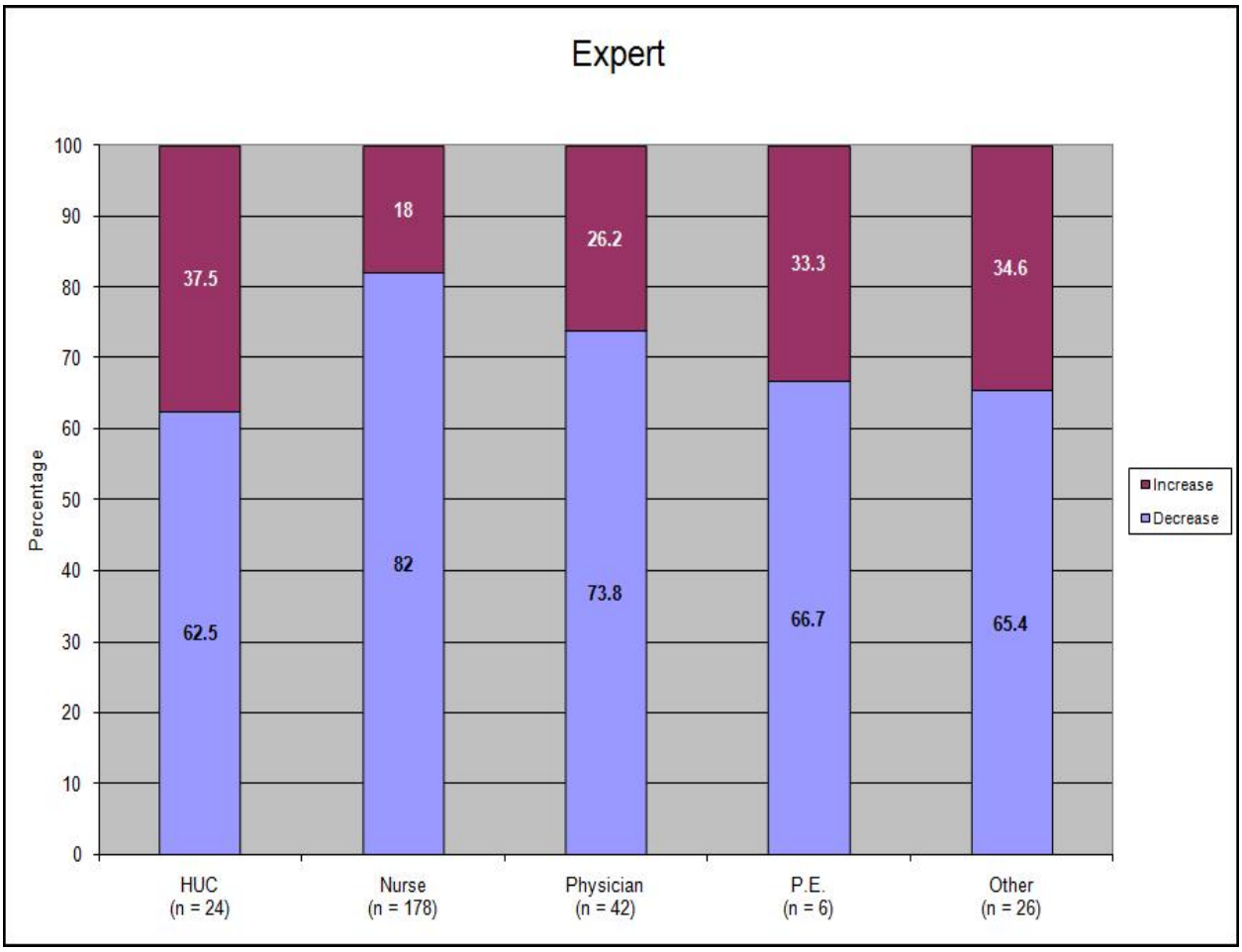

Figure 13: Changes in Expert Power Base By Position.

The decrease in Expert power is highest for nurses, then physicians.

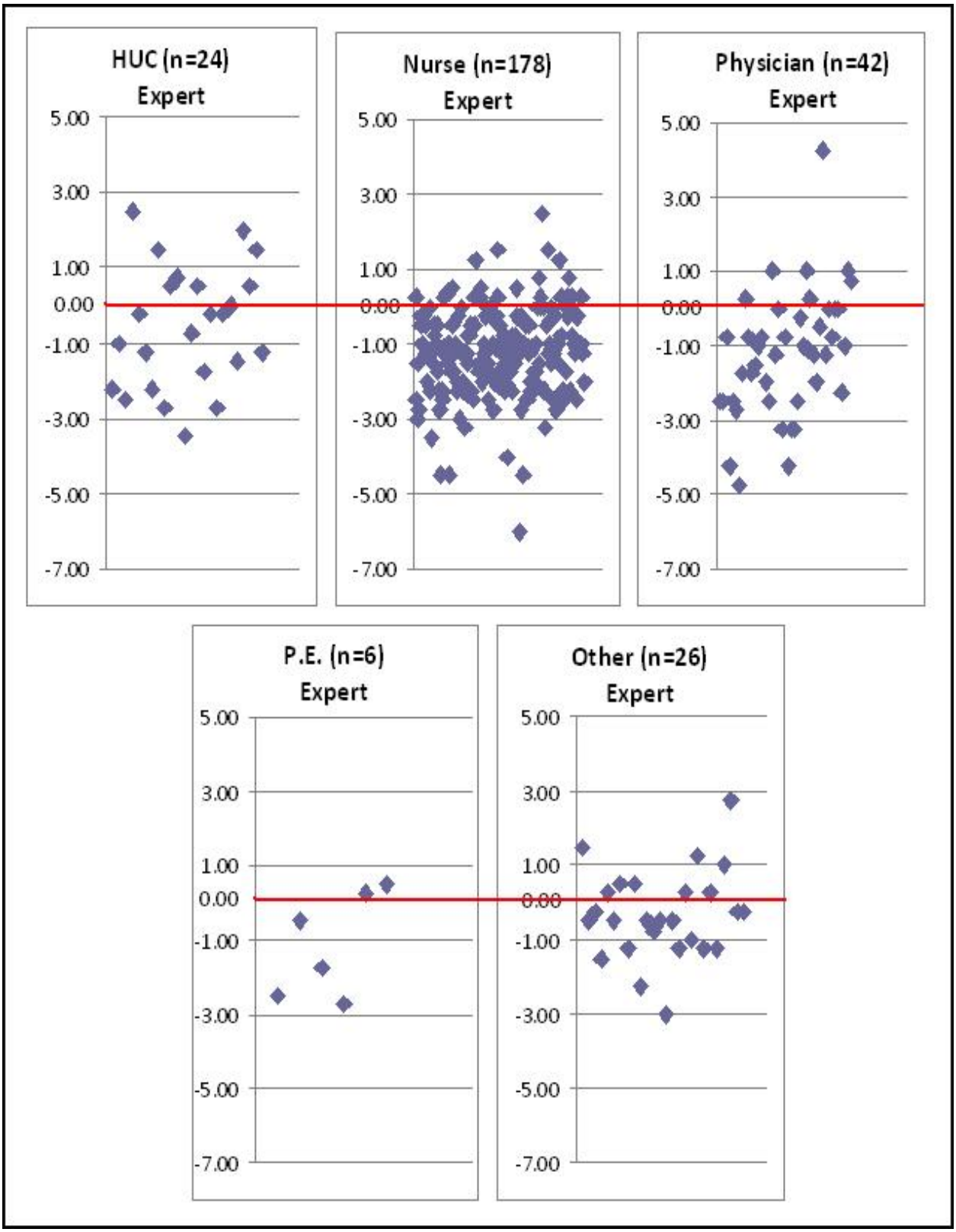

Figure 14: Scatter plots for Individuals and Expert Power base.

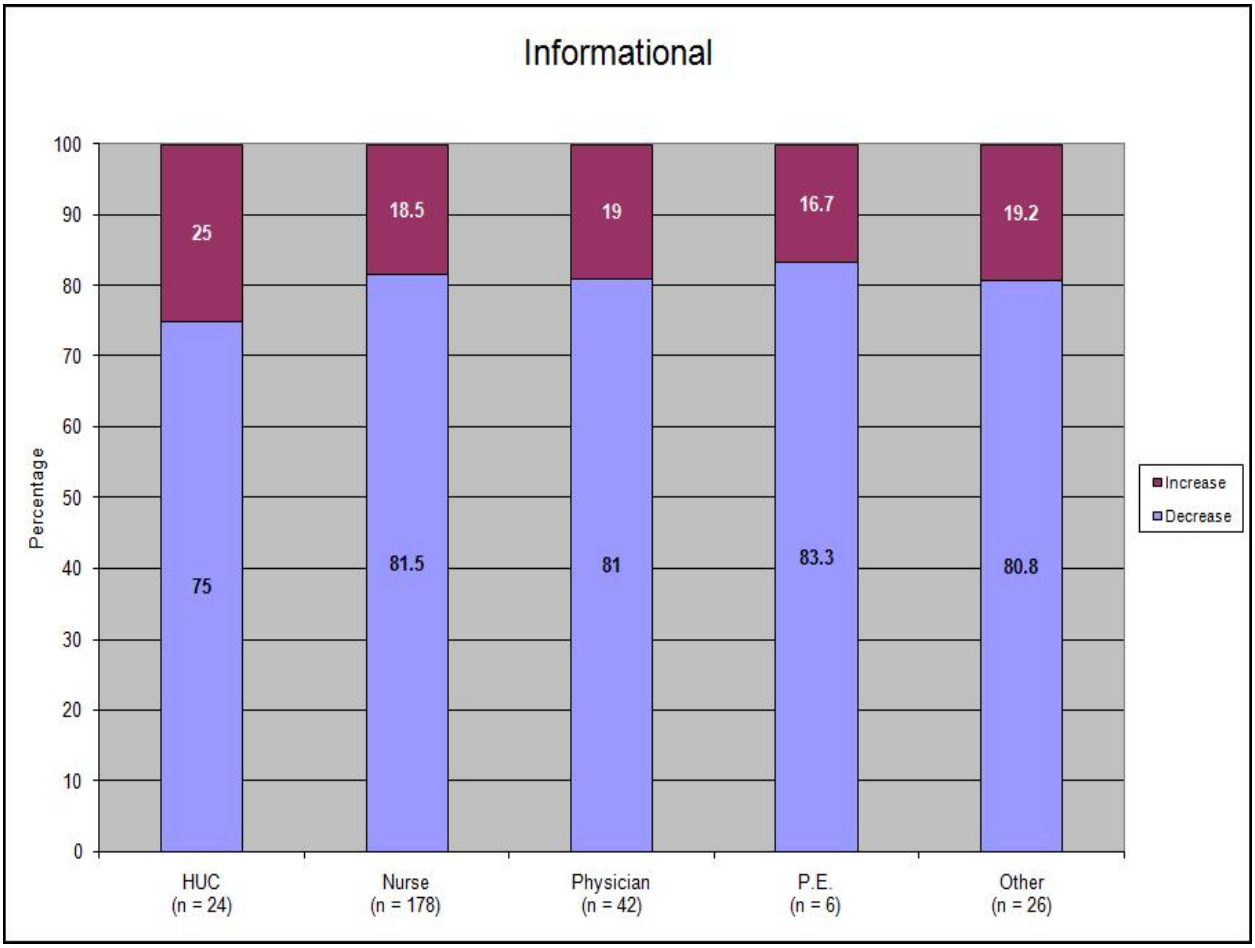

Figure 15: Changes in the Informational Power Base By Position.

The decrease in Informational power is comparable for all groups with a range between 75 -83.3%. This was the power base with the largest decrease.

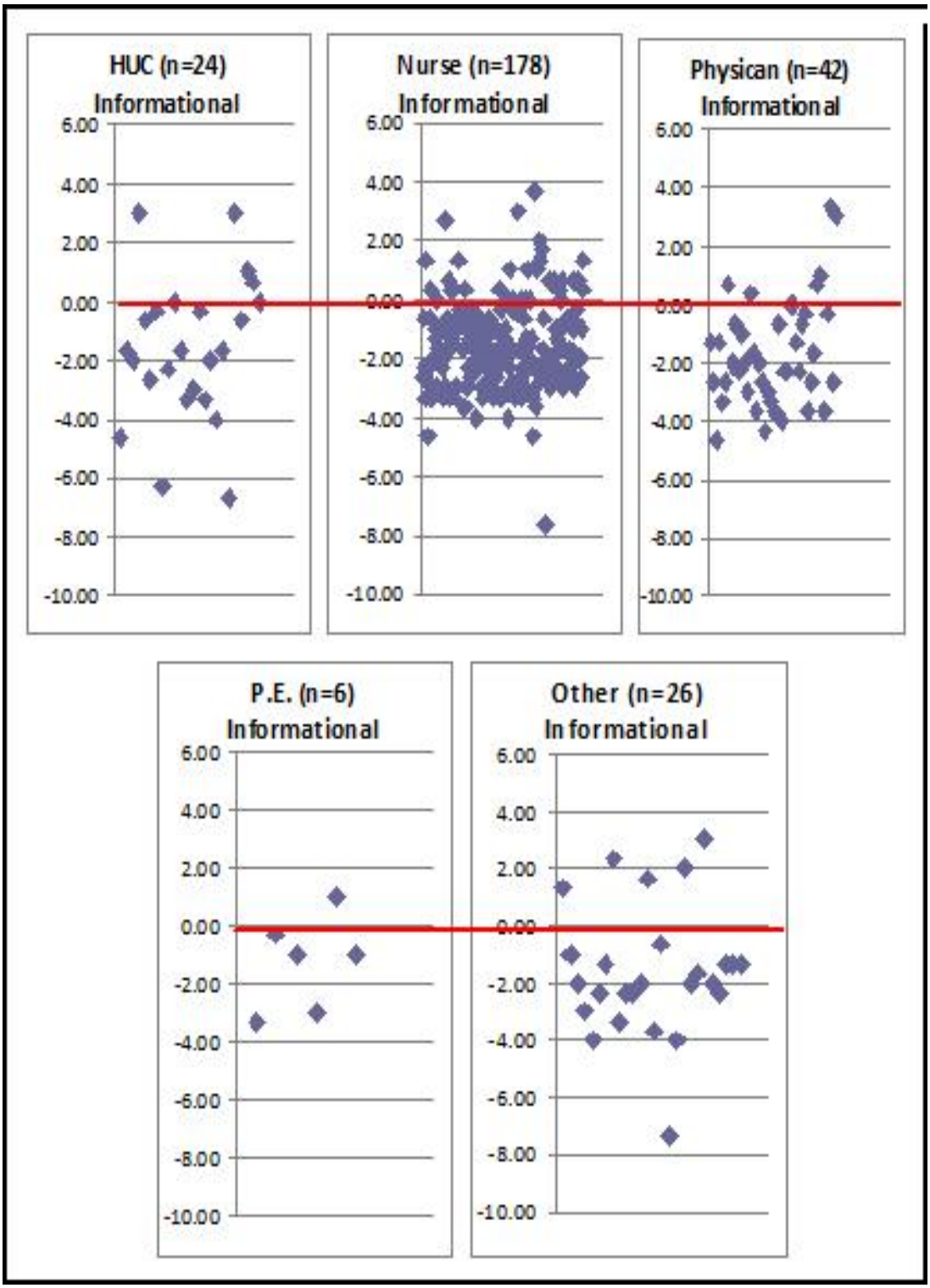

Figure 16: Scatter plots for Individuals and Informational Power Base.

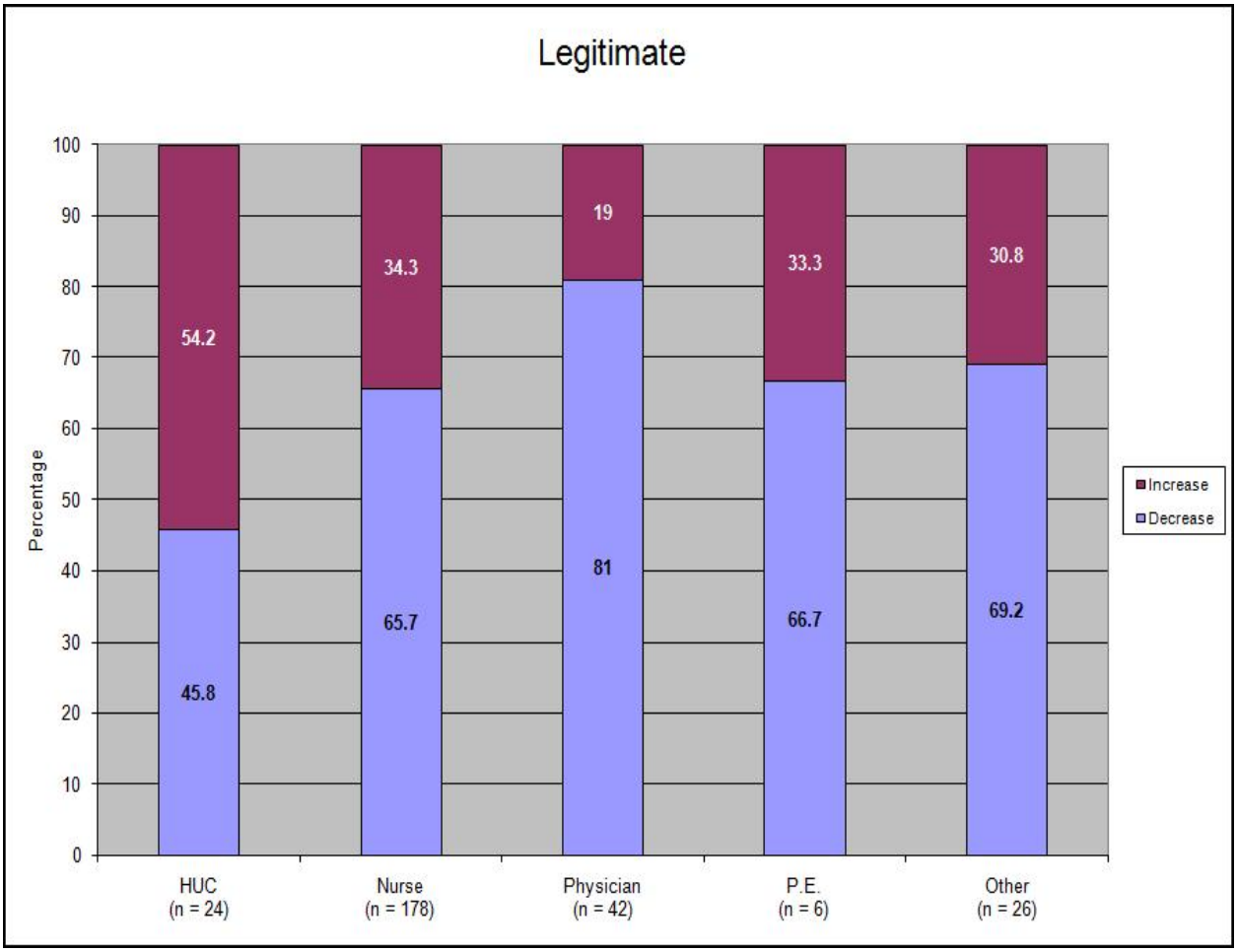

Figure 17: Scatter plots for Individuals and Informational Power Base.

The decrease in Legitimate power is greatest for physicians and least for HUC's.

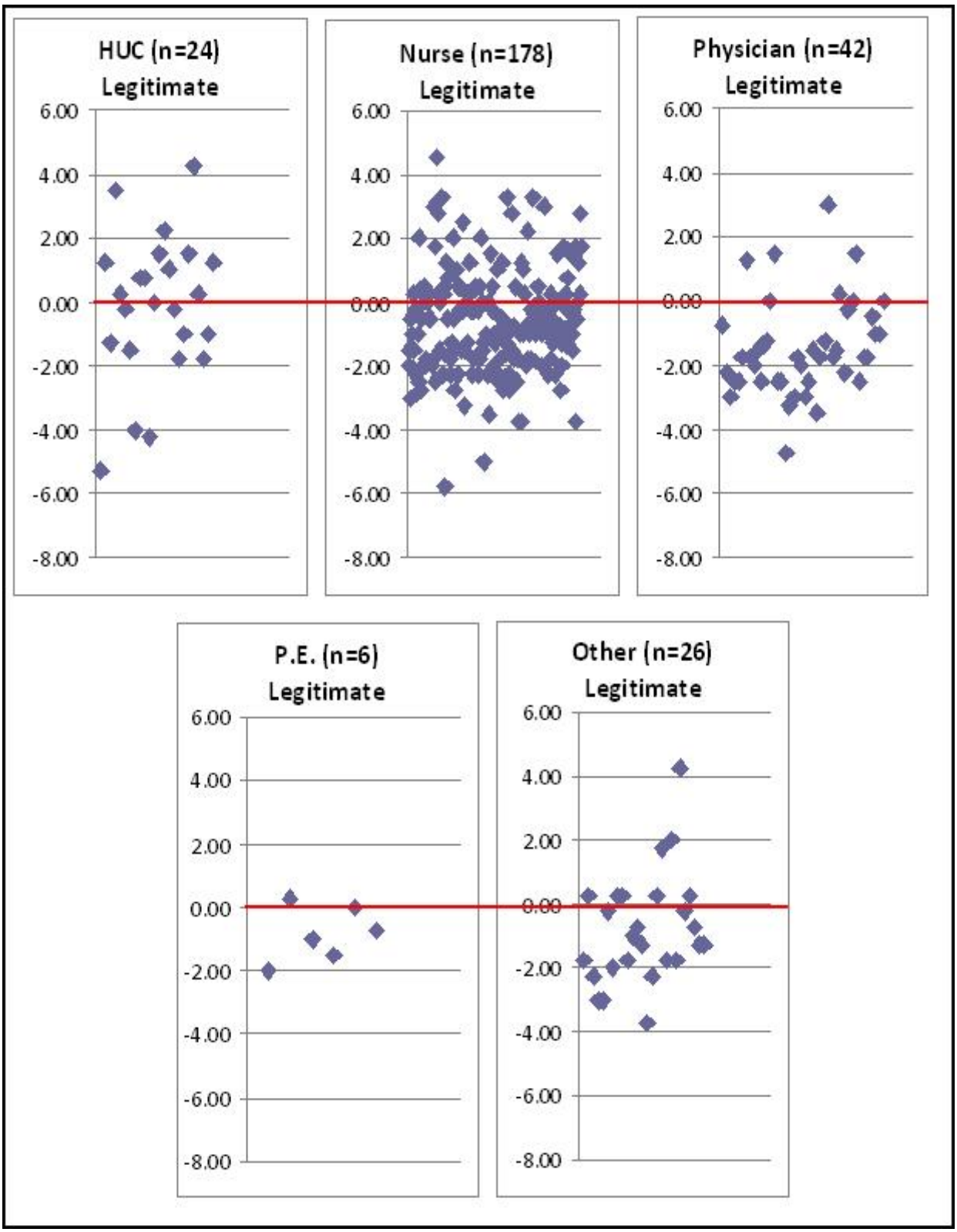

Figure 18: Scatter plots of Individuals for Legitimate Power Base.

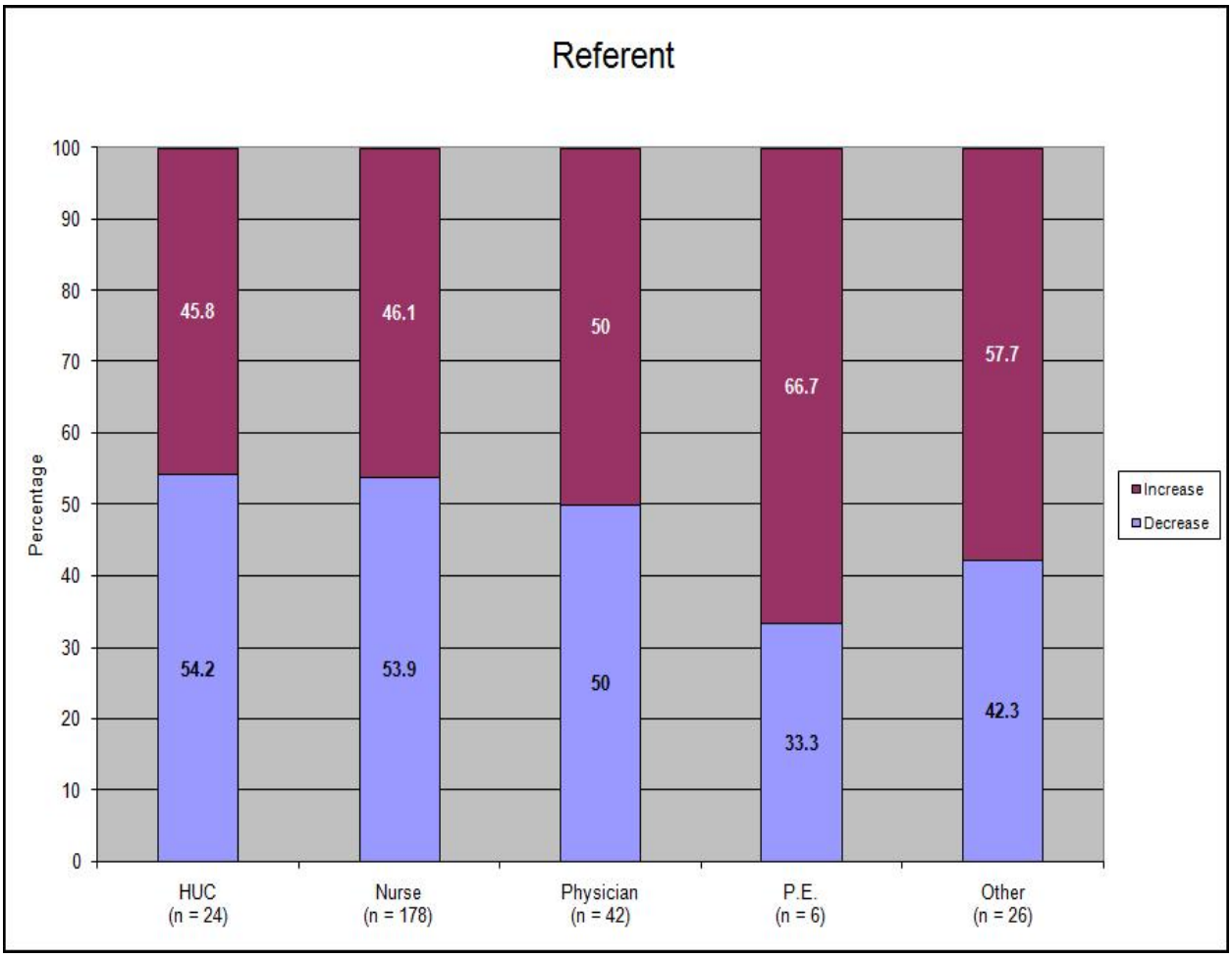

Figure 19: Changes in the Referent Power Base By Position.

Referent power has the greatest increase for all groups, especially Physician Extenders and Others.

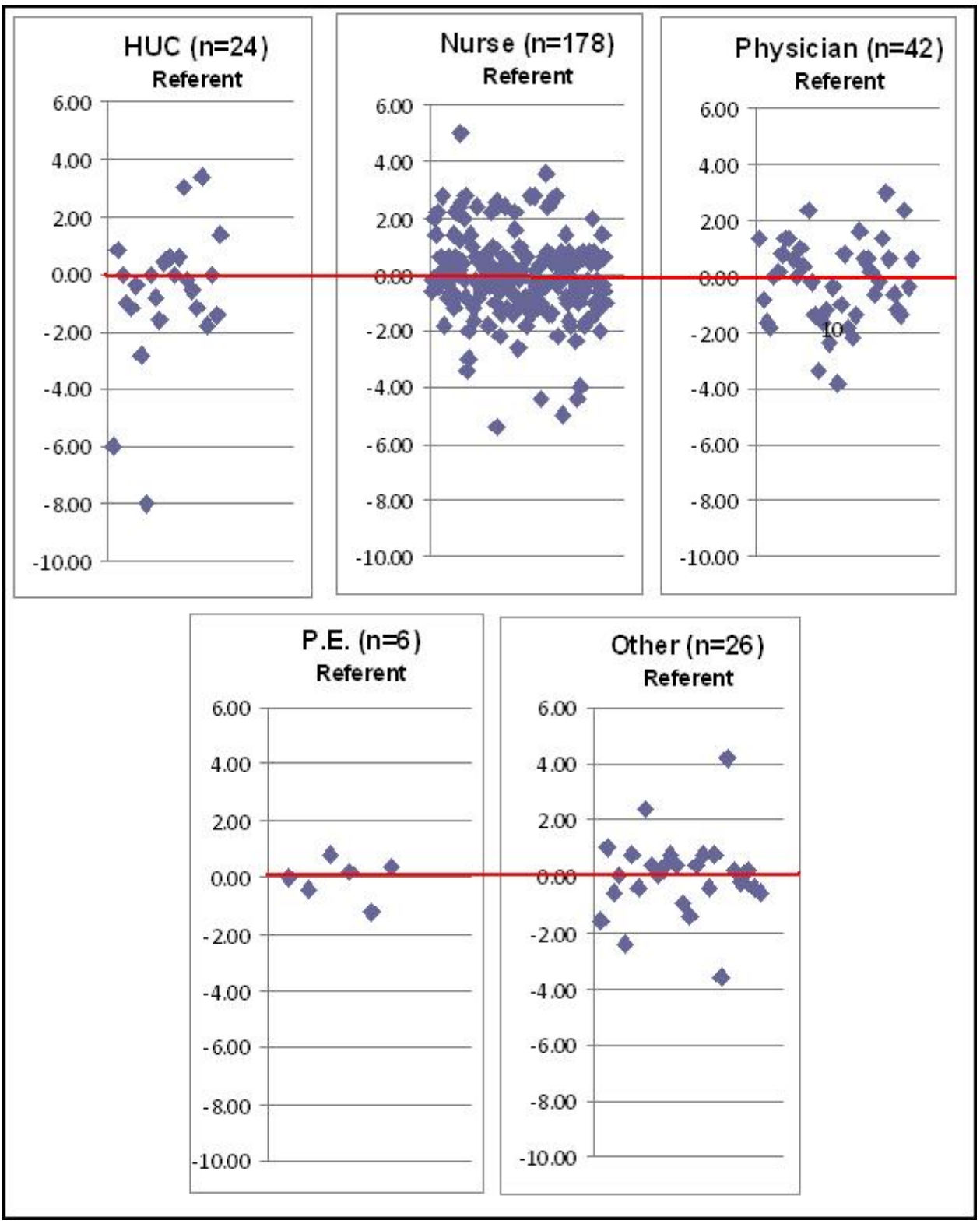

Figure 20: Scatter plots of Individuals for Referent Power Base.

7.2.5 Factor Analysis of CPOE attitudes

Power perception was analyzed overall and then broken down into the individual power bases that make up the entire power perception. Since there is no existing breakdown of factors for CPOE attitudes, an exploratory factor analysis was done to see if there actually are identifiable factors. The factor analysis used both the pre- and post-implementation scores and was performed using a Varimax method of rotation that was set to exclude absolute values less than .40. Four component factors were identified. Fifteen of the word pairs fell into only one factor while 15 word pairs were split between at least two factors (see Figure 21).

CPOE Attitude Word Pairs	Component			
	1	2	3	4
Q 20.1_Good/Bad	.492	.497		
Q 20.2_Fast/Slow	.427	.713		
Q 20.3_Harmful/Helpful	.402	.535		
Q 20.4_Difficult/Easy		.826		
Q 20.5_Simple/Complex		.742		
Q 20.6_Safe/Dangerous		.484	.497	
Q 20.7_TimeWasting/TimeSaving	.422	.739		
Q 20.8_Bothersome/Useful	.443	.671		
Q 20.9_Efficient/Inefficient		.694		
Q 20.10_Secure/Vulnerable			.619	
Q 20.11_Powerful/Limited	.460	.439		
Q 20.12_Trustworthy/Unreliable		.509	.481	
Q 20.13_Fun/Boring	.448	.476		
Q 20.14_Consistent/Inconsistent	.407	.460		.439
Q 20.15_Mandatory/Optional				-.724
Q 21.1_Complete/Incomplete	.503			
Q 21.2_Accurate/Inaccurate	.578		.419	.404
Q 21.3_Useful/Useless	.609		.426	
Q 21.4_Public/Private			.758	
Q 21.5_Confidential/Unprotected			.665	
Q 21.6_Questionable/Reliable	.537		.537	
Q 22.1_Divides/Links	.727			
Q 22.2_Informs/Misleads	.760			
Q 22.3_Improves/Worsens	.772			
Q 22.4_Organizes/Confuses	.768			
Q 22.5_Communicates/KeepsHidden	.805			
Q 22.6_Warns/Annoys	.760			
Q 22.7_Enables/Blocks	.805			
Q 22.8_LessWork/MoreWork	.444	.633		
Q 22.9_Strengthens/Weakens	.769			

Word pairs with a red line were split between at least 2 factors and were removed from consideration.

Figure 21: Rotated Component Factor Analysis of CPOE attitudes.

The 15 word pairs that were split between more than one factor were eliminated and the remaining factors were placed in factor groups identified as Impact, Use, Data and Discretion (see Table 31).

Table 31: Word pairs identified in a single factor.

"Impact"	**"Use"**	**"Data"**	**"Discretion"**
55.3% of Variance	**6.6% of Variance**	**4.2% of Variance**	**3.6% of Variance**
Factor1	**Factor2**	**Factor 3**	**Factor 4**
Complete / Incomplete	Difficult / Easy	Public / Private	Mandatory / Optional
Divides / Links	Simple / Complex	Confidential / Unprotected	
Informs / Misleads	Efficient / Inefficient		
Improves / Worsens			
Organizes / Confuses			
Communicates / Keeps Hidden			
Warns / Annoys			
Enables / Blocks			

"Impact" indicates that responses to these word pairs reflect the CPOE attitudes about workflow and communication factors. "Use" reflects CPOE attitudes regarding physical use of the system, while the factor "Data" reflects CPOE attitudes about the data contained within the system. "Discretion" represents discretionary use of the system which is the user's attitude about whether use of the CPOE system was considered mandatory or optional. These factors explain a total of 69.7% of the variance in CPOE attitudes.

7.3 ANALYSIS OF HYPOTHESIS 2

Hypothesis 2: There is a positive correlation between changes in perception of personal power, work organization structure, and the change in CPOE attitudes. Assuming decreasing CPOE attitudes are reflective of resistance, this would indicate a negative correlation between power perceptions and degree of resistance to the introduction of CPOE.

7.3.1 Correlations

Pearson Correlations and significance testing was performed between CPOE attitudes and power perceptions for overall power perceptions and the separate power bases. Analysis shows a highly significant correlation between power perceptions and CPOE attitudes ($r = .429$, $p<.001$) prior to the implementation of the CPOE system and also post implementation ($r = .449$, $p<.001$). There was also a highly significant correlation between CPOE attitudes and each of the power bases (see Table 32.)

Table 32: Correlation between Power perceptions and CPOE attitudes Pre-Implementation.

	Pearson Correlation	**Significance**
Overall Power and CPOE	.429	**.000***
Reward/Coercive Power and CPOE	.399	**.000***
Expert Power and CPOE	.254	**.000***
Informational Power and CPOE	.416	**.000***
Legitimate Power and CPOE	.358	**.000***
Referent Power and CPOE	.382	**.000***

***Values are considered significant if p <=.05 (two-tailed)**

Post-implementation of CPOE, a significant positive correlation between power perceptions and CPOE attitudes remains. A significant correlation also remains for all of the individual power bases with the exception of Expert power. From Pre to Post implementation, the correlation strength increased for the Reward/Coercive and Referent power bases, but decreased for Expert, Informational and Legitimate (see Table 33).

Table 33: Correlation between power perception and CPOE attitudes Post-Implementation.

	Pearson Correlation	**Significance**
Overall Power and CPOE	.449	**.000***
Reward/Coercive Power and CPOE	.445	**.000***
Expert Power and CPOE	.095	.115
Informational Power and CPOE	.214	**.000***

	Pearson Correlation	Significance
Legitimate Power and CPOE	.351	**.000***
Referent Power and CPOE	.411	**.000***

***Values are considered significant if p <=.05 (two-tailed)**

Just as overall power was correlated with overall CPOE attitudes, the individual power bases were correlated with the CPOE factors to see if there is a statistically significant relationship between a particular power base and a particular CPOE attitude factor (see Table 34). The 15 word pairs that were split between two or more factors in the factor analysis of CPOE attitudes were not considered in these correlations.

Table 34: Pearson Correlations of Power Perceptions with CPOE Factors Pre- and Post-Implementation.

Survey	Power Bases		CPOE Attitude Factors			
			Data	Impact	Discretion	Use
Pre	**Overall Power**	**Correlation**	.368	.451	-.184	.354
		Sig. (2-tailed)	.000*	.000*	.002*	.000*
	Reward / Coercive	**Correlation**	.191	.364	-.142	.342
		Sig. (2-tailed)	.001*	.000*	.018*	.000*
	Expert	**Correlation**	.138	.314	-.234	0.053
		Sig. (2-tailed)	.022*	.000*	.000*	.380
	Informational	**Correlation**	.237	.422	-0.075	.275
		Sig. (2-tailed)	.000*	.000*	.216	.000*
	Legitimate	**Correlation**	.182	.375	-.246	.217
		Sig. (2-tailed)	.002*	.000*	.000*	.000*
	Referent	**Correlation**	.199	.379	-0.106	.276
		Sig. (2-tailed)	.001*	.000*	.078	.000*
Post	**Overall Power**	**Correlation**	.369	.470	-.147	.402
		Sig. (2-tailed)	.000*	.000*	.015*	.000*
	Reward / Coercive	**Correlation**	.226	.443	-0.117	.311
		Sig. (2-tailed)	.000*	.000*	.053	.000*

Survey	Power Bases		CPOE Attitude Factors			
			Data	Impact	Discretion	Use
	Expert	Correlation	0.074	.121	-0.022	0.019
		Sig. (2-tailed)	.222	.044*	.710	.750
	Informational	Correlation	0.072	.215	0.035	.209
		Sig. (2-tailed)	.235	.000*	.561	.000*
	Legitimate	Correlation	.237	.355	-.189	.258
		Sig. (2-tailed)	.000*	.000*	.002*	.000*
	Referent	Correlation	.162	.404	-.163	.321
		Sig. (2-tailed)	.007*	.000*	.007*	.000*

***Values are considered significant if p <=.05 (two-tailed)**

Overall, power is significantly correlated with all of the CPOE factors both pre and post implementation. Both pre- and post-implementation, all power bases are significantly related to the Impact factor while significance is scattered between the other factors and the power bases.

7.3.2 Matching of Power Perception and CPOE Attitude Direction Change

A direct visual comparison by individuals of pre-implementation scores and post-implementation scores was done to determine if CPOE attitudes decrease when power perception scores decrease. Using a simple visual match comparison of the direction of change of power perceptions and CPOE attitudes, we see that approximately 60% of the time, power and CPOE go the same direction, either increasing or decreasing. When broken down by position, this coincides fairly closely (+/- 2.5 %) with each position except the physician extender (see Table 35).

Table 35: Matching of Direction of Change of power perception and CPOE attitude scores.

	Power and CPOE direction change match	Power and CPOE direction change <u>DO NOT</u> match
OVERALL (n = 276)	166 (60.1%)	110 (39.9%)

	Power and CPOE direction change match	**Power and CPOE direction change <u>DO NOT</u> match**
HUC (n = 24)	15 (62.5%)	9 (37.5%)
Nurse (n = 178)	109 (61.2%)	69 (38.8%)
Physician (n = 42)	24 (57.1%)	18 (42.9%)
Physician Extender (n = 6)	3 (50%)	3 (50%)
Other (n = 26)	15 (57.7%)	11 (42.3%)

Looking directly at a graphic representation of the change in the mean scores over time, we see that power perceptions decrease at a faster rate than CPOE attitudes (see Figure 22).

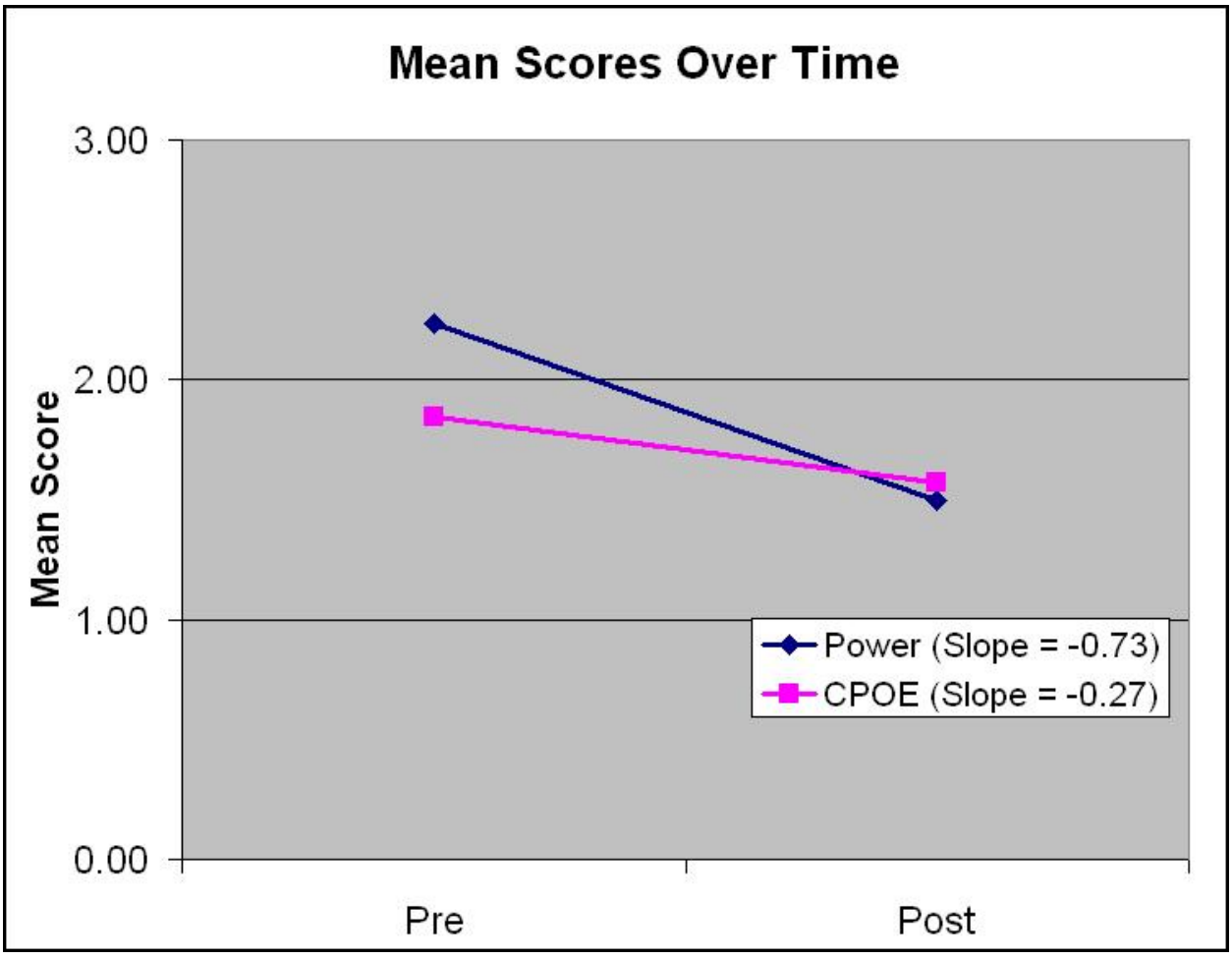

Figure 22: Power Perceptions and CPOE Attitudes over time.

Because a relationship between power perception and CPOE attitude has been shown, it is important to determine if the changes from pre- to post-implementation are statistically significant.

Since the same subjects were surveyed both pre and post implementation, a repeated measures ANOVA was performed as a single model to determine if these changes in power perceptions and CPOE attitudes were significant from pre to post-implementation (see Tables 36 and 37).

Table 36: Repeated Measures ANOVA of Power and CPOE attitudes by Position Tests of Within-Subjects Contrasts.

Tests of Within-Subjects Contrasts				
Position	**Measure**	**Mean Square**	**F**	**Sig.**
Physician	Power	36.867	30.222	0.000*
	CPOE	9.734	5.835	0.020*
Nurse	Power	83.876	87.709	0.000*
	CPOE	15.417	8.692	0.004*
HUC	Power	15.601	6.639	0.017*
	CPOE	1.256	0.406	0.530
Physician Extender	Power	2.535	7.873	0.038*
	CPOE	0.170	0.089	0.778
Other	Power	12.157	8.571	0.007*
	CPOE	0.478	0.166	0.687

***Values are considered significant if p <=.05 (two-tailed)**

All Within-Subjects means showed significant changes for power perceptions. CPOE attitudes were only significant for physicians and nurses.

Table 37: Repeated Measures ANOVA of Power and CPOE attitudes by Position Tests of Between-Subjects Effects.

Tests of Between-Subjects Effects				
Position	**Measure**	**Mean Square**	**F**	**Sig.**
Physician	Power	212.963	142.985	0.000*

Tests of Between-Subjects Effects				
Position	**Measure**	**Mean Square**	**F**	**Sig.**
	CPOE	66.906	23.238	0.000*
	Power	559.848	389.379	0.000*
Nurse	CPOE	564.692	299.835	0.000*
	Power	52.584	27.326	0.000*
HUC	CPOE	90.501	54.487	0.000*
Physician	Power	20.907	7.232	0.043*
Extender	CPOE	18.603	25.086	0.004*
	Power	127.609	102.683	0.000*
Other	CPOE	76.527	53.009	0.000*

***Values are considered significant if p <=.05 (two-tailed)**

All Between-Subjects means showed significant changes for both power perceptions and CPOE attitudes. There was no need for multiple comparison adjustments such as the Bonferroni.

7.3.3 Comparison of Mean Scores by Unit Structure

Subjects were aggregated by the type of patient unit that they work on. The mean CPOE scores were compared to determine if hierarchically-based patient unit subjects had a more negative score for CPOE than team-based patient unit subjects. A negative change in score is considered to be related to an increasing level of resistance. CPOE attitude scores were aggregated by unit structure and then the means compared (see Table 38).

Table 38: CPOE Mean Scores Aggregated by Unit Structure.

	Team			**Hierarchical**		
	Pre Mean	**Post Mean**	**Diff**	**Pre Mean**	**Post Mean**	**Diff**
Overall	1.94	1.77	**-0.17**	1.59	1.05	**-0.54**
	(n=171)	(n=177)		(n=54)	(n=60)	
Physician	*1.70*	*1.17*	**-0.53**	.25	.32	**0.07**

	Team			Hierarchical		
	Pre Mean	**Post Mean**	**Diff**	**Pre Mean**	**Post Mean**	**Diff**
	(n=19)	(n=20)		(n=7)	(n=9)	
Nurse	2.00	1.81	**-0.19**	1.73	.97	**-0.76**
	(n=125)	(n=131)		(n=41)	(n=39)	
HUC	2.08	1.68	**-0.4**	2.22	1.75	**-0.47**
	(n=17)	(n=17)		(n=4)	(n=5)	
Physician Extender	1.38	2.50	**1.12**	2.47	3.03	**0.56**
	(n=4)	(n=2)		(n=1)	(n=1)	
Other	1.37	2.68	**1.31**	1.53	1.78	**0.25**
	(n=6)	(n=7)		(n=1)	(n=6)	

Comparisons were then performed on the means for power perceptions for Team and Hierarchical-based subjects (see Table 39).

Table 39: Power Mean Scores Aggregated by Unit Structure.

	Team			Hierarchical		
	Pre Mean	**Post Mean**	**Diff**	**Pre Mean**	**Post Mean**	**Diff**
Overall	2.40	1.71	**-0.69**	1.55	.64	**-0.91**
	(n=171)	(n=177)		(n=54)	(n=60)	
Physician	2.72	1.79	**-0.93**	2.98	1.26	**-1.72**
	(n=19)	(n=20)		(n=7)	(n=9)	
Nurse	2.38	1.73	**-0.65**	1.29	.47	**-0.82**
	(n=125)	(n=131)		(n=41)	(n=39)	
HUC	2.24	1.17	**-1.07**	.64	.32	**-0.32**
	(n=17)	(n=17)		(n=4)	(n=5)	
Physician Extender	2.05	2.40	**0.35**	4.05	.60	**-3.45**
	(n=4)	(n=2)		(n=1)	(n=1)	
Other	2.53	2.20	**-0.33**	3.00	1.09	**-1.91**

	Team			Hierarchical		
	Pre Mean	**Post Mean**	**Diff**	**Pre Mean**	**Post Mean**	**Diff**
	(n=6)	(n=7)		(n=1)	(n=6)	

Hierarchically-based physicians had the lowest mean CPOE attitudes and the largest decrease in power perceptions. Physician extenders and Others were not considered since there was only one subject in the hierarchical group.

Because physicians and nurses had the lowest scores in power perception for unit structure, analysis was done to ensure that the physician and nursing subjects shown in Table 40 were not all from the same hospital and may have been responding to some other variable.

Table 40: Number of physicians and nurses by hospital as identified by unit structure.

		Pre-Implementation		Post-Implementation	
Position:	**Unit Structure:**	**Community**	**Pediatric**	**Community**	**Pediatric**
Physician	Team	14	5	13	7
	Hierarchy	6	1	6	3
Nurse	Team	82	43	84	47
	Hierarchy	26	15	26	13

Because the community hospital is more than twice the size of the pediatric hospital, we found that the distribution of subjects corresponded approximately to that same ratio of 2 to 1.

7.4 QUALITATIVE ANALYSIS OF COMMENTS

On the pre-implementation survey, subjects that had previous experience using an EHR or CPOE were asked, "Why they felt their previous experience with an EHR was either positive or negative?" They were also asked both pre- and post-implementation, "What do you feel has influenced how much power you have over your work?" The comments to both questions were

analyzed for common themes. These comments crossed both hospitals and all positions so they do not all relate to the same previously used system.

7.4.1 Previous EHR Experience Comments

Since the vast majority of subjects with previous EHR experience felt that it was a positive experience (138 positive, and 11 negative), the comments were predominately positive. Of the 11 negative experiences, six were from physicians, two were from physician extenders, two were from nurses, and one was from the Other group. There were a total of 98 comments. The major themes that crossed both positive and negative comments were access, time, documentation, and paper waste. All comments on previous EHR experience are shown in Appendix J.

"Access" for the positive comments reflected the ability of multiple users to access the information simultaneously without fighting over a paper chart, having the information accessible from any location that the user happened to be at, and that access to information was easier because it was consistently in the same place in the record. Negative comments on "Access" related to passwords and the ability to access the computer system itself, access to a working computer because of dead batteries or not enough computers to go around, and reliability of the system being up, running and accessible.

"Time" was easily divided into the system being very efficient and saving time so that more time could be spent at the bedside, to the system taking more time and preventing time at the bedside. Nurses felt that it allowed them more time at the bedside because they were able to complete their online charting quicker and more efficiently using the computer, while physicians felt it took them more time to do their work and to find information in the "clutter" of the system. These were also the "Documentation" issues that physicians had. "Documentation" from a positive side was considered more accurate, thorough, organized, and legible. Actually, the most commonly stated positive comment was legibility for all types of documentation. Intake and output information was maintained more accurately, patient assessments were more thorough, information was easier to track, and errors were easier to fix in the computer than they are on paper.

"Paper waste" was another contradictory theme. Positive comments indicated that paper waste was minimal and paper clutter was decreased around the patient unit, while negative

comments indicated that paper was wasted because of the double work of having to enter it into the computer and then print out a hard copy for the physicians.

A recurring theme in the positive comments was "Ease/Easy" - ease of use, ease of finding information, ease of charting, easy to figure out, easy to read, and easy to enter orders were all mentioned more than once. On the negative side, a theme of "Poor Design" was noted a few times and not from physicians. One stated that the system was an alpha design and not ready to be in a patient environment and another indicated that poor design caused charting in the EHR to take longer than in the paper chart.

7.4.2 Influences on Power Comments

There were a total of 199 comments on what influences power (122 pre-implementation, 77 post-implementation). Comments were analyzed for power themes by position, looking first at the pre-implementation comments and then the post-implementation comments. The themes of leadership, self confidence, and experience crossed all positions and both time frames. Both themes had positive and negative responses. All comments on power are shown in Appendix K.

"Leadership" when it was positively influencing power was open, listened and reacted to input, encouraged personnel, supported continuing education, provided opportunities and autonomy of practice. "Leadership" when it negatively influenced power was non-caring, deaf to input, did not communicate, limited opportunities, lacked intelligent responses to input, mismatched goals and mission of the organization, and created rules and requirements to be followed. For most positions, leadership represented a positive influence, but for physicians, all comments reflected hospital administration as a limiting factor.

"Self confidence" also had opposing responses. Positive self confidence includes a positive work ethic, a can-do attitude, confidence in their abilities, how they apply themselves, and being responsible for successful patient care. The negative influences of poor self confidence are identified by comments such as I have little or no power at work, I will probably not have a job in a few years, others have power over my work, or I'm under-appreciated. "Self confidence" was one of the strongest responses for both HUCs and nurses. As an adjunct to self-confidence, "Experience" also surfaced as a valued positive influence to power.

Themes shared only by Nurses, Physicians and Others, were knowledge, education, and positional authority. These were all considered positive influences on an individual's power. "Position" also reflected a certain amount of self confidence resulting from personal achievement, illustrated by the simple comment of "my two initials m.d.".

Physicians also had unique themes of systems, and people. Comments made pre-implementation indicated that physicians felt that the systems that they must use, such as an EHR, greatly influenced their power. "People", such as co-workers, nurses and administration impact the culture and political environment of the organization therefore they also influence the physician's power.

Nurses' unique themes on influences to power included communication, a team-based approach, and the professional union to which they belong. Open communication with management was mentioned but open communication was especially important between nurses and physicians. Being listened to and having opinions valued by the physician was empowering to the nurse. This open communication represented trust, respect, and confidence in their abilities and involvement in a team-based approach to care. Being involved in a multidisciplinary care team fostered collaboration, and recognition as a professional. Also, several nurses indicated that the union contract protected their rights as a professional which influences their personal power by providing a certain amount of job security.

On the post-implementation comments, many subjects took this opportunity to make comments about the CPOE system that had been implemented. These comments indicated that the system was time consuming, slowed down work, caused more charting to be done and was responsible for layoffs due to the increased costs it imposed on the organization. In relation to the system, one HUC indicated that her power was influenced because she can now help solve problems people are experiencing. Another indicated that the system diminished her workload, but it is difficult to tell if this is a positive or negative comment.

8.0 DISCUSSION

The purpose of this study was to examine the relationship between perceptions of power and CPOE attitudes and measure changes in those variables resulting from CPOE implementation. Discussion regarding the results will not include causative relationships; rather, it will focus on correlational relationships. Future research could utilize different experimental techniques to determine causative relationships and to develop methods for minimizing resistance to CPOE by enhancing power perceptions and CPOE attitudes.

8.1 RESPONSE

Even though the pediatric hospital is about one third the size of the community hospital with corresponding staffing ratios, they had a much larger original response rate, actually almost twice as many. Since the same email message of recruitment was used for both hospitals, we must assume that some other factor was influential in encouraging staff to participate. The main difference between the two hospitals was the intervention of the Chief Medical Information Officer (CMIO) at the pediatric hospital.

As stated previously about power people, opinion leaders hold this role because of their charisma (referent power), and ability to encourage and persuade people (informational power)[105, 106]. Champions may be appointed or may fall into that role because of being an early adopter or opinion leader[107], but part of the role of being a CMIO is to be a champion[106]

The CMIO at the pediatric hospital made sure to have as many email addresses as possible by collecting them as people came for system training, and then sent a very engaging message at the beginning of our original contact email (Appendix B) that encouraged participation from everyone. He stayed in communication with myself and his staff and shared

preliminary results with the hospital administration. His enthusiastic participation in the study demonstrated the magnetic effect that a positive opinion leader can have.

Although very cooperative and helpful in managing to send the original email, the contact person at the community hospital was an administrative assistant and used those email addresses that were already available. The CMIO at the community hospital was cooperative, but only remotely involved. Additional information about the community hospital was obtained from the administrative assistant who remained my direct contact.

Differences in the interactions of the CMIOs in the study are in all probability reflective of the size of the institution and the demands on the CMIO's time. However, the much larger number of responses from the pediatric hospital illustrates the importance of the influence of the champion and the use of different power bases to achieve results.

8.2 DESCRIPTION OF SUBJECTS

Logically, there was a much higher response rate from nurses than from any other position since nurses are usually the highest number of staff in any hospital. Also, the very high female response coincides with the fact that nursing is predominantly a female profession. Another reason for the high nursing response may be because, as stated earlier, nursing has been seeking to move from a seemingly powerless to a more empowered position in healthcare[109-111], and they may have had more interest in wanting to participate in a study on power than any other group. Not surprisingly, the HUCs who do not indicate a high perception of power, and the physicians who already hold a high perception of power did not feel the need to participate as much; therefore, their numbers were significantly lower. Many in the Other group may have felt that CPOE does not impact them directly and so did not respond.

A group that was not originally considered when thinking of clinicians was the Physician Extender (PE). PEs are nurse practitioners and physician assistants who function with the CPOE system in a manner very much like the physician, but do not have the same organizational power as a physician. This group occurs in a lesser number than other positions within the hospital, but it is important to consider them also. Because I do not have data on the overall number of PEs at each hospital, I cannot know whether our subject sample is adequate for reliable information

from this group. As the use of Physician Extenders is likely to increase with time, further study focused on this group could be very informative.

Almost 80% of the subjects range in age from 26 to 45 years old, so it is relatively young population. A study commissioned by Microsoft indicates that approximately 80% of people in this age group are computer users[170]. The non-physician group is fairly well educated also, with 70% of the HUCs having at least one year of college up to a Bachelors degree. A relatively young, well-educated sample of subjects that use computers would seem not to be threatened by the introduction of CPOE into their work environment from the perspective of using a computer. The recurring theme of "Ease/Easy" in the comments also reflects a comfort level with the use of technology. So it may appear that any threats to the subjects come not from the introduction of the use of technology in their work as much as it is from the changes that result. CPOE introduces changes in the power structure of the organization and its subunits[117] and this is what is threatening to the subjects.

The length of time in a position is indicative of experience and experience is a commodity held in high regard in healthcare. Experience was mentioned often in the comments as a positive influence on power for nurses, and HUCs. In the comments, it was closely associated with trust, confidence and respect from physicians and co-workers. All of these concepts were also associated with being a member of a multidisciplinary team. Hierarchical organizational structures are stable and tend to have the most power at the top of the hierarchy which diminishes as it spreads down to the bottom[117]. In a team-based structure, power is more dispersed among the members, which is why nurses may perceive themselves to be more powerful as part of a team.

There is a higher ratio of subjects from ICUs than Non-ICUs because at this point in time, the pediatric hospital has only implemented ICU units. Only a few HUCs and nurses indicated that they do not work on a patient unit, but many physicians listed themselves as an Attending MD, yet indicated that they do not work on a patient unit. This may be that these physicians cover multiple types of patient units, such as consultants, or may be specialists such as radiologists or pathologists. The same situation of covering multiple types of patient units also influences the subjects' selection of patient unit structure.

As far as previous experience with an EHR, attending physicians were the group with the largest percentage of subjects having had previous experience (80%). All other positions seemed to be evenly split between experience and no experience.

8.3 DISCUSSION OF HYPOTHESIS 1

Hypothesis 1: Introduction of computerized physician order entry (CPOE) affects a clinician's perception of her/his personal power within the healthcare environment. Different types of clinicians will experience different directions of change, and individuals' characteristics and experience will influence their baseline perceptions and attitudes.

The following questions must be discussed to answer this hypothesis:

1. What are the characteristics that affect subjects' power perceptions and CPOE attitudes prior to implementing CPOE?
2. What is the affect of having previous experience with an EHR?
3. How do the values of overall power perceptions and CPOE attitudes change after the implementation of CPOE? For whom, by how much, and is it a positive or negative change?
4. How are the subjects' six power bases affected by CPOE implementation?
5. Can CPOE attitudes be broken down into factors similar to the way power perceptions are broken into power bases?

8.3.1 Characteristics that Affect Power Perceptions and CPOE Attitudes Pre-Implementation

The analysis of characteristics showed that nurses were the only group affected by specific characteristics, which were patient unit type and unit structure. Since Carli's work on power and gender shows that women are not perceived to have as much expert or legitimate power as men[75], we might assume that gender would have an impact on power perceptions pre-implementation, but statistically it did not. Microsoft's study on age and computer use,

mentioned earlier, has shown that age is no longer a factor on computer attitudes[170], at least for the age groups included in this study. Physicians hold the highest social and professional status of all of the groups in the study[76] but this indicates a formal power more than a perceptual power[104]. Since this study investigated perceptions of power, it would appear that the formal power that various positions hold did not influence the individual's perception of their own power. Education level is closely related to position also. Recognition of formal power and education might be insinuated by each groups' pre-implementation power perception average. For the clinical groups, they went in descending order of physician, physician extender, nurse, and then HUC. The Other group was such a conglomeration of various positions with varying formal power positions that they cannot be adequately incorporated into this list.

Being incorporated into the hierarchy of an organization or being an independent party as reflected by employment status would seem to hold significance, especially for the physician, but it did not. Professional autonomy, being able to practice without interference, is truly valued[155] by both physicians and nurses and was indicated as an influential factor on power in their comments. Pre-implementation, lack of significance may indicate a counter balance of power from being part of the organizational hierarchy and freedom to practice without supervision.

Surprisingly, previous experience with an EHR system was not significant to either CPOE attitudes or power perceptions even though studies indicate that our previous experiences and context knowledge influence our decisions[152] and our perceptions[16]. However the quality of the previous EHR experience may have more impact and will be discussed in more detail in the next topic.

As mentioned before, length of time in a position is reflective of experience and experience is reflective of expert power[89]. The comments of nurses and HUCs often mentioned that experience was influential to their power. Statistically, there seemed to be a weak relationship between nurses and length of position, but the much stronger relationship was with <u>where</u> they have the experience. This is where patient unit type and unit structure become important.

The relationship between power perceptions and patient unit structure was significant for nurses power perceptions but not for anyone else. Unit structure reflects the workflow and communication structure of a patient unit and it seems logical that a relationship between power and unit structure would exist. Hierarchical-based units tend to reflect a strong legitimate power

base with very structured roles, while a team-based unit would reflect the referent power base by flexibility of roles with a collegial atmosphere and the informational power base due to sharing information and decisions. Nurses' comments on influences to power repeatedly indicate teamwork, trust, collegiality, open communication, management support, and respect which reflect unit structure characteristics. Physicians mentioned knowledge and experience, but primarily expressed distress over their time management, and productivity related to the computer systems. HUCs expressed concerns that their jobs would eventually become non-existent. It would seem that the patient unit structure was indeed most important to the nurses and therefore showed as statistically significant for only them.

So, to answer the first question for this hypothesis, "what are the characteristics that affect subjects' power perceptions and CPOE attitudes prior to implementing CPOE?" this data suggests that patient unit type and unit structure affected nurses significantly, but not the other groups. Their CPOE attitudes were affected by the type of patient unit that they work on, and their power perceptions were affected by the unit structure of their patient unit. The fact that nurses showed a relationship with any of the characteristics may be affected by the large number of nurses as opposed to the small number of subjects in the rest of the groups.

8.3.2 Previous EHR experience

As mentioned before, all of the positions were almost evenly split between having and not having previous EHR experience with the exception of the physicians. Because previous experience appears to be evenly distributed across the ages and not just in younger physicians, this does not seem to just reflect experience during their education and residency programs. They may have worked at other institutions with EHR systems prior to coming to their current hospital.

The comments relating to their experiences were predominately positive, and reflected the established benefits and drawbacks of CPOE indicated in the background[11, 40, 42]. The findings do show that the quality of the experience sets expectations for what the new system will be.

It might be expected that subjects with a previously negative experience may be setting themselves up to have a negative experience again, but that is not the case. Those subjects with a

previously negative experience had positive changes in their CPOE attitudes while those with a previously positive experience had decreases in their attitudes toward CPOE (see Table 25).

Therefore, if the subject had a negative experience they may be pleasantly surprised by the new system. For subjects that had a positive experience, they may assume that the new system will also provide a positive experience. Because new systems are often immature, the subjects with positive memories of using a mature system may be disappointed at the onset. The implication for system developers is that they must make subjects who have had a previously positive experience with an EHR aware that the new system is immature and that it may take time to eventually live up to their expectations. This should enhance subjects' CPOE attitude changes. To help shorten the time from immature to mature system, developers should also seek input from these users to discover what made the previous system so good. Seeking their input will enhance the subjects' power perceptions also.

To answer the second question for this hypothesis, "what is the affect of having previous experience with an EHR?" I conclude that having previous EHR experience sets up expectations of what the new system will be like. It also provides a resource for system developers to obtain recommendations for improvements.

8.3.3 Changes in Power Perception and CPOE Attitudes Post CPOE Implementation

In order to allow for direct comparisons of power perceptions and CPOE attitudes by groups and for each individual, the same subjects were surveyed both pre- and post-implementation. Because the most important factor is change in perceptions and attitudes, I am not concerned where the numbers fall on the scale but more with the degree of change and in which direction they change.

Looking first at the changes in the mean scores for power perception, every group experienced a decrease in their scores. A previous qualitative study examined power changes related to CPOE implementation and predicted that physicians power would decrease, but that nurses and administrators power would increase[21]. Their subjects indicated "that power flowed away from physicians to pharmacists, nurse, information technology staff and administration." Their respondents also state that power structure changes were not considered as important as

other types of changes. However, even though this study included 176 hospitals, they only interviewed one representative from each hospital who worked within the IT department and had a clinical background. The study recognized that these respondents answers may well have been positively biased due to their belief in the system[21]. I believe they also do not want to admit to a perception of increased power due to working in IT.

An earlier study by Ash et al. concludes that power changes occur from changes in power structure because of mandates from administration, loss of clinician control, and shifts in autonomy (meaning "physician" control and autonomy),[171]. This study differs from my study in several ways. First that "clinicians" in my study includes physicians, nurses, HUCs, and physician extenders. Then, they discuss power "held", which reflects organizational changes, rather than power "perceived" which reflects belief changes in individuals. Studies in business have already indicated that the introduction of IT causes decision structure changes which impacts power distribution[20]. This may be why power changes were deemed less important in their later study – they are expected consequences. However, studies regarding a healthcare worker's perception of their own power have not been done until now. Because these changes are so deeply personal, the related issues of self-esteem and self-worth are unlikely to just resolve themselves over time but will require intervention.

Another major difference between Ash's study and this one is that our definition of informational power differs. Ash et al. defines informational power as having access and control over information as defined by Robbins[172] and that power is held by IT and administrative staff[171]. This differs from Raven's definition that I use, which is the ability to inform and persuade[88], and this informational power is held by all types of healthcare workers.

Even with the differences in our studies, comments from physicians in my study reflect Ash's conclusions about power changes, such as the importance of autonomy, feeling that administration was not listening to them, or imposing rules and requirements on their practice. But in most cases, comments from other positions indicate that management listened to them and was very supportive. Because physicians are so close to the top of the organizational hierarchy, only upper management is above them and they feel the impact of changes directly, while other positions feel the support of their immediate supervisor (middle management) who acts as a buffer and protector. Most HUCs commented that a positive influence on their power was their supervisor. Ash states that often physicians will not rebuff administrative mandates, but will use

their power over nurses to pass the buck regarding CPOE [171]. Unfortunately, nurses cannot pass the buck any further, which can result in conflicts between nurses and physicians as illustrated in the earlier case studies[173].

Nevertheless, unlike the predictions made in the previous qualitative studies, my study shows that everyone perceived a decrease in power regardless of their position and their level of involvement with CPOE. The changes resulting from CPOE affect workflow, communication patterns, and reporting methods. They produce a ripple effect contributing to changes in power even to those that are not directly involved in the CPOE process. However, CPOE attitudes did not experience the same effects.

Mean scores for CPOE attitudes decreased only for those directly involved with CPOE and increased for the Other group members who are only indirectly involved. This suggests that CPOE causes changes in work patterns for those who use it, and those who do not use it only experience the benefits, such as more information available, faster processing of the information and fewer errors. This concurs with Joshi's theory of Equity Status[19] mentioned earlier. Those directly involved with CPOE have to put more inputs but receive less beneficial outcomes, whereas those indirectly involved put in little or no inputs and receive more beneficial outcomes. Prior to CPOE, physicians wrote their orders on paper, yet they were still carried out. Someone else entered them into the computer and someone else was then responsible for determining if they were correct. With CPOE, the physician must now also enter them into the computer and take responsibility for their correctness. Prior to CPOE, the Other group did not always have information available unless they called to the patient unit or waited until the patient's chart was torn down at discharge. After CPOE is implemented, with no input on their part, information is readily available when they need it. When inputs are greater than outcomes, you will get resistance, and when outcomes are greater than inputs, you will get acceptance.

Power perception changes were larger than CPOE attitude changes for all groups. This would indicate that CPOE implementation has a greater effect on power perceptions than on attitudes toward CPOE or that there are additional factors affecting power perceptions. Since an individual's perception of their own power in the workplace, reflects their self esteem and personal worth, system developers must be aware that the impact of CPOE goes beyond workflow and organizational efficiency. They must be aware that the users' perception of their power affects each individual's work satisfaction and the interpersonal harmony of the

workplace. Steps taken to reduce the impact of power changes resulting from CPOE implementation will go further toward achieving acceptance than attempting to influence users' attitudes toward the system.

Looking at the mean scores for various positions separately, it is not surprising that physicians began with the highest perception of power and the lowest attitude toward CPOE. Physicians' attitudes and experiences with CPOE systems consistently indicate they perceive CPOE as interfering with their work and causing a change in their role in the healthcare organization[174-176]. One pre-implementation comment by a physician stated that physicians "…are being asked to do the jobs of secretaries, coder, data entry people, etc. without the compensation for our time." This sets the baseline on CPOE attitudes lower.

Another pre-implementation comment from a physician on influences on power in the workplace stated, "The RNs who [sic] seem to go out of their way to place obstacles in my way. No longer an attitude of 'How may I help you' but instead 'What can I do now to obstruct this physician in the practice of medicine and patient care'" This may be a case of the nurses attempting to pass the buck back to the physician. We can see this physician feels a definite threat to her personal power in the workplace in anticipation of the system. This of course is only one physician, but it represents the fact that the implementation of CPOE can be perceived as a threat to power and could cause a resistive reaction[14, 15]. With everyone concerned over their own personal power in the workplace, the possibility of conflicts between nurses and physicians can result.

Pre-implementation, physicians had the lowest CPOE attitude of any position. Post-implementation, physicians experienced the largest statistically significant decrease in both power perceptions and CPOE attitudes than any other group. This could reflect them not wanting to be incorrect in their assessment of the pre-implementation situation, a self-fulfilling prophecy of "If I expect it to interfere with my work and cause me problems, it will."

HUCs began with the lowest perception of power of any group and experienced a decrease in power perception second only to the physicians. Pre-implementation, transcribing physician orders is a major task for the HUC and changes in the HUC's workflow resulting from CPOE are major. Several pre-implementation comments indicated the fear that their job would become extinct. One stated, "As a HUC, it seems when the MDs do put in their own orders we won't have much of a job left other than answering phones and call lights." This is a serious

perceived threat to their power in the workplace so it is not surprising that their power perception was the lowest. Conversely, their pre-implementation CPOE attitude was higher than any other group! Because they feel they have less power than anyone else, they may be more accepting of changes in their work environment that they cannot control. The changes resulting from the implementation of CPOE are considered a "mandatory" part of their job. Also, since the burden of transcribing orders is no longer a major part of their job, the loss of power may be countered by a positive change in their work burden. Post-implementation, one HUC commented, "I feel my workload has considerably diminished since going live with computerized charting!" and another said, "I can help Dr's and residents enter orders and solve problems." For them, CPOE lightened the work load and gave them a sense of importance from having expert power.

Although physicians and HUCs experienced the largest decrease in power, they seem to have very different attitudes regarding CPOE. Going back to Joshi's theory of Equity Status[19], the physicians are incurring a greater amount of input costs (more time, additional work, etc.), while HUCs have a minimal amount of input costs. We might assume then that the greater the direct net effect CPOE has on an individual's workload and role, the more sensitive they are to the loss of perceived power. Receiving outcome benefits without incurring input costs may cause the subjects to be more inclined to overlook their perceived loss of power.

Nurses also had a statistically significant loss of perceived power and CPOE attitude change. As indicated earlier, Ash's study indicated that nurses would experience an increase in power perceptions[21], but this is not the case in my study. Nurses, who used to be an integral part of the order process by verifying orders and releasing them to the appropriate areas for processing, may feel demoted because they get their orders just like everyone else. It may seem like a loss of status. Since orders may be coming in from remote locations, they now have the additional work of constantly checking for new orders. Face to face communication of orders between nurses and physicians is diminished. Also, they may perceive that the CPOE system has imposed an additional layer of control over their work just like the physicians. A post-implementation comment from one nurse states, "My work ethic and professional moral [sic] are about the only things I have power of over my work. Management and computers are to make life more streamlined and efficient, but that is not how reality is." Kossman's study of nurses' perceptions of the impact of EHR's noted one of the same concerns that physicians express which is more time is spent at the computer than at the bedside[144].

Physician extenders showed statistically significant changes in power perceptions, but only minimal non-significant changes in CPOE attitudes. They may feel that dealing with the CPOE system was delegated to them because the physician does not want to do it, but writing orders for physicians was part of their role pre-implementation. Although, they may find that they are doing more orders than before because of physician avoidance. Unfortunately, with such a small sample of physician extenders, it is difficult to analyze their perceptions and attitudes. I would suggest that a study that incorporates a much larger number of physician extenders be done before confident predictions can be made regarding their power perceptions and CPOE attitudes.

Because the physicians and HUC positions have a small number of subjects, the extreme attitudes of only a few subjects can impact the mean. After accounting for the influence of these outlier values, the physicians remain the group with the largest decrease in power perception. However, the HUC now becomes the group with the smallest decrease in power perception which coincides with having the smallest decrease in CPOE attitude. A pre-implementation comment made by one of the outlier subjects stated, "The nurse [sic] have a lot of power over my work.", and that same person stated post-implementation, " A lot of power because I don't have a lot to do that need [sic] power." These comments reflect a low perception of personal power at work which coincides with that person's very negative change in power perception score. Overall, it would seem then that the HUCs felt less change in power perception and CPOE attitude than any of the clinicians surveyed, possibly because they perceived they had less power to begin with. However, I still believe the assumption that the lightening of the order transcription burden counter-balanced loss of power.

Summarizing, the subjects perceive a much greater change in their personal power than in their CPOE attitude after the implementation of CPOE. Comparing the pre-implementation values for power perceptions and CPOE attitudes, we see that subjects (excluding the HUCs) started with a lower opinion of CPOE than they did power perception but over time, power perceptions dropped further and faster than CPOE attitudes did (see Figure 18 in the Results section). It would appear then that power perceptions are the factor that undergoes the biggest, most consistent change as a result of CPOE implementation.

So in answer to the question "how do the values of overall power perceptions and CPOE attitudes change after the implementation of CPOE?", I conclude that power perceptions undergo

a negative direction change for all subjects regardless if they are directly involved with CPOE or not. But CPOE attitudes only change in a negative direction for those directly involved with the CPOE process.

8.3.4 Changes in the Six Power Bases Post CPOE Implementation

As we saw looking at the scatter plots, changes in individuals' power perceptions fell into both the positive and negative range of values. This may reflect that different subjects experienced changes in different power bases. In varying degrees, all positions experienced a decrease in all six power bases.

The Informational power base actually experienced the largest decrease of all of the power bases for every group. This may seem odd since the purpose of a computer system is to provide more and timely information for its users, but I assume that is exactly the reason that the subjects Informational power base fell. The computer has now become the information source rather than the person. As one of the nurse subjects commented, "Information is power." Whoever holds the information, holds the power coincides with Robbins' definition of informational power[172], which they may believe has now been relinquished from the people to the computer. This holds true for all positions.

The power base with the least decrease was the Referent power base. Referent power for a clinician reflects their role as a mentor, and confidant of patient information. Because the physicians, nurses and HUCs all perceived a statistically significant decrease in their Expert power base, they may feel a slight lessening of their ability to mentor in relation to the computer system (Expert power), but feel more positively toward the responsibility of maintaining patient confidentiality in the computer (Referent power).

Apart from the overall largest and smallest changes in power bases, each position varied as to what power bases had significant decreases. Physicians had statistically significant decreases in the Expert, Informational and Legitimate power bases. We've already discussed the Informational and Expert power bases, but the Legitimate power base suggests that they feel that their role has changed in the organization. As the earlier comment expresses, physicians feel as though they are now doing jobs that are demeaning to their professional status. Other statements indicate they believe that their autonomy is in jeopardy because of the regulations on using the

system, and their status has diminished because of administration's lack of interest in the physicians' input.

Nurses experienced statistically significant decreases in the same three power bases as the physicians with the inclusion of the Reward/Coercive power base. Legitimate power decreases for the nurse could reflect the feeling of demotion from being an integral part of the order entry process to being just another group receiving the orders. Previously, in the process of verifying physician orders, the nurse was aware of the work to be done, but now that orders can be entered from anywhere at any time, that direct line of communication that gave nursing more of a collegial relationship with physicians has been severed. The nurse must do additional work to constantly check for new orders. Unlike the physician, the nurse is an employee of the hospital and must follow the mandatory guidelines for using the system. Failure to follow these guidelines would result in reprimands or punishment. The decrease in the Reward/Coercive power base would indicate another layer of control over their work diminishing their own control over their work environment.

The HUC has statistically significant decreases in the Reward/Coercive, Informational, and Expert power bases. The previously mentioned rationales for the Reward/Coercive and Informational power bases would apply to the HUC as well as the others, but the Expert power base decrease may have different connotations. Physicians and nurses have expertise in their field based on their education and credentialing, but the HUC has expertise based on knowledge of the work environment and managing the correct communication of physician orders. Managing any computer systems on the unit is also usually within the realm of the HUC's expertise. This role of computer expert has now been delegated to someone else which diminishes the HUCs' perception of expert power.

The physician extender had no statistically significant power base decreases, but this could easily be because of the small number of subjects. The Other group had significant decreases in the Informational and Legitimate power bases. Even though the Other group does not have direct contact with the CPOE process, they have also been the source of various types of information for the clinicians that may not have been available through any other sources, but now can be found in the computer. This may reflect a perceived demotion of their role in the organization from a valuable information source to a perception of a data entry clerk also. This perception of a change of role would also have implications for their Legitimate power.

With regard to the final question for hypothesis 1, "how are the subjects' six power bases affected by CPOE implementation?" I conclude that the Informational power base was most drastically decreased for all groups because they no longer perceive themselves as the source of information. Otherwise, each group has different changes for different power bases.

8.3.5 Factor Analysis of CPOE Attitudes

Using the word pairs for CPOE attitudes used in the SDPP survey, the factor analysis identified four factors. The four factors are Impact (workflow and communication), Use (physical system), Data (data in system), and Discretion (mandatory or optional). When considering CPOE attitudes, this covers the gambit of interaction with the system – do I use it or not, if I do use it, how easy/hard is it to use, what does it do for me, and what can I get out of it?

Each of these factors has a relationship with power also: Do I have the power to choose whether or not to use it? Will I have the power to be able to learn to use it successfully? Will using it enhance or hinder my power? Will the information enhance or hinder my power?

Each of these questions reflects issues already identified. The choice of using it brings in the issue of autonomy and whether or not I perceive that the organization has the authority to make me use it. Learning to use a new system can make a person feel very insecure and no one wants to look stupid because they can't figure it out. It has already been acknowledged that the implementation of IT impacts workflow, in a positive way for some, but in a negative way for many. The information in the system that requires the user to follow it or provide a reason why they do not, affects power negatively for those who don't wish to follow it and positively for those who need the information available, even from remote locations, in order to do their work.

These four factors present a very definitive and separate view of CPOE attitudes, but just as the factors in the statistical factor analysis overlapped, CPOE attitudes can overlap. For example, using order sets and getting information from the system impacts workflow and it also impacts the data contained in the system. However, these four factors identify the main concepts impacting CPOE attitudes.

So, in answer to the question, "can CPOE attitudes be broken down into factors similar to the way power perceptions are broken into power bases?" yes, they break down into four major areas of CPOE attitudes, but there is a great deal of overlap between these four areas.

Based on the answers to the four confirming questions, hypothesis 1 is accepted. CPOE does affect a clinician's perception of his/her personal power within the healthcare environment, different clinicians do experience different types of changes, and individuals' circumstances do influence their baseline perceptions and attitudes.

8.4 DISCUSSION OF HYPOTHESIS 2

Hypothesis 2: There is a positive correlation between changes in perception of personal power, work organization structure, and the change in CPOE attitudes. Assuming decreasing CPOE attitudes are reflective of resistance, this would indicate a negative correlation between power perceptions and degree of resistance to the introduction of CPOE.

To discuss hypothesis 2, it is necessary to answer the following questions:

1. Is there a positive correlation between power perceptions and CPOE attitudes?
2. Is there a correlation between CPOE factors and the power bases?
3. Do subjects with a negative change in their power perception also have a negative change in their CPOE attitudes?
4. Is there a relationship between power perceptions, CPOE attitudes and unit structure?

8.4.1 Correlations Between Power Perceptions and CPOE Attitudes

A correlation is a measure of the relationship between two variables, meaning that "when one variable deviates from its mean, we would expect another variable to deviate from its mean in a similar way"[177]. In my hypothesis when I state that I expect a positive correlation, I mean that I expect that the direction of change of both power perception and CPOE attitudes to change in the same direction, and by negative correlation, I mean that if power perceptions decrease, resistance will increase (indicated by CPOE attitudes decreasing).

There is a statistically significant positive correlation between power perceptions and CPOE attitudes both pre- and post-implementation. This indicates that subjects perceived that

CPOE would have an impact on their personal power even before the system was implemented and confirmed it after the system was implemented. Because IT implementation has been shown to result in power changes due to changes in workflow, communication patterns, decision structures and resource distribution[20], it is easy to believe that subjects' would anticipate pre-implementation that a new computer system would change their work environment, and therefore change their control over their work. Post-implementation, they would have experienced these changes not only in their workflow, but also in communications and roles. So, yes, there is a positive correlational relationship between power perceptions and CPOE attitudes both in anticipation of the implementation of CPOE and in the realization of it.

Analyzing by the different power bases, the correlations remain statistically significant with the exception of post-implementation Expert power. It was no longer significant for anyone. To determine why this happens, it will help to look at Expert power by each position group.

Aggregating the Expert power base by position, we see that pre-implementation, this correlation between Expert power and CPOE attitudes was significant for HUCs, nurses and the Other group. But post-implementation, it is only significant for the HUCs. This reflects their belief that the introduction of this system has affected their expert status on the patient unit in some way, whereas for the nurses and Others, they realize after implementation that their expert power does not solely lie in expert use of the system. The physicians and physician extenders do not associate their expertise with the use of the CPOE system at any time.

In summary, the correlations answer the question, "Is there a positive correlation between power perceptions and CPOE attitudes?" by indicating a relationship between power perceptions and CPOE attitudes both before and after the CPOE system. If power perceptions decrease, CPOE attitudes also decrease. For the individual power bases, all power bases are significantly correlated to CPOE attitudes with the exception of the Expert power base. The only group with a relationship between Expert power and CPOE attitudes post-implementation is the HUCs because a major part of their expertise on the patient unit is tied to the computer system.

8.4.2 Correlations Between Power Bases and CPOE Attitude Factors

Correlations were done between the power bases and the CPOE factors to determine if there were significant relationships. Both pre- and post-implementation, all of the power bases were

significantly correlated with the CPOE "Impact" factor. This would indicate that CPOE attitudes about workflow and communication impact all of the power bases.

Surprisingly, the "Discretion" factor, which represents whether use of the system is perceived as mandatory or optional, had a negative correlation with the power bases and was negatively correlated with different power bases pre- and post-implementation. Pre-implementation it was negatively correlated with Reward/Coercive, Expert, and Legitimate while post-implementation it was negatively correlated with Legitimate and Referent. According to dissertation research by Boss on information security precautions, rewards were not a motivator for users, but punishment as a result of non-compliance to mandatory processes was[178]. Therefore, as one's perception of Reward/Coercive power decreases, their attitude about mandatory use increases toward optional. This type of negative correlation is what you would expect. In other words, as a user, the more punishment I perceive will occur from non-compliance with using the system, the more mandatory I feel its use to be. The significance of this correlation did not hold post-implementation, perhaps because there was no punishment given for non-compliance, or because there were no clear policies in place for handling non-compliance.

Legitimate power actually maintained a significant correlation with all four of the CPOE attitude factors both pre- and post-implementation. This would seem to indicate that the formal role that a user has within the organization affects all factors of their CPOE attitude.

Because Informational power had the largest decrease of all of the power bases, we see that there was a significant relationship with CPOE attitudes regarding Data, Impact and Use. Post-implementation the significant relationship remained only with Impact and Use. This would reflect the fact that if a user feels that they are losing their identification as the source of information, it would seem logical that they would feel that this also has a negative effect on their workflow, communication and use of the system. Attitudes about data is no longer significant because having the data available in the computer is a positive factor even for those who feel diminished as an information source. Over time, these relationships may change as the user realizes that the computer as an information source can benefit their own informational power.

The answer to the question, "is there a correlation between CPOE factors and the power bases?" is yes, there is a relationship between the various power bases and the CPOE attitude

factors. Legitimate power affects all factors of the CPOE attitudes, and the Impact factor that reflects workflow and communication attitudes affects all of the power bases. Finally, discretionary use of the system is negatively correlated to the punishment that the user perceives they will receive for non-compliance.

8.4.3 Matching Power Perception and CPOE Attitudes Direction Changes

As I stated earlier, since I was looking for a positive correlation between power and CPOE attitudes, I would expect that when power perceptions change, CPOE attitudes would also change in the same direction. In over 60% of all individuals the two variables matched in direction change. This stayed consistent across all positions. This is supported by Figure 18 in the Results section, which graphically shows the relationship between the changes in power scores and CPOE scores over time. The only difference is that power perceptions decrease at a much steeper rate than CPOE attitudes.

Because I have the same subjects pre- and post-implementation, it is important to know if the changes from pre- to post-implementation for the individuals (within-subjects) and between members of the groups (between-subjects) are likely to have happened by chance or if they are more likely to have happened as a result of the intervention of implementing CPOE[177].

Within-subjects, I found that for all groups the changes in power perception are more likely to be attributed to something other than chance. It may be the CPOE implementation or some other unknown factor. CPOE attitudes for nurses and physicians were also attributed to something other than chance. However, changes in CPOE attitudes for the other three groups - HUCs, physician extenders and Others – may be attributed to chance alone. For all groups, the between-subjects (between members within each group) effects showed that the changes in both power perceptions and CPOE attitudes are attributed to something other than chance.

I conclude from this that when considering system users as a group (nurses, physicians, HUCs, etc.) the changes in power perception and CPOE attitudes are a result of the implementation of CPOE. As individuals, nurses and physicians experience changes in power perceptions resulting from CPOE implementation as threatening to their personal power whereas the other three groups do not necessarily perceive it that way.

Therefore, to answer the question, "do subjects with a negative change in their power perception also have a negative change in their CPOE attitudes?" the answer would be yes for the majority of subjects. Over time, both power perceptions and CPOE attitudes decrease, with power decreasing faster than CPOE attitudes. Within individuals, power perceptions change as a result of something other than chance, but attitudes about CPOE may change for some individuals based on chance alone. However, changes for the positions as a group are attributed to something other than chance. Going forward, if we want to influence resistive behavior, it may be more effective to address power perception changes since they change more rapidly rather than CPOE attitudes.

8.4.4 Power Perceptions, CPOE Attitudes and Unit Structure

Unit structure includes Team-based patient units and Hierarchically-based units. Hierarchical is the traditional structure that has a definitive chain-of-command where information goes up and down through the appropriate channels and often follows strict protocols[117, 146]. Team structure is more open-ended and relies on interdisciplinary communication and decision making which encourages novel solutions[146]. To determine if these characteristics identify a unit as Team-based or Hierarchically-based, a series of four questions were asked about communication, care decisions and protocols and then the subject was asked to self-identify their patient unit structure as Team or Hierarchy based. These questions were asked both pre and post-implementation to subjects who identified themselves as working on a patient unit.

My intention was to see if for example, subjects answered the questions with answers illustrating a team-based structure, would they then self-identify their unit structure as team-based also? Comparing the answers of the unit structure questions to the self-selected unit structure, I found that the unit structure answers rarely matched the subjects' self selected unit structure. In several instances from pre- to post-implementation, the subject changed their answers to the questions, and still identified the same unit structure or kept the same answers and changed their self selection of unit structure. This tells me that subjects perceive the structure of their patient unit based on their feelings and perceptions, not according to the presence or absence of multidisciplinary meetings, protocols, decision processes or information flow. Across

all positions, their perceptions identify the perceived power structure of the unit rather than the processes.

It appears that for my subjects, teams are evaluated by open communication, respect, trust, and collegiality. Being part of an interdisciplinary team is not as important to physicians as it is to other positions[179], but nurses especially value the feeling of collegiality and being heard by physicians. These concepts were indicated as influences on power by such comments as, "An awesome team of healthcare providers who are respectful, open to questions and work well together." and "Physicians respect for the nursing role & verbal acknowledgement of our experience/knowledge when deciding a plan of care for a patient." Because nurses have been struggling for so long to achieve empowerment[109-111] and consideration as a peer in a team rather than a subordinate, they appear to value the respect and trust of physicians and "being heard" by them as the factors that makes them part of a team more than any formal organizational structure.

Nurses had a higher pre- and post-implementation power perception score on the team-based units than they did on the hierarchy-based units. I would then assume that subjects that believe they are part of a team-environment perceive more personal power in the workplace. Hierarchically-based nurses experienced the largest decrease in CPOE attitudes of any position, which would seem to represent that CPOE affected their open communication with the physicians.

As a member of an interdisciplinary team, physicians perceive themselves as the team leader, find themselves challenged by the overlapping skills and knowledge of non-physician team members and are not formally trained in interdisciplinary teamwork in medical school[179]. So even on a team-based unit, physicians may still see themselves in the role of the leader or the top of the hierarchy.

Looking at attitude scores, physicians on hierarchically structured patient units had the very lowest attitudes toward CPOE than any other aggregated combination of attributes, both pre and post-implementation (see Table 36 and Appendix H). As mentioned earlier, perhaps because they sit at the top of the hierarchy, they believe that CPOE would have a negative impact on their power. Because of this low CPOE attitude, I would conclude that these physicians will probably express a higher level of resistance to the CPOE system than team-based physicians.

Earlier, I indicated that all positions suffered a perception of power loss, but the physicians on the hierarchical units perceived a greater decrease in power perceptions than team

unit physicians. Pre-implementation, hierarchical unit physicians had a higher power perception score than team-based physicians. Post-implementation physicians had a higher power perception score than any of the other positions in the hierarchy-based group. I would then assume that hierarchically-based physicians perceive themselves to be more powerful than team-based physicians, and perceive themselves to be the most powerful position on the patient unit – the top of the hierarchy. But it also shows that they have more power to lose from CPOE implementation than anyone else which is why they had a much larger decrease than anyone else, on team or hierarchy units.

The HUC had the lowest perception of power both pre- and post-implementation on the hierarchical units. This indicates that these HUCs perceive themselves as the lowest rank on the patient unit hierarchy. Whereas on the Team-based units, even though they have a lower power score pre- and post-implementation than other team members, HUCs have a significantly higher perception of their power in a team environment. In their comments, HUCs also valued "being heard", but being heard by their supervisor, not the physician. The Other group, which also contained patient unit based people such as nursing assistants, and social workers, experienced much larger decreases in power perception on the hierarchy units and larger increases in CPOE attitudes on team-based units. There was such a small sample of physician extenders that it is not reasonable to evaluate their results since there was only one physician extender in the hierarchy group.

In answer to the final question, "is there a relationship between power perceptions, CPOE attitudes and unit structure?" , it would seem that power perceptions decrease for all members of the healthcare team, but the levels of power perceptions on team-based units are higher than hierarchically-based units both pre and post-implementation. CPOE attitudes dropped for the three main positions directly involved with CPOE (physicians, nurses and HUCs), but they had a much larger decrease in attitude on the hierarchical units. I conclude that team-based subjects maintain a higher perception of power in the workplace post-implementation than hierarchical-based subjects and CPOE attitudes on hierarchical units are more negative than team units which could reflect a higher possibility of resistance to CPOE.

Based on the answers to the four confirming questions, hypothesis 2 is accepted. There is a statistically significant positive correlation between power perceptions and CPOE attitudes, there is a correlation between the CPOE factors of Impact, Use, Data, Discretion and the six

power bases, the majority of subjects had power perceptions and CPOE attitudes changing in the same direction, and unit structure does have an impact on power perceptions and CPOE attitudes.

8.5 LIMITATIONS

A major limitation of this study is the fact that the data collection from the pediatric hospital is incomplete. With data from only 25% of the subjects from that hospital, it is not possible to accurately do any analytical comparisons between the hospitals. Also, the only subjects from that hospital are from the ICU units and the Other group. This may unfairly bias any comparisons done by patient unit type since it is weighted heavily toward ICU patient unit subjects. Since data was collected from those who were in the Other group at the pediatric hospital, comparisons for them should be acceptable.

Because this study was correlational in nature, it does not allow me to do more than speculate on causality. Based on the studies referenced in this document, I feel that my assumptions are not without substance, but they are assumptions just the same. Correlation does not imply causation, so further work to confirm or refute my assumptions is necessary

Another limitation is that all of the subjects who participated in the study use email. I assume that people who do not use email may be less comfortable with computers than those who do use email. Therefore, it is possible that had I included those that do not use email, the baselines for power perceptions and CPOE attitudes would have been lower and that the decreases may have been larger.

A larger number of participants would provide more confidence in the results. There is an adequate number of nurses, but a larger number of physicians, HUCs, and especially physician extenders would allow additional confidence in my findings. It would also be interesting to separate the Other group into their actual positions in the organization and recruit more people for each. To see how the ripple effect on power perceptions impacts each of these groups would indeed be interesting. Is it truly a ripple effect? Are the effects weaker as it gets further from the patient unit environment?

Finally, only two hospitals were involved in the study. Having more hospitals and more subjects involved would greatly increase the generalizability of the results and conclusions.

Attempts to locate and involve hospitals that planned to implement CPOE within the time frame of this study were disappointing. However, based on these results and the interest that they may attract, a larger study base may be available for follow up studies.

8.6 FUTURE WORK

Because data collection is incomplete at this point, future work will include completing the data collection at the pediatric hospital and re-evaluating these results with the complete data set. At that point, I would like to do comparisons between hospitals for the factors studied here by position, and for the factors that make these hospitals different, such as size, specialty, CPOE system, and implementation method. Studying these factors may necessitate additional data collection from these and other subjects at these hospitals.

Also, there are 407 pre-implementation surveys that have not yet been examined. These are surveys of people who only completed the pre-implementation survey. Hopefully, many of these subjects will be included in the final data collection from the pediatric hospital but there may be additional information that can be gleaned from examining just these pre-implementation cases, such as more comments.

This study has identified a relationship between power perceptions and CPOE attitudes. It has laid the groundwork for future studies on establishing a causal relationship between these variables and how they relate to resistance to CPOE implementation. Using other experimental designs, such as multiple repeated measures, having a control, and qualitative methods of interviews and observations, I would also like to gather more information from subjects about the perception of power loss, where they feel the power goes when is goes away from them, and observe subjects for examples of resistive behavior and interaction with a CPOE system.

We know how power perceptions impact CPOE attitudes, but what else do these power perception changes impact? We've seen that conflicts between nurses and physicians have risen over CPOE implementations because of power changes, and how power perceptions change in relation to whether a patient unit it hierarchical or team-based. Both of these findings warrant further study.

Taking this a step further, I would like to see how changes in power perceptions of clinicians impacts patient outcomes. We know that workflow and communication changes impact power perceptions of clinicians directly involved with CPOE, but does this ripple effect that impacts those indirectly involved with CPOE go out as far as patients?

It would be beneficial to improve and enhance the SDPP survey to include better and additional word pairs to reflect the power bases and the CPOE factors. This instrument can become a standardized tool used by developers pre-implementation to determine existing power perceptions and CPOE attitudes before even starting the project. Used by those who are within the organization, it can be administered multiple times, or can be modified to include additional areas of concern.

Studying the causal relationship between power perceptions and CPOE attitudes will lead to changes in implementation and training methods. These changes would be designed to mitigate the effects of diminished power perceptions, bolster waning power bases, and minimize the resistance reflected by negative CPOE attitudes. Future research would be to design changes in the implementation and training processes and pilot them for effectiveness based on patient outcomes and clinician acceptance.

In addition, I would like to do research on my theory of Ranked Order of Influence. The concept that I have described in this document is based on a very limited set of case studies. I would like to examine more cases applying this ranking of influence, then attempt experimental research in a controlled setting, and finally be able to apply these techniques to real world settings. My goal is to enable this as a tool for system developers and administrators to gain cooperation and acceptance of new systems when faced with resistive situations.

Obviously, these ideas are just what come to mind now as a result of this first step, but as more of these research projects are performed, new and better ideas and concepts will emerge. From that, I can develop methods and applications that can be used in the real world. That is what is so exciting about research; we are constantly learning, expanding our ideas, and creating better tools and methods for those working in the clinical world.

9.0 CONCLUSIONS

From this research, I have made a number of conclusions. First, the implementation of CPOE affects the healthcare worker's perception of their personal power in the workplace regardless of their position and their level of contact with it. In most cases, the changes cause a decrease in perceptions of personal power. Post-implementation of CPOE, attitudes toward CPOE are influenced by how directly involved with the CPOE process that person is. After implementation, attitudes tend to diminish for those that are directly involved with the CPOE process and improve for those indirectly involved.

Because this study has shown a statistically significant relationship between power perceptions and CPOE attitudes, we can assume that actions that affect one of these variables will affect the other. However, power perceptions diminish at a steeper rate than CPOE attitudes.

Breaking the concept of power down into the six power bases, I found that different power bases are influenced in different ways for different healthcare workers. However, the Informational power base, which is the ability to provide information or to persuade, had the most negative change for all positions.

These conclusions are the first step toward measuring power perception changes in the individual healthcare worker as a result of the implementation of CPOE. The SDPP survey that was created for this study provides a method for gathering quantitative data on power perception changes and changes in CPOE attitudes. Being able to measure those perceptual changes, will allow system developers, administrators, and information officers to know the degree of change their system design is causing among the healthcare workers.

APPENDIX A

SDPP SURVEY PRE-IMPLEMENTATION OF CPOE

Instructions: Please complete the following information. (A response is required for each question unless indicated as Optional.)

Start Survey

Question 1 of 23

Gender: ☐ Female

☐ Male

Next

Question 2 of 23

Age:

- ☐ 25 years or less
- ☐ 26-35 years
- ☐ 36-45 years
- ☐ 46-55 years
- ☐ 56–65 years
- ☐ Greater than 65 years

Previous Next

Question 3 of 23

Position:

- ☐ Unit Clerk/Secretary
- ☐ Nurse
- ☐ Attending physician
- ☐ Other:_____

Length of time in this position? _____

Previous Next

Question 4 of 23

Please indicate the highest level of education you have achieved:

- ☐ Less than a High School Diploma
- ☐ High School Diploma
- ☐ Vocational School Diploma
- ☐ 1 - 2 Years of College
- ☐ 3 or more Years College
- ☐ Bachelor's Degree
- ☐ 1 - 2 Years Graduate School
- ☐ 3 or more Years Graduate School
- ☐ Master's Degree
- ☐ Doctorate Degree

Previous Next

Question 5 of 23

Employer: ☐ Employed by the healthcare organization/hospital

☐ Independent practitioner *(You are not employed by this healthcare organization/hospital but you do work there and you may possibly work at other organizations/hospitals also)*

Previous Next

Question 6 of 23

Area of specialty of your work environment (please check all that apply):

☐ Intensive/Critical Care unit

☐ Non-invasive specialty (*Example: patients are on your unit are there to have medical care or therapy.)*

☐ Invasive specialty *(Example: patients on your unit are there specifically because they are having surgery)*

☐ Do not work on a patient unit.

Previous Next

(If the person selects DO NOT WORK ON A PATIENT UNIT they will be taken to question #12.)

Question 7 of 23

Does your patient unit routinely have multi-disciplinary meetings to determine the patient's care?

☐ Yes

☐ No

Previous Next

Question 8 of 23

<u>Routinely</u>, do physicians on your patient unit make decisions on patient care with minimal input from other care disciplines (e.g. physical therapy, social work, nursing)?

☐ Yes

☐ No

Previous Next

Question 9 of 23

Does patient care information have to pass through a chain of command to/from the physician, or can any healthcare worker approach the physician with patient care information?

- ☐ Patient care information comes through a chain of command to/from physician
- ☐ Any healthcare worker can approach physician with patient care information

Previous Next

Question 10 of 23

<u>Usually</u>, does your unit arrive at novel or innovative solutions in patient care based on multi-disciplinary decisions or does your unit follow a strict protocol on patient care?

- ☐ Novel/innovative solutions based on multidisciplinary decisions
- ☐ Follow strict protocol

Previous Next

Question 11 of 23

Would you consider your patient unit to be Team-Based (group decisions on patient care) or Hierarchically-Based (a formal chain of command on patient care)?

☐ Team-Based patient unit (group decisions on patient care)

☐ Hierarchically-Based (formal chain of command on patient care)

Previous Next

Question 12 of 23

P*revious experience with any electronic health record (EHR):*

(An EHR is any hospital computer system that you use to enter orders, document on patients, look up results, or chart medications, such as CliniPac, Cerner, SMS, TDS, Eclipsys, Emtek.):

☐ Yes

☐ No

Previous Next

(If they answer YES to question #12, they are taken to questions 13 through 17.

If they answer NO to question #12, they are taken to question 18.)

Question 13 of 23

Please indicate what you did within any or all of the EHR systems that you've used previously (check <u>all</u> that apply):

- ☐ Entered orders
- ☐ Charted medications
- ☐ Looked up test results
- ☐ Wrote prescriptions
- ☐ Documented notes
- ☐ Documented history and/or problems
- ☐ Documented assessments
- ☐ Other: _____

Previous Next

Question 14 of 23

Length of time you worked with any EHR systems previously (please fill in a number next to the unit of time):

_____ days
_____ week(s)
_____ month(s)
_____ year(s)

Previous Next

Question 15 of 23

How <u>long ago</u> did you last work with an EHR (please fill in a number next to the unit of time):

☐ Currently work with an EHR

_____ days
_____ week(s)
_____ month(s)
_____ year(s)

Previous Next

Question 16 of 23

Do you feel your experience with an EHR was:

☐ Positive

☐ Negative

Previous Next

Question 17 of 23

(Optional) Why do you think your experience with the EHR was either positive or negative?

Previous Next

Instructions: Please color in **one** dot between each set of words that reflects how you feel.

EXAMPLE:

Today, I am...

happy	○ ○ ● ○ ○ ○ ○ ○ ○ ○ ○	sad
sick	○ ○ ○ ○ ○ ○ ○ ○ ○ ● ○	healthy

Previous Next

Question 18 of 23

At my work, I have…

opportunities	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	nowhere to go
uncertainty	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	security
experience	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	inexperience
education	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	no education
knowledge	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	ignorance
self-doubt	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	confidence
secrets	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	communication
arguments	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	discussions
ideas	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	rules
authority	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	no authority
goals	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	disorder
honesty	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	dishonesty
influence	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	no-say
cooperation	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	resistance
conflict	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	agreement

Previous Next

Question 19 of 23

At my work, I am...

rewarded	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	punished
restricted	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	permitted
encouraged	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	discouraged
respected	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	looked down on
in control	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	supervised
independent	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	dependent
a student	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	a teacher
asked	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	ignored
obedient	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	in charge
complimented	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	criticized
a leader	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	a follower

Previous Next

Question 20 of 23

Computerized Physician Order Entry (CPOE) is…

good	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	bad
fast	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	slow
harmful	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	helpful
difficult	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	easy
simple	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	complex
safe	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	dangerous
time wasting	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	time saving
bothersome	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	useful
efficient	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	inefficient
secure	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	vulnerable
powerful	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	limited
trustworthy	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	unreliable
fun	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	boring
consistent	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	inconsistent
mandatory	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	optional

Previous Next

Question 21 of 23

CPOE Information is…

complete	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	incomplete
accurate	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	inaccurate
useful	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	useless
public	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	private
confidential	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	unprotected
questionable	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	reliable

Previous Next

Question 22 of 23

What CPOE does...

divides	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	links
informs	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	misleads
improves	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	worsens
organizes	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	confuses
communicates	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	keeps hidden
warns	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	annoys
enables	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	blocks
less work	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	more work
strengthens	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	weakens

Previous Next

Question 23 of 23

What do you feel has influenced how much power you have over your work?

Previous

SUBMIT SURVEY

By completing this survey, you are entered in a drawing for a

$50 cash gift card

along with the other research participants at your healthcare organization.

Thank you for participating in this research study and Good Luck!

CLOSE

APPENDIX B

SOURCES OF POWER AUDIT

Where do you get your power?

Circle the number for each item below that represents your best estimate.

START

When I attempt to influence others, they usually comply:

	Never Sometimes Always
	1 2 3 4 5 6 7 8 9 10
1. because they are convinced of the facts I present.	○ ○ ○ ○ ○ ○ ○ ○ ○ ○
2. because of my logical presentation.	1 2 3 4 5 6 7 8 9 10
	○ ○ ○ ○ ○ ○ ○ ○ ○ ○

NEXT

When I attempt to influence others, they usually comply:

	Never				Sometimes					Always
3. because of my experience.	1	2	3	4	5	6	7	8	9	10
	○	○	○	○	○	○	○	○	○	○
4. because of my education, my knowledge.	1	2	3	4	5	6	7	8	9	10
	○	○	○	○	○	○	○	○	○	○

PREVIOUS **NEXT**

When I attempt to influence others, they usually comply:

	Never				Sometimes					Always
5. because they like me.	1	2	3	4	5	6	7	8	9	10
	○	○	○	○	○	○	○	○	○	○
6. because they want to be cooperative.	1	2	3	4	5	6	7	8	9	10
	○	○	○	○	○	○	○	○	○	○

PREVIOUS **NEXT**

When I attempt to influence others, they usually comply:

	Never				Sometimes					Always
7. because they respect my position.	1	2	3	4	5	6	7	8	9	10
	○	○	○	○	○	○	○	○	○	○
8. because that is part of their job.	1	2	3	4	5	6	7	8	9	10
	○	○	○	○	○	○	○	○	○	○

PREVIOUS **NEXT**

When I attempt to influence others, they usually comply:

	Never				Sometimes					Always
9. because they know they will be rewarded.	1	2	3	4	5	6	7	8	9	10
	○	○	○	○	○	○	○	○	○	○
10. because they know I recognize cooperation.	1	2	3	4	5	6	7	8	9	10
	○	○	○	○	○	○	○	○	○	○

PREVIOUS **NEXT**

When I attempt to influence others, they usually comply:

	Never			Sometimes					Always
11. because they know I can punish them.	1	2	3	4	5	6	7	8	9	10
	○	○	○	○	○	○	○	○	○	○
12. because they know I will enforce my decisions.	1	2	3	4	5	6	7	8	9	10
	○	○	○	○	○	○	○	○	○	○

PREVIOUS

SUBMIT SURVEY

APPENDIX C

EMAIL SENT TO SUBJECTS PRE-IMPLEMENTATION

Dear staff member

You are being asked to participate in a research study in which we will investigate the relationship between perceptions of your personal power within your work environment, and computerized physician order entry (CPOE). Those of you who do not work on a patient unit are being asked to participate as a "control" for this study.

This is what the study involves:

1) Click the link below . You will be taken to a screen that explains everything about the study and will give you the opportunity to say "I agree to participate" or "I do NOT want to participate."

Click here to access the survey.

If you agree to participate, you will be taken to a 23 item online survey (for those of you that do not work on a patient unit, it will be a few questions less) that will record your perceptions of the type of patient unit you work on, your perceptions of your personal power within your work environment, and your perceptions of CPOE. The survey is done online and will take approximately 10 minutes to complete. NO ONE at your hospital will know who participated and who did not!

PLEASE COMPLETE THE SURVEY NO LATER THAN SUNDAY, APRIL 15, 2007.

At this time you will entered into a drawing for a $50 cash gift card.

One participant's name at your healthcare organization will be drawn to receive the gift card.

Six months after the implementation of CPOE at your healthcare organization,

2) You will receive another email asking you to take an even shorter version of the same survey again, and you will be entered into another drawing for a $50 cash gift card at your hospital. Since only those that participated the first time will be asked to participate the second time, your odds of winning will be even greater!!

If you choose NOT to participate, you will NOT be taken to the survey form, you will not be submitted for the $50 cash gift card drawing, and you will NOT be asked to participate in the second survey process.

If you have questions not answered on the form, please feel free to call or email me. I think you will find the survey easy to complete, and I wish you good luck in the drawing!!

Christa E. Bartos RN, MSIS, MS
Department of Biomedical Informatics
School of Medicine
University of Pittsburgh
Phone: (412) 648-6704
Email: bartce@cbmi.pitt.edu

APPENDIX D

ELECTRONIC CONSENT FORM

TITLE: Perceptions of Personal Power and Their Relationship to Clinician's Resistance to the Introduction of Computerized Physician Order Entry

PRINCIPAL INVESTIGATOR

Christa E. Bartos, RN MSIS MS
NLM Fellow
Department of Biomedical Informatics
School of Medicine
University of Pittsburgh
Suite M-183 VALE
Pittsburgh, PA 15260
Telephone: 412-648-6704
ceb2@pitt.edu

CO-INVESTIGATORS:

Rebecca S. Crowley, MD
Assistant Professor of Biomedical Informatics
School of Medicine
University of Pittsburgh
WG19.1, 5230 Centre Avenue
Pittsburgh, PA 15232
Telephone: 412- 623-1752

George Reynolds, M.D., M.M.M.
Director, Pediatric Critical Care

Chief Medical Informatics Officer
XXXXX Hospital
XXXXXX Street
XXXXXX, NE 111111
Telephone: 555-555-5555

Why is this research being done?

You are being asked to participate in a research study in which we will investigate clinicians' perceptions of their personal power within their work environment and their perceptions of computerized physician order entry (CPOE). We are investigating how these perceptions may be related to a clinician's resistance to the introduction of CPOE into that work environment.

Who is being asked to take part in this research study?

You are being invited to take part in this research study because you are an attending physician, a nurse, or a unit clerk/secretary/coordinator on an inpatient unit, OR because you do not work with the CPOE system directly and you are acting as a "control" for the study . People invited to participate in this study must work within a hospital environment, but need not be employed by the healthcare organization. This study is being performed on all individuals willing to participate.

What procedures will be performed for research purposes?

If you participate in this study, you will be taken to a 23 question online survey (a few questions less for those of you that are in the "control" group) that will record your perceptions of the type of patient unit that you work on, perceptions of your personal power within your work environment and your perceptions of CPOE. This survey will be administered twice - once now, prior to the implementation of the CPOE, and then we will contact you again six months after the CPOE implementation. The total time to complete the survey should be approximately 10 minutes.

What are the possible risks, side effects, and discomforts of this research study?

There is a slight risk of breach of confidentiality of survey results, though this is unlikely.

What are possible benefits from taking part in this study?

You will likely receive no direct benefit from taking part in this research study.

Will I be paid if I take part in this research study?

At the end of the survey period, a drawing for a $50 cash gift card will be held for participants at your hospital. Your name will be submitted for the $50 cash gift card drawing upon submission of the completed online survey form. One participant's name at your healthcare organization will be drawn to receive the gift card. A drawing will be held after your pre-implementation participation and then another drawing after your post-implementation participation.

Who will know about my participation in this research study?

Any information about you obtained from this research will be kept as confidential (private) as possible. Only the principle investigator (PI) will have access to the completed survey information and identification of the participants, which means that no one at your healthcare organization will have access to any identifiable information. All records related to your involvement in this research study will be stored in a locked file cabinet. Your identity on these records will be indicated by a case number rather than by your name or email address, and the information linking these case numbers with your identity will be kept in a locked file cabinet separate from the research records. You will not be identified by name or email address in any publication of the research results.

Who will have access to identifiable information related to my participation in this research study?

In addition to the principle investigator listed at the top of this authorization (consent), the following individuals will or may have access to identifiable information related to your participation in this research study:

Authorized representatives of the University of Pittsburgh Research Conduct and Compliance Office may review your identifiable research information for the purpose of monitoring the appropriate conduct of this research study.

For how long will the investigators be permitted to use and disclose identifiable information related to my participation in this research study?

The investigators may continue to use and disclose to authorized representatives of the University of Pittsburgh Research Conduct and Compliance Office identifiable information related to your participation in this research study for a minimum of five years after final reporting or publication of a project.

Is my participation in this research study voluntary?

Your participation in this research study is completely voluntary. Whether or not you provide your consent for participation in this research study will have no effect on your current or future relationship with your healthcare organization.

May I withdraw, at a future date, my consent for participation in this research study?

You may withdraw, at any time, your consent for participation in this research study, to include the use and disclosure of your identifiable information for the purposes described above. Any identifiable research information recorded for, or resulting from, your participation in this research study prior to the date that you formally withdrew your consent may continue to be used and disclosed by the investigators for the purposes described above.

To formally withdraw your consent for participation in this research study you should provide a written and dated notice of this decision to the principal investigator of this research study at the address listed at the top of this form.

Your decision to withdraw your consent for participation in this research study will have no effect on your current or future relationship with the University of Pittsburgh or your healthcare organization.

****

VOLUNTARY CONSENT

I understand the above information and I have no current questions. I understand that I am encouraged to ask questions about any aspect of this research study during the course of this study, and that such future questions will be answered by a qualified individual or by the investigator(s) listed at the top of this consent document at the telephone number(s) given. I understand that I may always request that my questions, concerns or complaints be addressed by a listed investigator.

I understand that I may contact the Human Subjects Protection Advocate of the IRB Office, University of Pittsburgh (1-866-212-2668) to discuss problems, concerns, and questions; obtain information; offer input; or discuss situations in the event that the research team is unavailable.

☐ I agree to participate in this research study

☐ I choose NOT to participate in this research study

ENTER

APPENDIX E

EMAIL SENT TO SUBJECTS POST-IMPLEMENATION

Dear staff member

Approximately six months ago prior to the implementation of computerized physician order entry (CPOE) at XXXX Hospital in XXXXX, XX, you agreed to participate in a study investigating the relationship between perceptions of your personal power within your work environment and CPOE. At that time you completed an online survey that I sent you via email and you were entered into a drawing for a $50 cash gift card for participants at your hospital. Now that XXXX Hospital has implemented CPOE, it is time for the second and final part of your participation in the study.

Please click the link below and you will be taken to the Post Implementation Survey - which is shorter than the first survey that you did six months ago. This survey should take you LESS THAN 5 MINUTES to complete. **Please complete the survey no later than Tuesday, NOVEMBER 13, 2007**.

Click here to access the Post Implementation Survey.
<http://caties.cabig.upmc.edu/sdpp2/index.jsp?id=Susan.Mukunza@allina.com>

At the end of the survey period, once again **A DRAWING FOR A $50 CASH GIFT CARD** will be held for participants at your hospital. Only those of you that completed the Pre-Implementation survey are being asked to complete the Post-Implementation survey, so it is important that I receive this second survey from you. As before, no one at your hospital will know who participated and who did not!

If you have questions, please feel free to call or email me. I wish you good luck in the drawing and thank you so much for your participation in this study!!

Christa E. Bartos RN, MSIS, MS
Department of Biomedical Informatics
School of Medicine
University of Pittsburgh
Phone: (412) 648-6704
Email: **CEB2@PITT.EDU**

APPENDIX F

SDPP SURVEY POST-IMPLEMENTATON OF CPOE

Instructions: Please complete the following information. (A response is required for each question unless indicated as Optional.)

Start Survey

Question 1 of 14

Position:

- ☐ Unit Clerk/Secretary/Health Unit coordinator
- ☐ Nurse
- ☐ Attending physician
- ☐ Other:_____

Previous Next

Question 2 of 14

Since completing the pre-implementation survey in April 2007, do you work on a different patient unit now?

☐ Yes

☐ No

Previous Next

(If the person selects "YES", go to question #3. If they select "NO", go to question #4.)

Question 3 of 14

Area of specialty of your work environment <u>now</u> (please check <u>all</u> that apply):

☐ Intensive/Critical Care unit

☐ Non-invasive specialty (*Example: patients are on your unit are there to have medical care or therapy.)*

☐ Invasive specialty *(Example: patients on your unit are there specifically because they are having surgery)*

☐ Do not work on a patient unit.

Previous Next

(If the person selects DO NOT WORK ON A PATIENT UNIT they will be taken to the Instructions and sample screen right before question #9.)

Question 4 of 14

Does your patient unit routinely have multi-disciplinary meetings to determine the patient's care?

☐ Yes

☐ No

Previous Next

Question 5 of 14

<u>Routinely</u>, do physicians on your patient unit make decisions on patient care with minimal input from other care disciplines (e.g. physical therapy, social work, nursing)?

☐ Yes

☐ No

Previous Next

Question 6 of 14

Does patient care information have to pass through a chain of command to/from the physician, or can any healthcare worker approach the physician with patient care information?

☐ Patient care information comes through a chain of command to/from physician

☐ Any healthcare worker can approach physician with patient care information

Previous Next

Question 7 of 14

<u>Usually</u>, does your unit arrive at novel or innovative solutions in patient care based on multi-disciplinary decisions or does your unit follow a strict protocol on patient care?

- ☐ Novel/innovative solutions based on multidisciplinary decisions
- ☐ Follow strict protocol

Previous Next

Question 8 of 14

Would you consider your patient unit to be Team-Based (group decisions on patient care) or Hierarchically-Based (a formal chain of command on patient care)?

- ☐ Team-Based patient unit (group decisions on patient care)
- ☐ Hierarchically-Based (formal chain of command on patient care)

Previous Next

Instructions: Please color in **one** dot between each set of words that reflects how you feel.

EXAMPLE: **Today, I am...**

happy	○ ○ ● ○ ○ ○ ○ ○ ○ ○ ○	sad
sick	○ ○ ○ ○ ○ ○ ○ ○ ○ ● ○	healthy

Previous Next

Question 9 of 14

At my work, I have…

opportunities	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	nowhere to go
uncertainty	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	security
experience	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	inexperience
education	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	no education
knowledge	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	ignorance
secrets	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	communication
arguments	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	discussions
authority	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	no authority
goals	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	disorder
honesty	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	dishonesty
influence	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	no-say
cooperation	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	resistance

Previous Next

Question 10 of 14

At my work, I feel...

rewarded	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	punished
restricted	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	permitted
encouraged	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	discouraged
respected	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	looked down on
in control	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	supervised
a student	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	a teacher
asked	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	ignored
complimented	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	criticized

Previous Next

Question 11 of 14

Computerized Physician Order Entry (CPOE) is…

good	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	bad
fast	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	slow
harmful	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	helpful
difficult	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	easy
simple	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	complex
safe	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	dangerous
time wasting	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	time saving
bothersome	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	useful
efficient	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	inefficient
secure	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	vulnerable
powerful	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	limited
trustworthy	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	unreliable
fun	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	boring
consistent	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	inconsistent
mandatory	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	optional

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Question 12 of 14

CPOE Information is…

complete	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	incomplete
accurate	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	inaccurate
useful	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	useless
public	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	private
confidential	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	unprotected
questionable	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	reliable

Previous Next

Question 13 of 14

What CPOE does...

divides	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	links
informs	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	misleads
improves	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	worsens
organizes	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	confuses
communicates	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	keeps hidden
warns	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	annoys
enables	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	blocks
less work	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	more work
strengthens	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	weakens

Previous Next

Question 14 of 14

What do you feel has influenced how much power you have over your work?

Previous

SUBMIT SURVEY

By completing this survey, you are entered in a drawing for a

$50 cash gift card

along with the other research participants at your healthcare organization.

Thank you for participating in this research study and Good Luck!

CLOSE

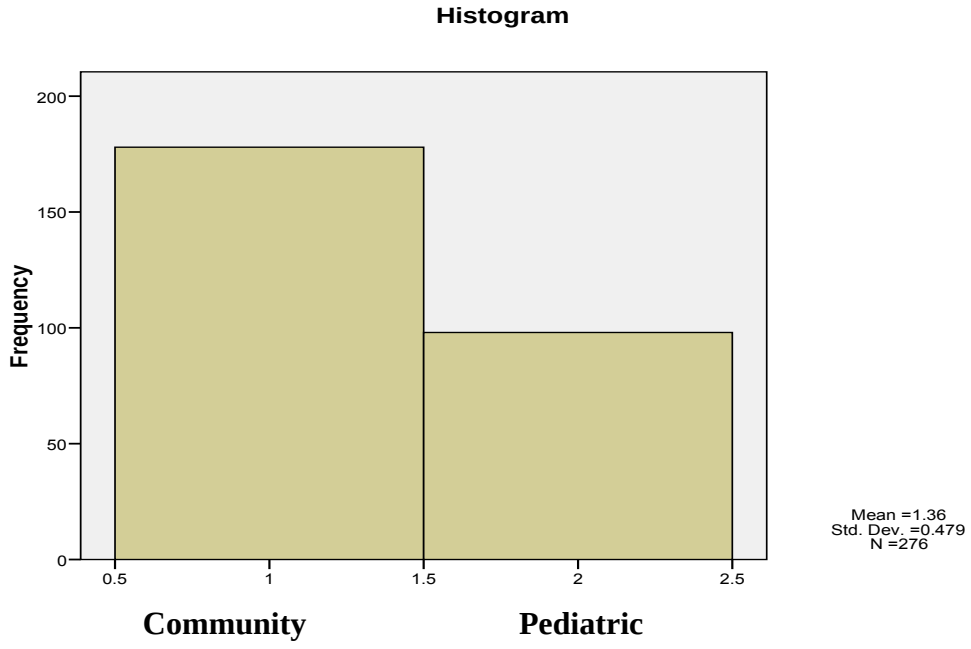
APPENDIX G

FREQUENCIES AND HISTOGRAMS

FREQUENCIES - HOSPITAL

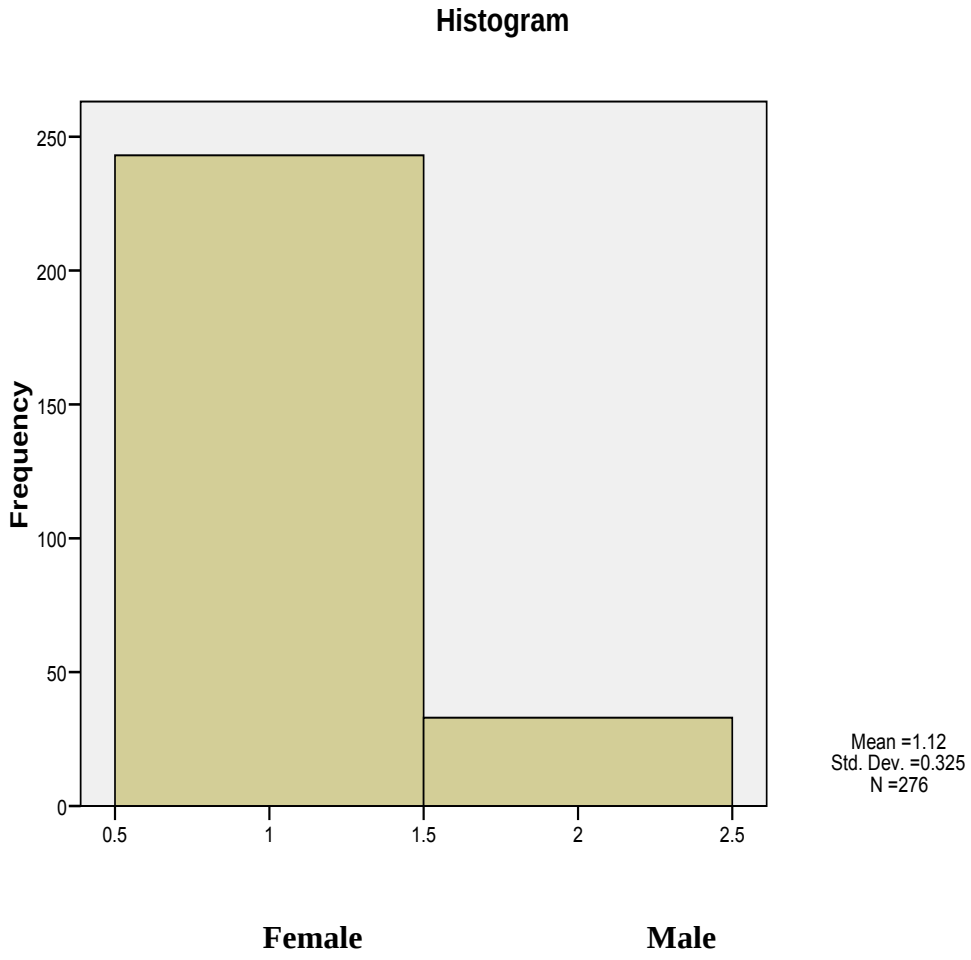
HOSPITAL	Frequency	Percent	Valid Percent	Cumulative Percent
Community	178	64.5	64.5	64.5
Pediatric*	98	35.5	35.5	100.0
Total	276	100.0	100.0	

* There were also 2 residents that responded, but due to the small number, they were not included in any analysis.



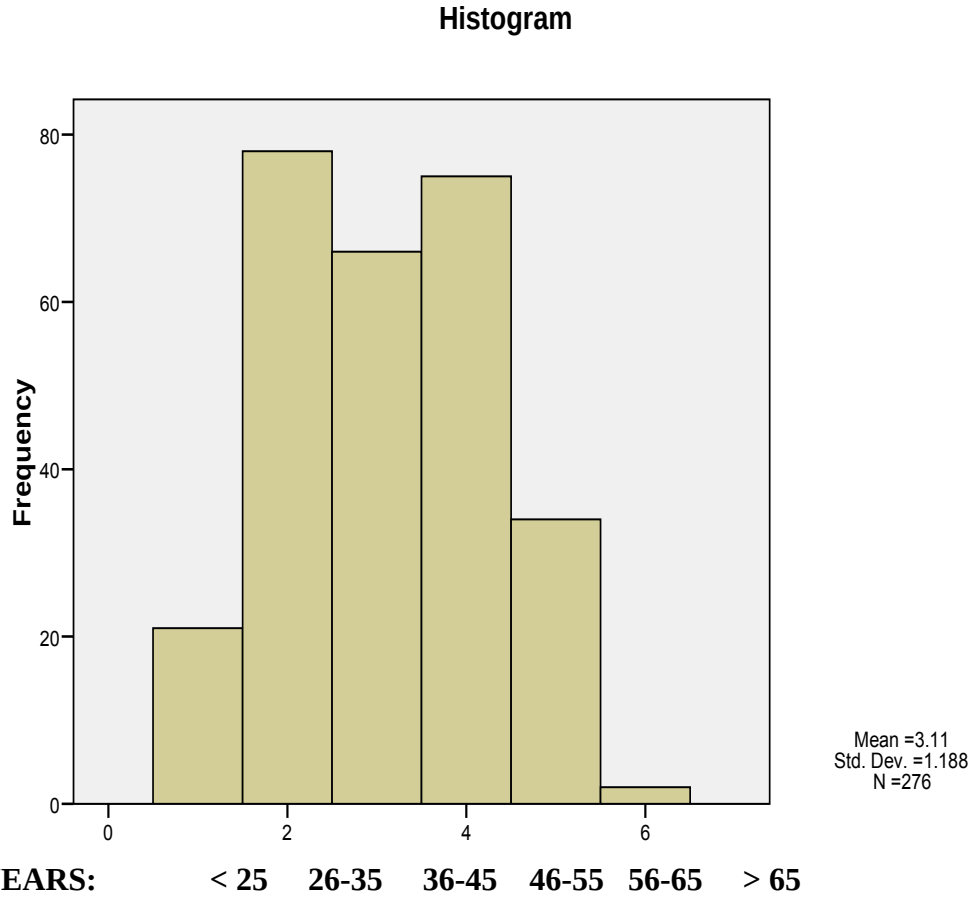
FREQUENCIES - GENDER

GENDER	Frequency	Percent	Valid Percent	Cumulative Percent
Female	243	88.0	88.0	88.0
Male	33	12.0	12.0	100.0
Total	276	100.0	100.0	



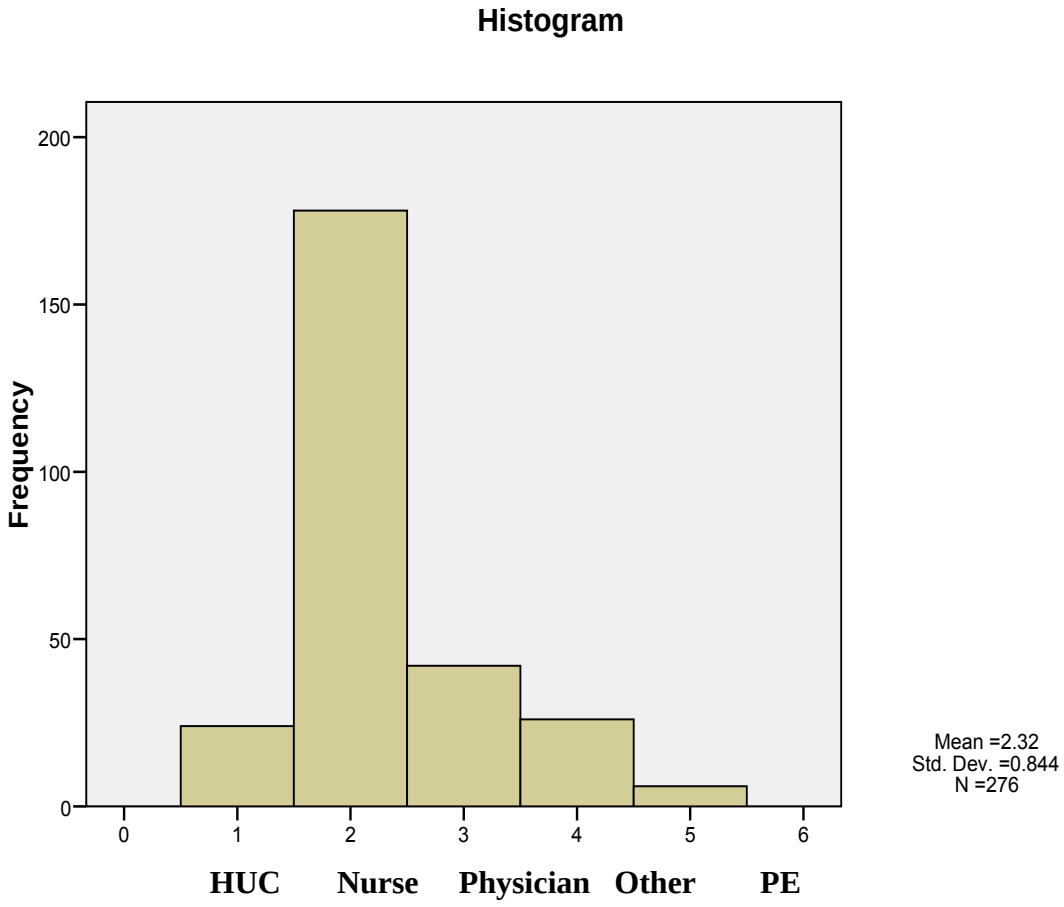
FREQUENCIES - AGE

AGE	Frequency	Percent	Valid Percent	Cumulative Percent
25 years old or less	21	7.6	7.6	7.6
26-35 years old	78	28.3	28.3	35.9
36-45 years old	66	23.9	23.9	59.8
46-55 years old	75	27.2	27.2	87.0
56-65 years old	34	12.3	12.3	99.3
Greater than 65 years old	2	.7	.7	100.0
Total	276	100.0	100.0	



FREQUENCIES - POSITION

POSITION	Frequency	Percent	Valid Percent	Cumulative Percent
Health Unit Coordinator	24	8.7	8.7	8.7
Nurse	178	64.5	64.5	73.2
Physician	42	15.2	15.2	88.4
Other	26	9.4	9.4	97.8
Physician Extender	6	2.2	2.2	100.0
Total	276	100.0	100.0	



Number of survey respondents divided by hospital Pre- and Post-Implementation

Position	Community		Pediatric	
	Pre	**Post**	**Pre**	**Post**
HUC	14	14	10	10
Nurse	115	115	61	63
Attending MD	27	27	15	15
Physician Extender	5	5	1	1
Others	17	17	11	9

Ratio of staff between hospitals

	# Community	# Pediatric	Community : Pediatric	Ratio
Hospital Beds	500	120	500:120	**4 : 1**
HUC	131	74	131 : 74	**2 : 1**
Nurse	1239	285	1239 : 285	**5 : 1**
Attending MD	1053	600	1053 : 600	**2 : 1**

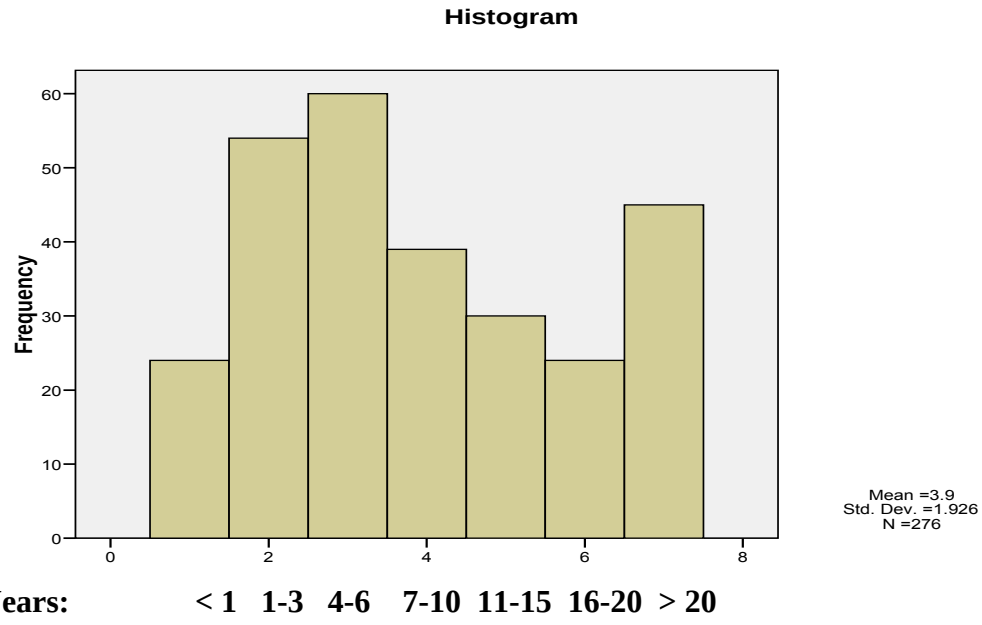
Percentage of staff that responded to the survey

	Total Clinical Staff at Each Hospital				
Position*	**Community**	**Pediatric**	**Total for Both Hosp**	**Number of Subjects**	**Number Subjects/ Total Possible Staff (%)**
HUC's	131	74	205	24	11.7%
Nurses	1239	285	1524	178	11.7%
Attending MD's	1053	600	1653	42	2.5%

*Information regarding other staff and physician extenders was not available.

FREQUENCIES - LENGTH OF TIME IN THIS POSITION

LENGTH OF TIME IN POSITION	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 1 year	24	8.7	8.7	8.7
1-3 years	54	19.6	19.6	28.3
4-6 years	60	21.7	21.7	50.0
7-10 years	39	14.1	14.1	64.1
11-15 years	30	10.9	10.9	75.0
16-20 years	24	8.7	8.7	83.7
Greater than 20 years	45	16.3	16.3	100.0
Total	276	100.0	100.0	

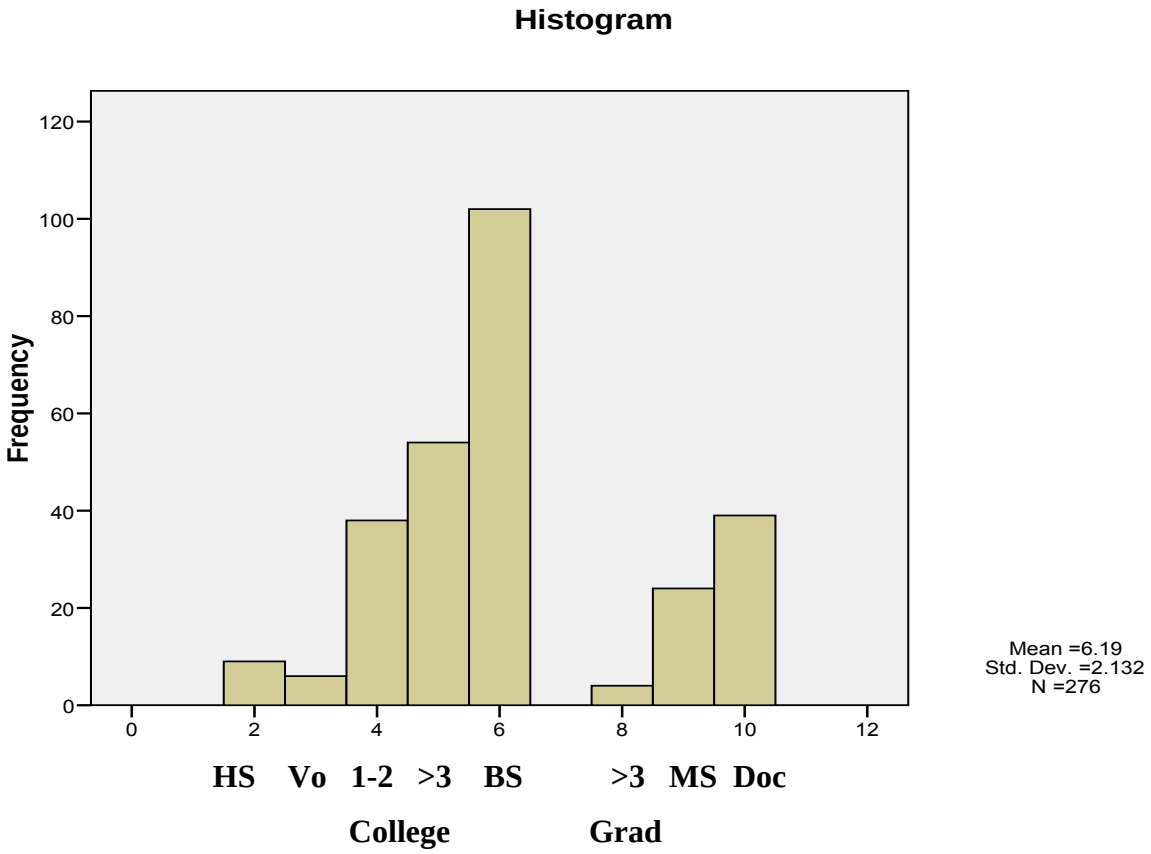


Years: < 1 1-3 4-6 7-10 11-15 16-20 > 20

FREQUENCIES - LEVEL OF EDUCATION

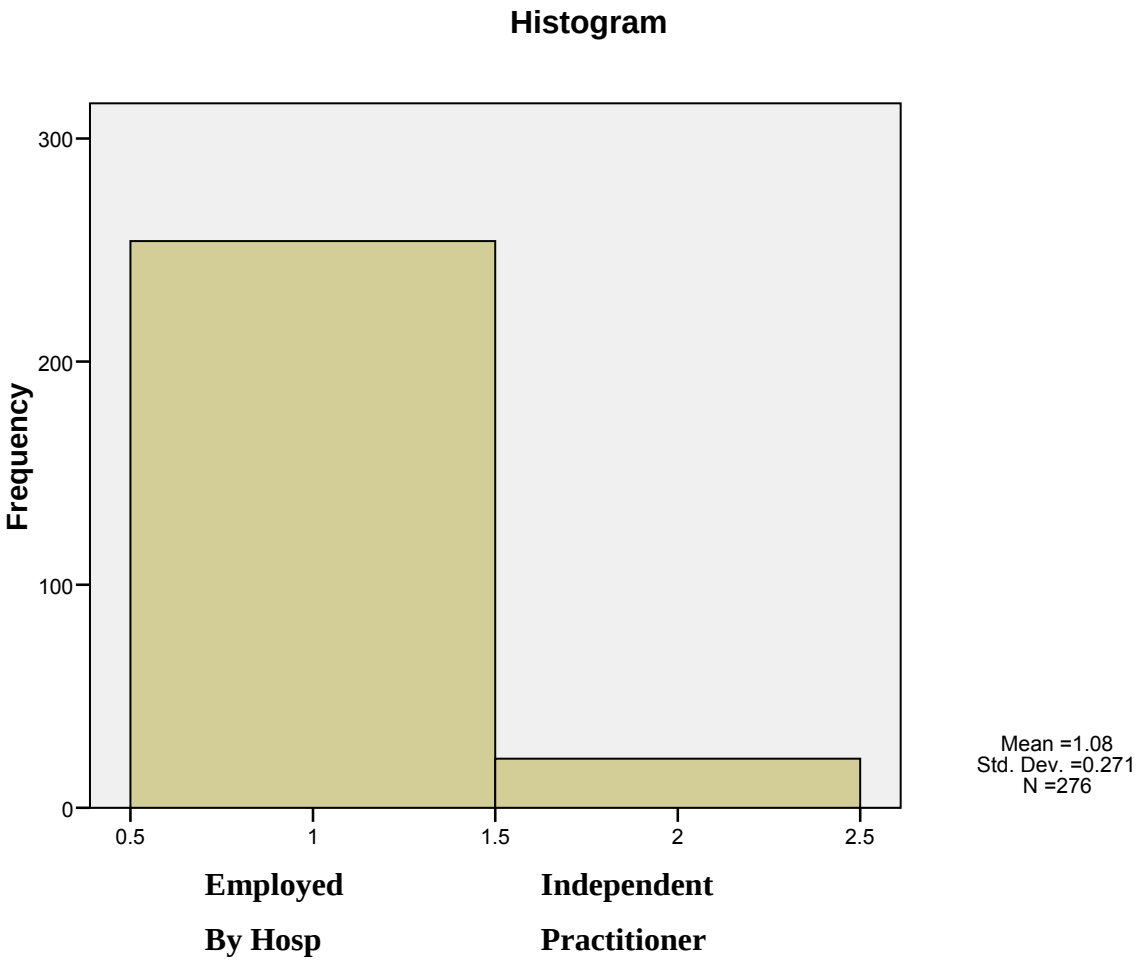
LEVEL OF EDUCATION	Frequency	Percent	Valid Percent	Cumulative Percent
High School Diploma	9	3.3	3.3	3.3
Vocational School Diploma	6	2.2	2.2	5.4
1-2 years of college	38	13.8	13.8	19.2

3 or more years of college	54	19.6	19.6	38.8
Bachelors Degree	102	37.0	37.0	75.7
3 or more years of graduate school	4	1.4	1.4	77.2
Masters Degree	24	8.7	8.7	85.9
Doctorate Degree	39	14.1	14.1	100.0
Total	276	100.0	100.0	



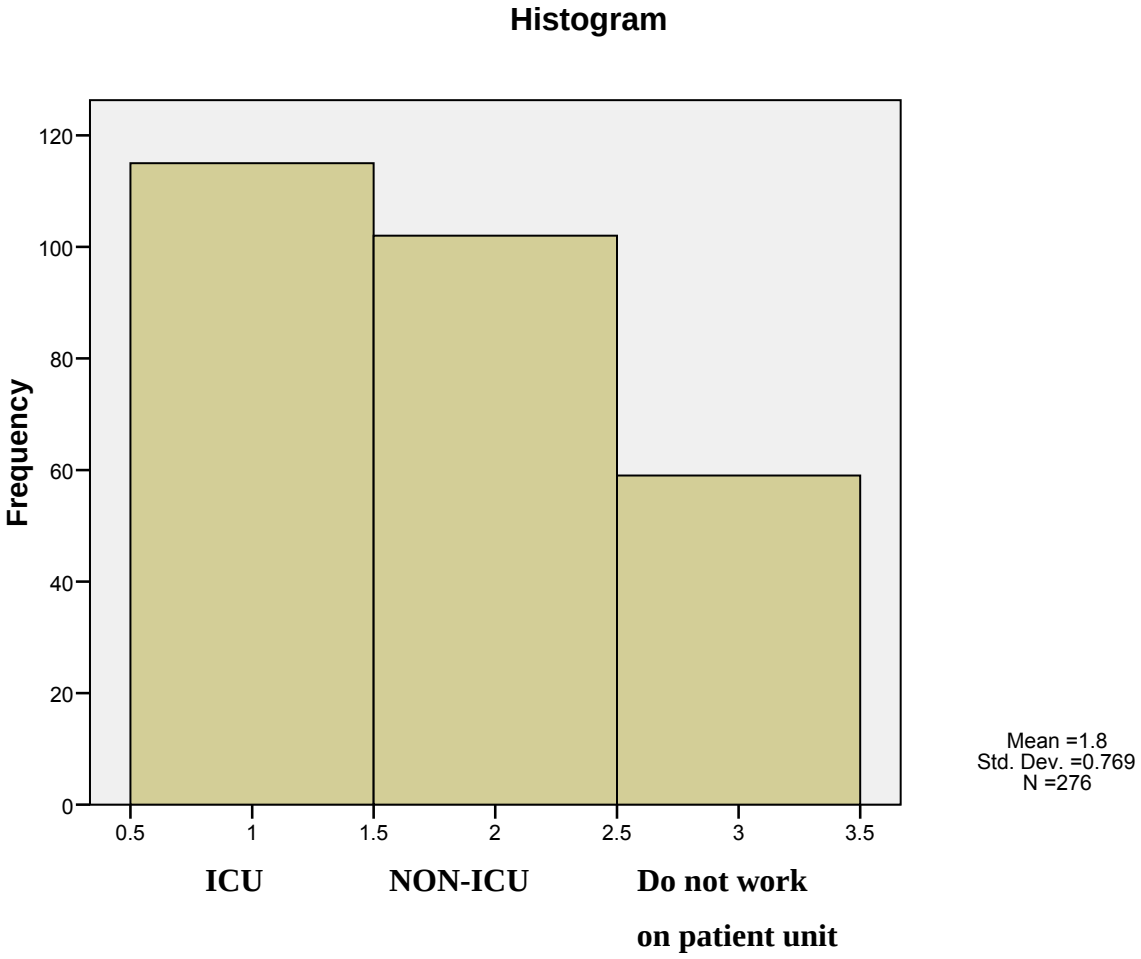
FREQUENCIES - EMPLOYMENT STATUS

EMPLOYMENT STATUS	Frequency	Percent	Valid Percent	Cumulative Percent
Employed by hospital	254	92.0	92.0	92.0
Independent Practitioner	22	8.0	8.0	100.0
Total	276	100.0	100.0	



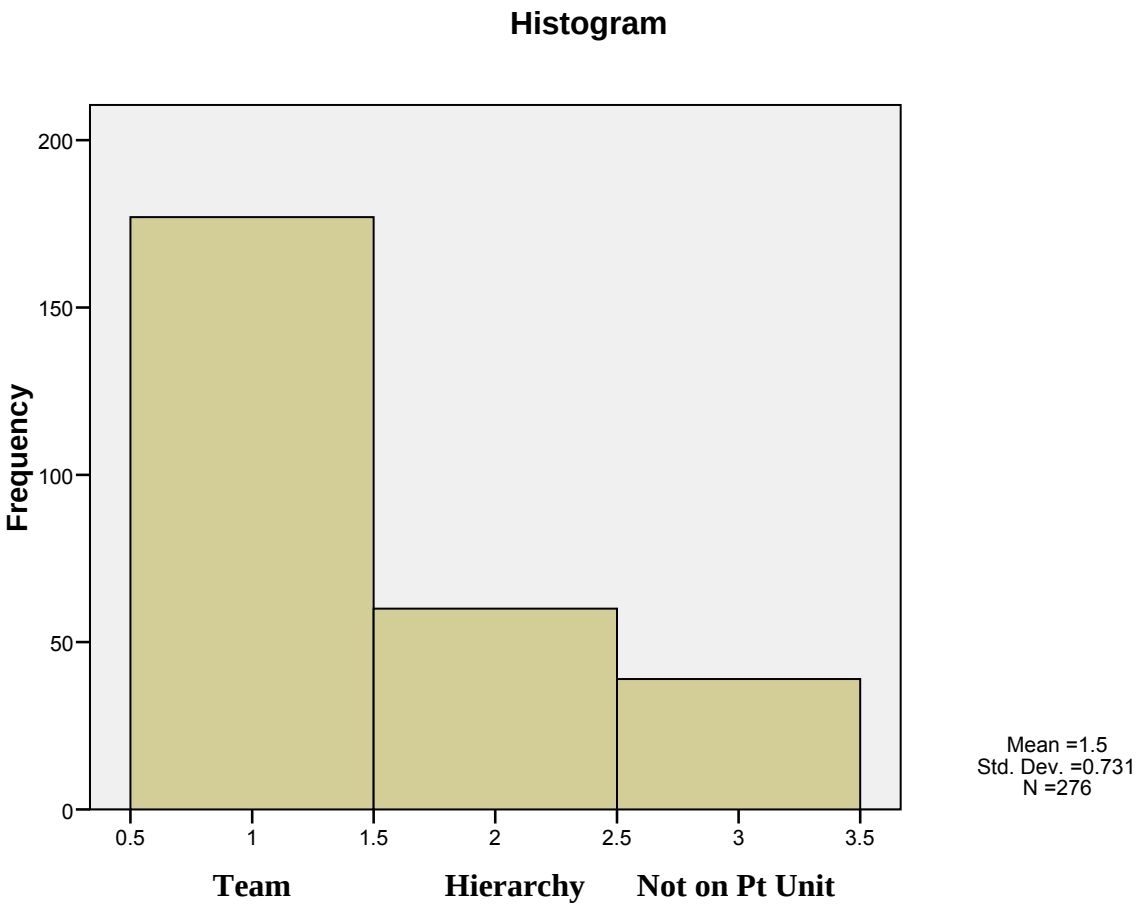
FREQUENCIES - PATIENT UNIT TYPE

PATIENT UNIT TYPE	Frequency	Percent	Valid Percent	Cumulative Percent
ICU	115	41.7	41.7	41.7
Non-ICU	102	37.0	37.0	78.6
Do not work on a patient unit	59	21.4	21.4	100.0
Total	276	100.0	100.0	



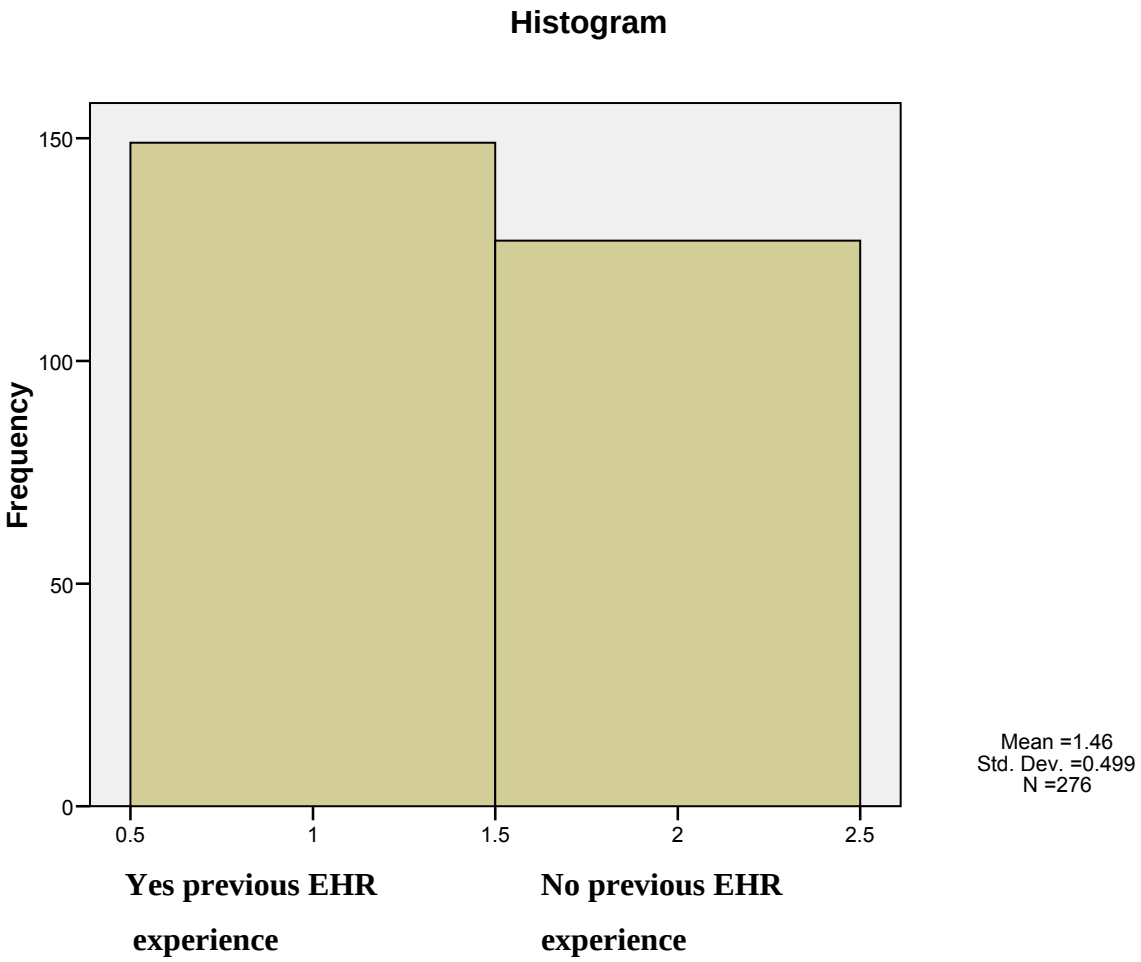
FREQUENCIES - UNIT STRUCTURE

UNIT STRUCTURE	Frequency	Percent	Valid Percent	Cumulative Percent
Team	177	64.1	64.1	64.1
Hierarchy	60	21.7	21.7	85.9
Do not work on patient unit	39	14.1	14.1	100.0
Total	276	100.0	100.0	



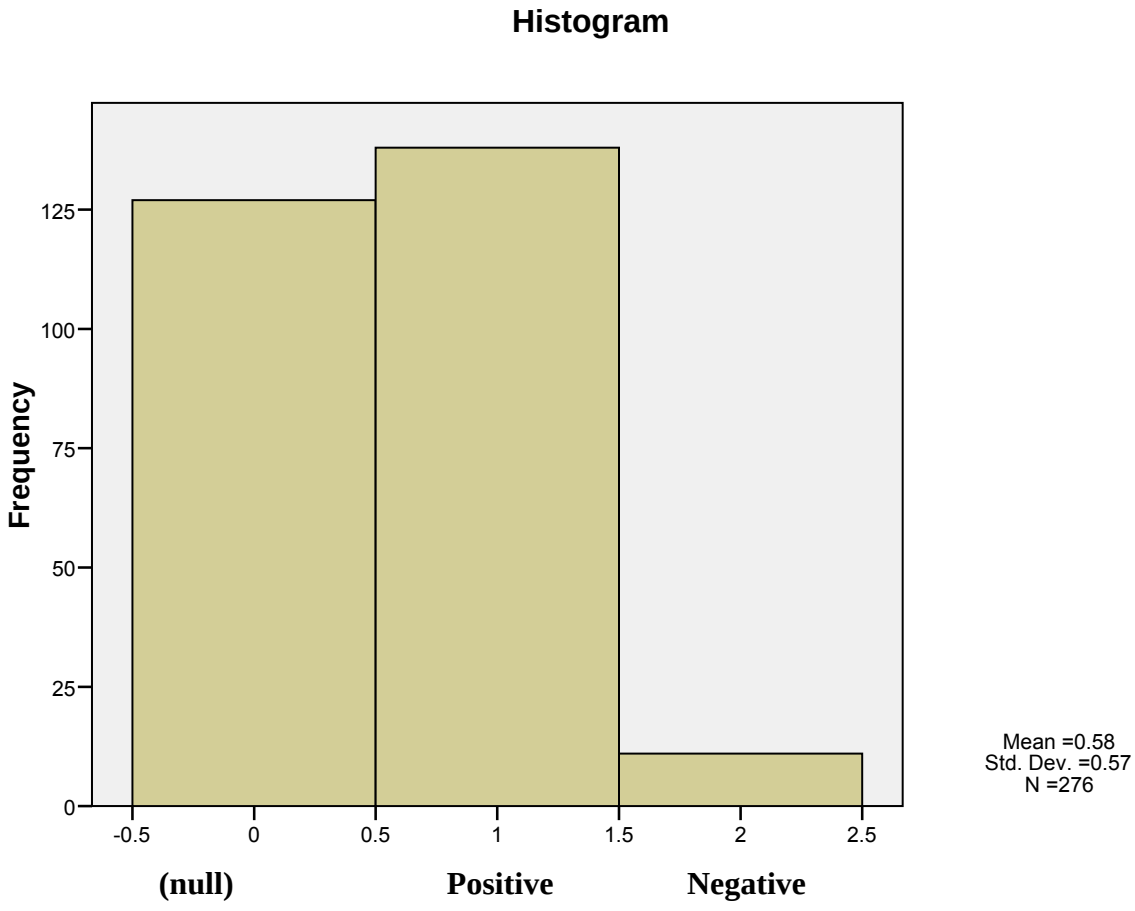
FREQUENCIES - PREVIOUS EXPERIENCE WITH AN EHR

PREVIOUS EXPERIENCE WITH AN EHR	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	149	54.0	54.0	54.0
No	127	46.0	46.0	100.0
Total	276	100.0	100.0	



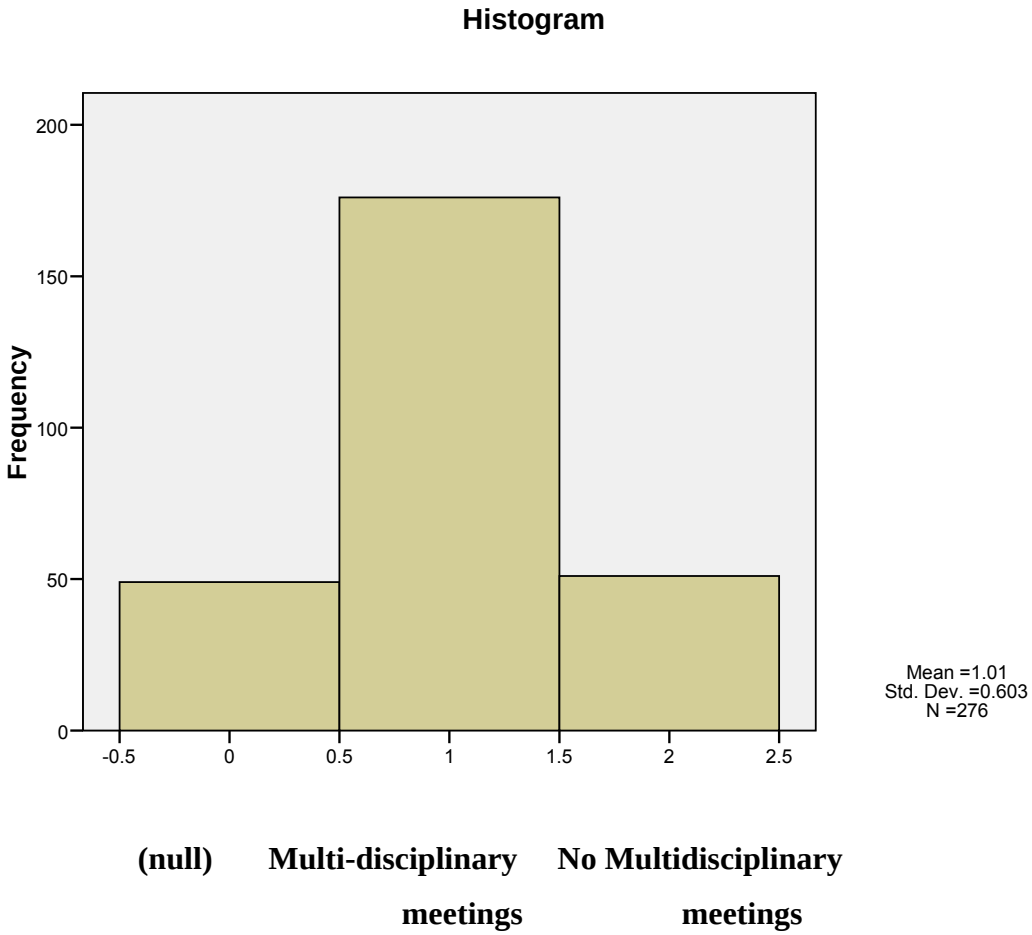
FREQUENCIES - WHETHER PREVIOUS EHR EXPERIENCE WAS POSITIVE OR NEGATIVE

QUALITY OF EXPERIENCE WITH EHR	Frequency	Percent	Valid Percent	Cumulative Percent
Null	127	46.0	46.0	46.0
Positive	138	50.0	50.0	96.0
Negative	11	4.0	4.0	100.0
Total	276	100.0	100.0	



FREQUENCIES - QUESTION #1 TO DETERMINE PATIENT UNIT STRUCTURE TYPE

MULTIDISCIPLINARY MEETINGS	Frequency	Percent	Valid Percent	Cumulative Percent
Null	49	17.8	17.8	17.8
Yes, have multi-disciplinary meetings to determine patient care	176	63.8	63.8	81.5
No, do not have multi-disciplinary meetings	51	18.5	18.5	100.0
Total	276	100.0	100.0	



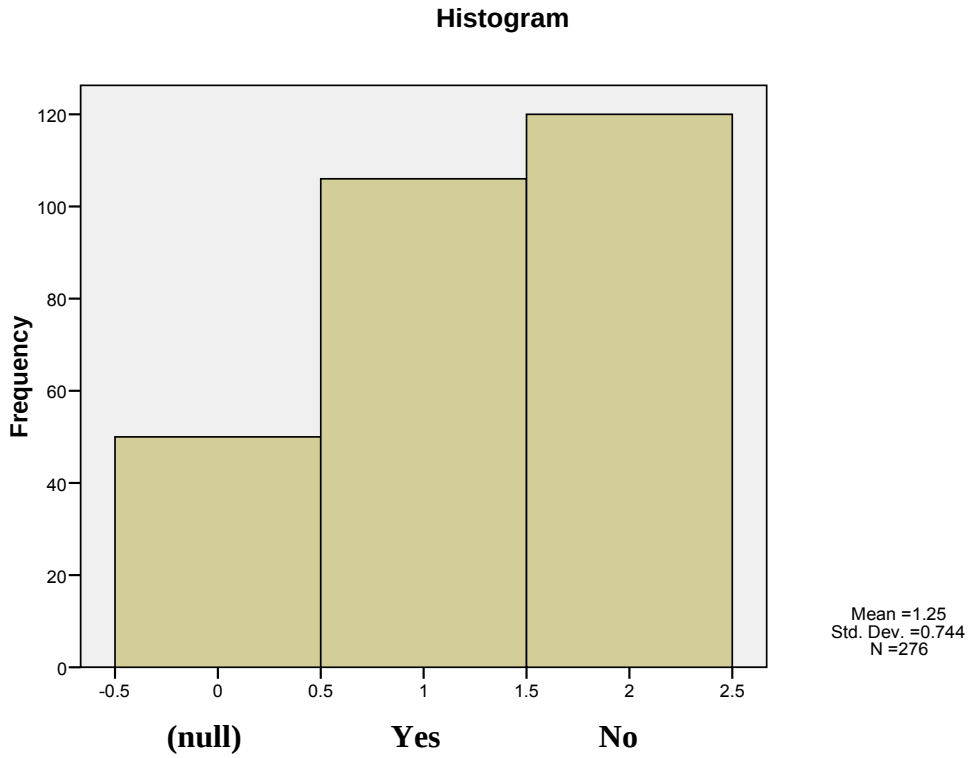
FREQUENCIES - QUESTION #2 TO DETERMINE PATIENT UNIT STRUCTURE TYPE

DECISIONS	Frequency	Percent	Valid Percent	Cumulative Percent
Null	50	18.1	18.1	18.1
Yes, physicians make decisions with minimal input from other disciplines	106	38.4	38.4	56.5
No, physicians do not make decision with minimal input from other disciplines	120	43.5	43.5	100.0
Total	276	100.0	100.0	

This question was determined to be ambiguous because the focus of the question is not clear as to whether we want to discover if they make decisions with input from other disciplines, or if only get minimum rather than maximum input from other disciplines. This question is not dichotomous, but is really a 2 x 2 matrix (see Table 4). Because we do not have sufficient information to determine the information in this context, this question will not be used in any analysis.

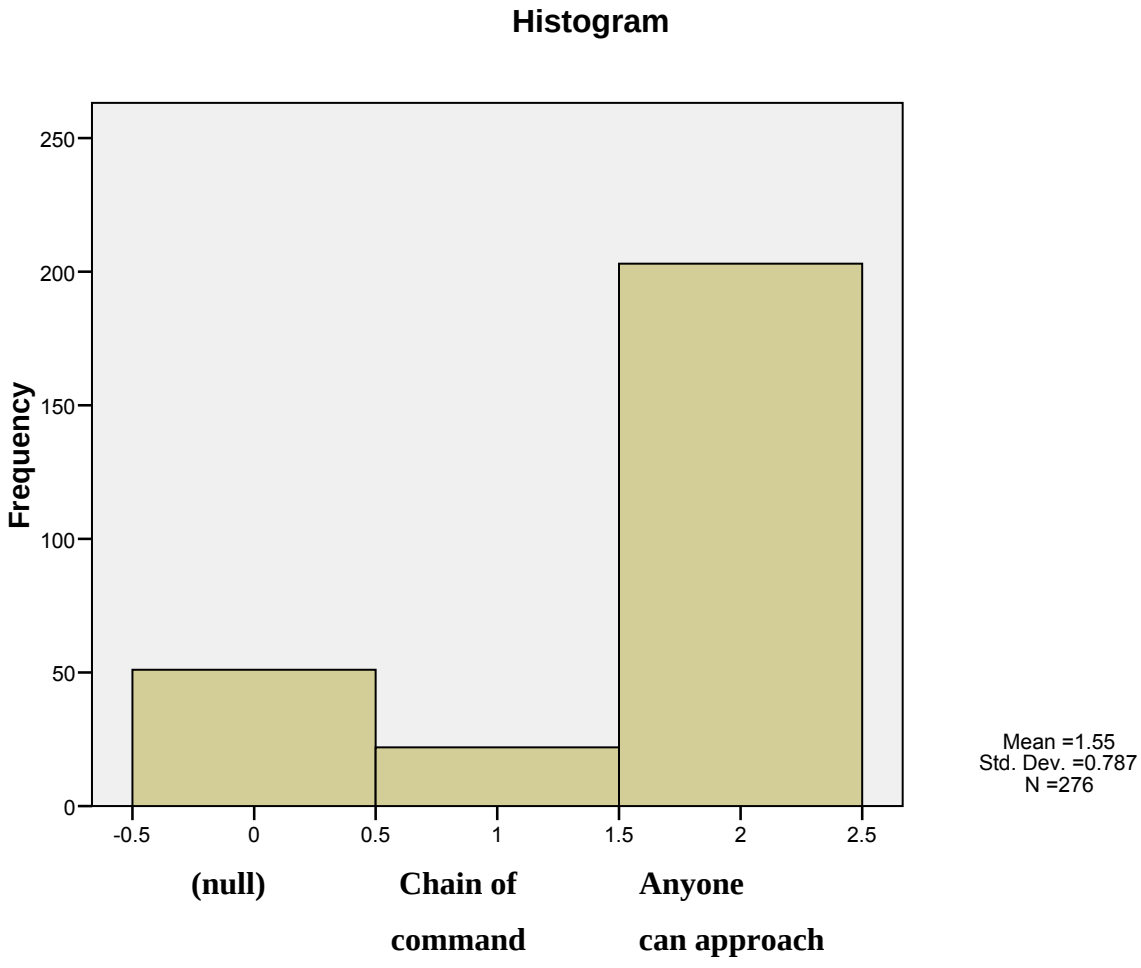
Table 4. The 2 x 2 matrix

	Minimum input	Maximum input
Make decisions with input		
Do not make decisions with input		


Histogram
Frequency
120
100
80
60
40
20
0
-0.5
0
0.5
1
1.5
2
2.5
(null)
Yes
No
Mean =1.25
Std. Dev. =0.744
N =276

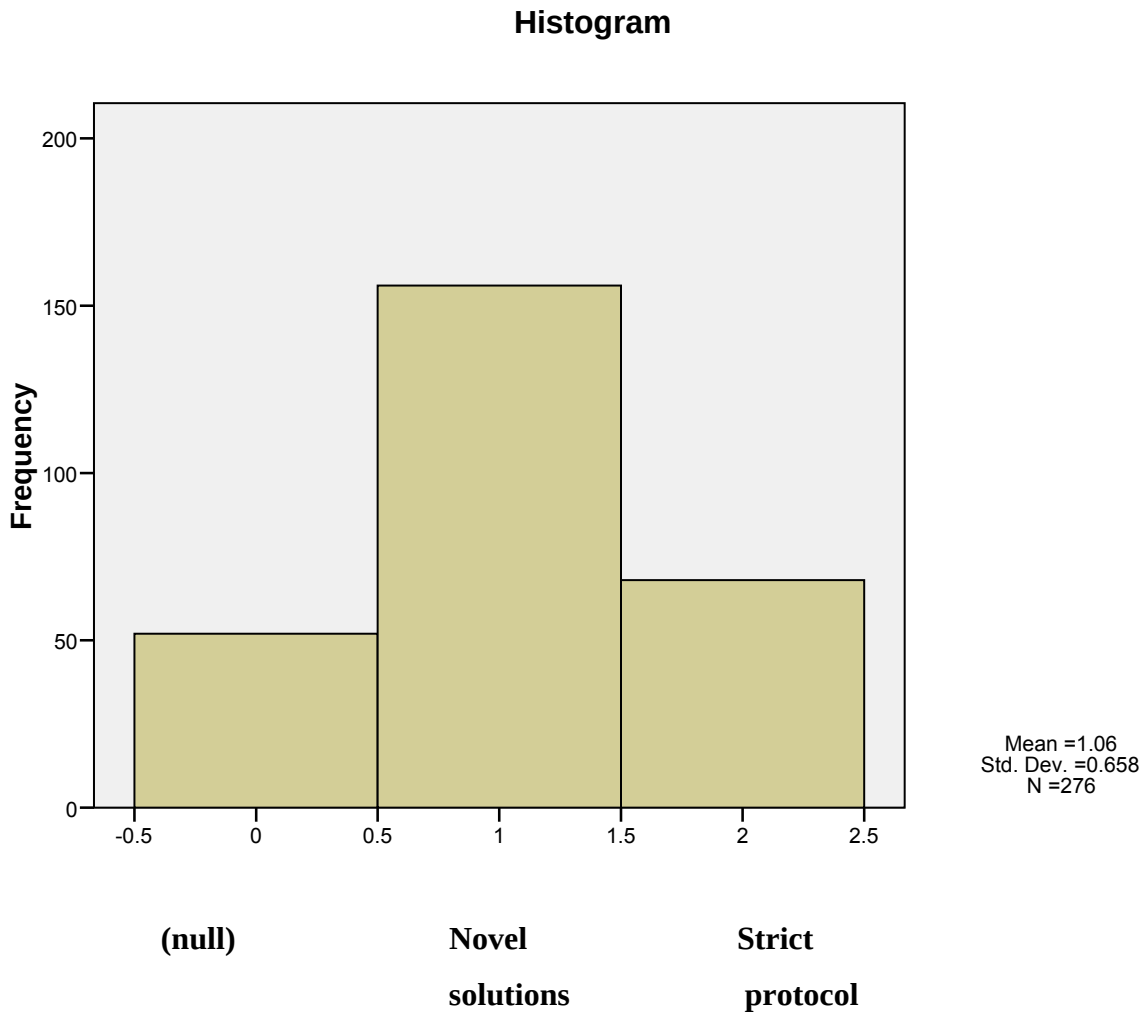
FREQUENCIES - QUESTION #3 TO DETERMINE PATIENT UNIT STRUCTURE TYPE

CHAIN OF COMMAND OR NOT	Frequency	Percent	Valid Percent	Cumulative Percent
Null	51	18.5	18.5	18.5
Information must pass through chain of command	22	8.0	8.0	26.4
Anyone can approach physician with patient information	203	73.6	73.6	100.0
Total	276	100.0	100.0	



FREQUENCIES - QUESTION #4 TO DETERMINE PATIENT UNIT STRUCTURE TYPE

NOVEL OR PROTOCOL	Frequency	Percent	Valid Percent	Cumulative Percent
Null	52	18.8	18.8	18.8
Novel solutions based on multidisciplinary decisions	156	56.5	56.5	75.4
Follow strict protocol	68	24.6	24.6	100.0
Total	276	100.0	100.0	



APPENDIX H

PRE AND POST IMPLEMENTATION MEAN SCORE COMPARISONS AGGREGATED BY VARIABLE CHARACTERISTICS

GENDER	Measures	PRE		POST		DIFFERENCE		
		N	Mean	N	Mean	From Pre to Post	Paired t-test	Sig
Female	Reward/Coercive	243	2.12	243	1.63	-0.49	4.675	.000*
	Expert	243	2.92	243	1.84	-1.08	12.549	.000*
	Informational	243	2.33	243	0.75	-1.58	13.911	.000*
	Legitimate	243	1.61	243	0.92	-0.69	6.350	.000*
	Referent	243	2.17	243	1.99	-0.18	1.792	.074
	Power	243	2.22	243	1.49	-0.74	10.783	.000*
	CPOE	243	1.84	243	1.58	-0.26	2.799	.006*
Male	Reward/Coercive	33	2.12	33	1.82	-0.30	1.041	.306
	Expert	33	3.20	33	2.12	-1.08	4.241	.000*
	Informational	33	2.26	33	0.62	-1.65	5.679	.000*
	Legitimate	33	1.80	33	0.95	-0.86	2.808	.008*
	Referent	33	2.13	33	2.02	-0.11	0.442	.662
	Power	33	2.30	33	1.58	-0.72	3.704	.001*
	CPOE	33	1.86	33	1.49	-0.37	1.937	.062

*Values are considered significant if p <=.05

AGE	Measures	PRE		POST		DIFFERENCE		
		N	Mean	N	Mean	From Pre to Post	Paired t-test	Sig
25 years old or less	Reward/Coercive	21	2.92	21	1.83	-1.08	5.191	.000*
	Expert	21	1.86	21	1.65	-0.20	0.567	.577
	Informational	21	2.38	21	0.98	-1.40	5.181	.000*
	Legitimate	21	1.62	21	0.98	-0.64	2.091	.049*
	Referent	21	2.57	21	2.24	-0.33	1.437	.166
	Power	21	2.28	21	1.60	-0.68	4.776	.000*
	CPOE	21	1.96	21	2.16	0.20	-0.651	.523
26-35 years old	Reward/Coercive	78	2.06	78	1.52	-0.54	2.742	.008*
	Expert	78	2.53	78	1.70	-0.83	4.799	.000*
	Informational	78	2.22	78	0.61	-1.61	9.362	.000*
	Legitimate	78	1.28	78	0.52	-0.76	4.211	.000*
	Referent	78	2.17	78	1.75	-0.41	2.643	.010*
	Power	78	2.05	78	1.28	-0.77	6.430	.000*
	CPOE	78	1.56	78	1.41	-0.15	1.280	.204
36-45 years old	Reward/Coercive	66	1.96	66	1.65	-0.31	1.251	.216
	Expert	66	2.94	66	1.78	-1.16	7.512	.000*
	Informational	66	2.38	66	0.85	-1.53	6.126	.000*
	Legitimate	66	1.44	66	1.11	-0.33	1.621	.110
	Referent	66	1.84	66	1.76	-0.07	0.309	.759
	Power	66	2.08	66	1.48	-0.61	4.313	.000*
	CPOE	66	1.92	66	1.61	-0.31	1.677	.098
46-55 years old	Reward/Coercive	75	2.08	75	1.74	-0.35	2.151	.035*
	Expert	75	3.43	75	2.07	-1.35	10.482	.000*
	Informational	75	2.20	75	0.66	-1.54	7.112	.000*
	Legitimate	75	1.78	75	1.07	-0.71	3.777	.000*

AGE	Measures	PRE		POST		DIFFERENCE		
		N	Mean	N	Mean	From Pre to Post	Paired t-test	Sig
	Referent	75	2.06	75	2.11	0.05	-0.278	.782
	Power	75	2.30	75	1.60	-0.70	5.788	.000*
	CPOE	75	1.83	75	1.42	-0.41	2.319	.023*
56-65 years old	Reward/Coercive	34	2.23	34	1.65	-0.58	2.492	.018*
	Expert	34	3.52	34	2.13	-1.40	6.975	.000*
	Informational	34	2.72	34	0.74	-1.98	7.257	.000*
	Legitimate	34	2.51	34	1.04	-1.48	4.416	.000*
	Referent	34	2.86	34	2.55	-0.32	1.117	.272
	Power	34	2.78	34	1.71	-1.07	5.693	.000*
	CPOE	34	2.24	34	1.69	-0.55	1.916	.064
Greater than 65 years old	Reward/Coercive	2	0.75	2	1.75	1.00	-4.000	.156
	Expert	2	4.63	2	2.63	-2.00	4.000	.156
	Informational	2	1.83	2	2.00	0.17	-0.060	.962
	Legitimate	2	1.75	2	3.00	1.25	-0.417	.749
	Referent	2	1.40	2	2.80	1.40	-0.700	.611
	Power	2	2.05	2	2.48	0.43	-0.270	.832
	CPOE	2	3.22	2	4.19	0.97	-2.425	.249

*Values are considered significant if p <=.05

POSITION	Measures	PRE		POST		DIFFERENCE		
		N	Mean	N	Mean	From Pre to Post	Paired t-test	Sig
Health Unit Coordinator	Reward/Coercive	24	1.31	24	0.17	-1.15	2.555	.018*
	Expert	24	2.85	24	2.02	-0.83	2.097	.047*
	Informational	24	2.60	24	0.92	-1.68	3.347	.003*
	Legitimate	24	0.93	24	0.92	-0.01	0.024	.981
	Referent	24	1.90	24	1.28	-0.63	1.273	.216
	Power	24	1.88	24	1.08	-0.81	2.577	.017*
	CPOE	24	2.06	24	1.83	-0.23	0.637	.530
Nurse	Reward/Coercive	176	2.07	176	1.73	-0.33	2.954	.004*
	Expert	176	2.91	176	1.72	-1.20	13.798	.000*
	Informational	176	2.19	176	0.64	-1.56	13.171	.000*
	Legitimate	176	1.47	176	0.88	-0.59	4.785	.000*
	Referent	176	2.04	176	1.91	-0.13	1.172	.243
	Power	176	2.13	176	1.44	-0.69	9.365	.000*
	CPOE	176	1.94	176	1.64	-0.30	2.948	.004*
Physician	Reward/Coercive	42	2.55	42	2.08	-0.46	1.889	.066
	Expert	42	3.44	42	2.20	-1.24	4.749	.000*
	Informational	42	2.52	42	0.83	-1.69	6.029	.000*
	Legitimate	42	2.51	42	1.04	-1.47	6.334	.000*
	Referent	42	2.57	42	2.38	-0.19	0.818	.418
	Power	42	2.72	42	1.78	-0.94	5.497	.000*
	CPOE	42	1.50	42	1.02	-0.48	2.416	.020*
Physician Extender	Reward/Coercive	6	2.04	6	1.75	-0.29	1.234	.272
	Expert	6	3.04	6	1.92	-1.13	1.964	.107
	Informational	6	2.28	6	1.00	-1.28	1.913	.114

POSITION	Measures	PRE		POST		DIFFERENCE		
		N	Mean	N	Mean	From Pre to Post	Paired t-test	Sig
	Legitimate	6	1.63	6	0.79	-0.83	2.370	.064
	Referent	6	2.03	6	2.00	-0.03	0.117	.911
	Power	6	2.19	6	1.54	-0.65	2.806	.038*
	CPOE	6	1.85	6	1.68	-0.17	0.298	.778
Other	Reward/Coercive	28	2.51	28	1.73	-0.78	2.025	.053
	Expert	28	2.58	28	2.26	-0.32	1.436	.162
	Informational	28	2.60	28	0.98	-1.62	3.935	.001*
	Legitimate	28	1.97	28	1.07	-0.90	2.671	.013*
	Referent	28	2.65	28	2.59	-0.06	0.237	.815
	Power	28	2.46	28	1.81	-0.66	2.928	.007*
	CPOE	28	1.59	28	1.72	0.13	-0.407	.687

*Values are considered significant if p <=.05

LENGTH IN POSITION	Measures	PRE		POST		DIFFERENCE		
		N	Mean	N	Mean	From Pre to Post	Paired t-test	Sig
Less than 1 year	Reward/Coercive	23	2.99	23	2.48	-0.51	1.816	.083
	Expert	23	2.25	23	1.86	-0.39	1.114	.277
	Informational	23	3.06	23	1.04	-2.01	7.454	.000*
	Legitimate	23	1.89	23	1.26	-0.63	2.135	.044*
	Referent	23	2.92	23	2.55	-0.37	1.812	.084
	Power	23	2.62	23	1.91	-0.70	4.553	.000*
	CPOE	23	2.28	23	1.81	-0.47	1.368	.185

LENGTH IN POSITION	Measures	PRE		POST		DIFFERENCE		
		N	Mean	N	Mean	From Pre to Post	Paired t-test	Sig
1-3 years	Reward/Coercive	55	2.30	55	1.76	-0.53	2.360	.022*
	Expert	55	2.23	55	1.70	-0.54	3.034	.004*
	Informational	55	2.20	55	0.70	-1.50	5.714	.000*
	Legitimate	55	1.40	55	0.92	-0.48	2.205	.032*
	Referent	55	2.20	55	2.00	-0.20	1.096	.278
	Power	55	2.07	55	1.48	-0.58	4.344	.000*
	CPOE	55	1.69	55	1.62	-0.08	0.532	.597
4-6 years	Reward/Coercive	60	2.01	60	1.45	-0.56	2.171	.034*
	Expert	60	2.88	60	1.83	-1.05	5.598	.000*
	Informational	60	2.29	60	0.51	-1.78	8.310	.000*
	Legitimate	60	1.54	60	0.58	-0.96	4.313	.000*
	Referent	60	2.13	60	1.77	-0.36	1.461	.149
	Power	60	2.16	60	1.29	-0.87	5.341	.000*
	CPOE	60	1.93	60	1.67	-0.27	1.618	.111
7-10 years	Reward/Coercive	39	2.15	39	1.56	-0.59	2.929	.006*
	Expert	39	3.33	39	1.85	-1.49	7.331	.000*
	Informational	39	2.41	39	0.91	-1.50	5.782	.000*
	Legitimate	39	1.70	39	0.87	-0.83	3.435	.001*
	Referent	39	2.28	39	1.98	-0.29	1.582	.122
	Power	39	2.37	39	1.49	-0.88	6.408	.000*
	CPOE	39	1.87	39	1.73	-0.14	0.687	.496
11-15 years	Reward/Coercive	30	1.98	30	1.33	-0.64	2.208	.035*
	Expert	30	3.39	30	1.83	-1.57	7.729	.000*
	Informational	30	2.30	30	0.63	-1.67	6.954	.000*
	Legitimate	30	1.48	30	0.83	-0.66	2.212	.035*

LENGTH IN POSITION	Measures	PRE		POST		DIFFERENCE		
		N	Mean	N	Mean	From Pre to Post	Paired t-test	Sig
	Referent	30	1.91	30	1.78	-0.13	0.552	.585
	Power	30	2.19	30	1.34	-0.86	5.402	.000*
	CPOE	30	1.75	30	1.51	-0.23	1.086	.286
16-20 years	Reward/Coercive	24	2.08	24	1.84	-0.24	0.896	.379
	Expert	24	3.42	24	2.00	-1.42	6.185	.0008
	Informational	24	2.31	24	1.22	-1.08	2.313	.030*
	Legitimate	24	2.06	24	1.03	-1.03	2.612	.016*
	Referent	24	2.14	24	2.48	0.34	-1.195	.244
	Power	24	2.39	24	1.78	-0.61	2.839	.009*
	CPOE	24	1.89	24	1.42	-0.47	1.272	.216
Greater than 20 years	Reward/Coercive	45	1.68	45	1.53	-0.15	0.580	.565
	Expert	45	3.45	45	2.16	-1.29	7.787	.000*
	Informational	45	2.07	45	0.57	-1.50	5.336	.000*
	Legitimate	45	1.73	45	1.28	-0.45	1.549	.129
	Referent	45	1.90	45	1.89	-0.01	0.028	.978
	Power	45	2.16	45	1.55	-0.61	3.146	.003*
	CPOE	45	1.71	45	1.26	-0.45	1.696	.097

*Values are considered significant if p <=.05

EDUCATION	Measures	PRE		POST		DIFFERENCE		
		N	Mean	N	Mean	From Pre to Post	Paired t-test	Sig
High School Diploma	Reward/Coercive	9	2.75	9	0.25	-2.50	4.170	.003*
	Expert	9	2.58	9	2.44	-0.14	0.281	.786
	Informational	9	2.67	9	0.44	-2.22	2.948	.018*
	Legitimate	9	1.81	9	0.92	-0.89	1.277	.237
	Referent	9	2.91	9	2.38	-0.53	1.140	.287
	Power	9	2.56	9	1.38	-1.17	3.591	.007*
	CPOE	9	1.28	9	1.56	0.28	-0.382	.712
Vocational School Diploma	Reward/Coercive	6	1.50	6	2.25	0.75	-0.756	.484
	Expert	6	3.75	6	1.96	-1.79	3.513	.017*
	Informational	6	3.11	6	1.33	-1.78	2.394	.062
	Legitimate	6	1.88	6	2.38	0.50	-0.559	.600
	Referent	6	2.30	6	4.03	1.73	-2.191	.080
	Power	6	2.47	6	2.53	0.06	-0.088	.933
	CPOE	6	2.21	6	1.51	-0.71	1.161	.298
1-2 years of college	Reward/Coercive	38	2.21	38	1.58	-0.63	1.828	.076
	Expert	38	2.63	38	2.07	-0.57	3.009	.005*
	Informational	38	1.99	38	0.71	-1.28	3.840	.000*
	Legitimate	38	1.55	38	0.71	-0.84	2.612	.0138
	Referent	38	2.10	38	1.67	-0.43	1.192	.241
	Power	38	2.10	38	1.39	-0.71	3.033	.004*
	CPOE	38	1.77	38	1.77	0.00	0.018	.986
3 or more years	Reward/Coercive	54	1.69	54	1.13	-0.56	2.943	.005*

EDUCATION	Measures	PRE		POST		DIFFERENCE		
		N	Mean	N	Mean	From Pre to Post	Paired t-test	Sig
of college								
	Expert	54	2.94	54	1.77	-1.17	6.700	.000*
	Informational	54	2.16	54	0.94	-1.22	4.721	.000*
	Legitimate	54	1.11	54	0.84	-0.27	1.181	.243
	Referent	54	1.63	54	1.51	-0.12	0.678	.501
	Power	54	1.88	54	1.27	-0.61	4.476	.000*
	CPOE	54	1.94	54	1.45	-0.50	2.387	.021*
Bachelors Degree	Reward/Coercive	102	2.04	102	1.74	-0.31	2.066	.041*
	Expert	102	2.79	102	1.60	-1.19	9.375	.000*
	Informational	102	2.35	102	0.59	-1.76	12.582	.000*
	Legitimate	102	1.52	102	0.91	-0.61	3.924	.000*
	Referent	102	2.18	102	2.00	-0.18	1.201	.233
	Power	102	2.17	102	1.44	-0.73	7.947	.000*
	CPOE	102	1.96	102	1.74	-0.22	1.691	.094
3 or more years of graduate school	Reward/Coercive	4	2.75	4	2.94	0.19	-0.227	.835
	Expert	4	1.25	4	2.19	0.94	-0.795	.485
	Informational	4	1.42	4	0.75	-0.67	0.658	.558
	Legitimate	4	0.75	4	1.63	0.88	-1.021	.382
	Referent	4	1.75	4	2.45	0.70	-0.891	.438
	Power	4	1.60	4	2.08	0.48	-1.094	.354
	CPOE	4	1.50	4	0.56	-0.94	1.898	.154
Masters Degree	Reward/Coercive	24	2.55	24	2.27	-0.28	1.193	.245

EDUCATION	Measures	PRE		POST		DIFFERENCE		
		N	Mean	N	Mean	From Pre to Post	Paired t-test	Sig
	Expert	24	3.42	24	2.14	-1.28	5.277	.000*
	Informational	24	2.60	24	0.74	-1.86	4.725	.000*
	Legitimate	24	1.96	24	1.10	-0.85	2.908	.008*
	Referent	24	2.50	24	2.43	-0.08	0.320	.752
	Power	24	2.60	24	1.82	-0.78	4.456	.000*
	CPOE	24	1.81	24	1.68	-0.12	0.459	.651
Doctorate Degree	Reward/Coercive	39	2.45	39	1.94	-0.51	2.026	.050*
	Expert	39	3.58	39	2.22	-1.37	5.731	.000*
	Informational	39	2.52	39	0.82	-1.70	5.980	.000*
	Legitimate	39	2.55	39	0.89	-1.66	7.986	.000*
	Referent	39	2.59	39	2.24	-0.35	1.522	.136
	Power	39	2.74	39	1.69	-1.05	6.384	.000*
	CPOE	39	1.61	39	1.17	-0.45	2.118	.041*

*Values are considered significant if p <=.05

EMPLOYMENT STATUS	Measures	PRE		POST		DIFFERENCE		
		N	Mean	N	Mean	From Pre to Post	Paired t-test	Sig
Employed by hospital	Reward/Coercive	254	2.08	254	1.57	-0.51	4.880	.000*
	Expert	254	2.91	254	1.84	-1.07	12.734	.000*
	Informational	254	2.30	254	0.72	-1.59	14.457	.000*
	Legitimate	254	1.56	254	0.88	-0.68	6.348	.000*

EMPLOYMENT STATUS	Measures	PRE		POST		DIFFERENCE		
		N	Mean	N	Mean	From Pre to Post	Paired t-test	Sig
	Referent	254	2.13	254	1.91	-0.22	2.208	.028*
	Power	254	2.19	254	1.44	-0.75	11.042	.000*
	CPOE	254	1.89	254	1.62	-0.27	3.002	.003*
Independent Practitioner	Reward/Coercive	22	2.59	22	2.58	-0.01	0.040	.968
	Expert	22	3.45	22	2.28	-1.17	3.625	.002*
	Informational	22	2.56	22	0.94	-1.62	4.022	.001*
	Legitimate	22	2.51	22	1.44	-1.07	3.081	.006*
	Referent	22	2.62	22	2.99	0.37	-1.588	.127
	Power	22	2.75	22	2.15	-0.60	2.857	.009*
	CPOE	22	1.32	22	1.01	-0.32	1.247	.226

*Values are considered significant if p <=.05

PATIENT UNIT TYPE	Measures	PRE		POST		DIFFERENCE		
		N	Mean	N	Mean	From Pre to Post	Paired t-test	Sig
ICU	Reward/Coercive	115	2.06	115	1.60	-0.46	2.882	.005*
	Expert	115	2.85	115	1.89	-0.96	7.387	.000*
	Informational	115	2.19	115	0.62	-1.57	10.332	.000*
	Legitimate	115	1.38	115	0.73	-0.65	4.603	.000*
	Referent	115	2.15	115	1.81	-0.35	2.280	.024*
	Power	115	2.12	115	1.39	-0.74	7.805	.000*
	CPOE	115	1.61	115	1.24	-0.37	2.792	.006*
Non-ICU	Reward/Coercive	107	2.10	107	1.64	-0.45	3.284	.001*

PATIENT UNIT TYPE	Measures	PRE		POST		DIFFERENCE		
		N	Mean	N	Mean	From Pre to Post	Paired t-test	Sig
	Expert	107	3.09	107	1.77	-1.32	10.539	.000*
	Informational	107	2.46	107	0.79	-1.67	11.336	.000*
	Legitimate	107	1.80	107	1.01	-0.79	4.960	.000*
	Referent	107	2.11	107	2.05	-0.06	0.457	.649
	Power	107	2.29	107	1.52	-0.78	8.647	.000*
	CPOE	107	2.10	107	1.84	-0.26	2.005	.048*
Not on patient unit	Reward/Coercive	54	2.29	54	1.77	-0.52	2.011	.049*
	Expert	54	2.93	54	2.06	-0.87	4.751	.000*
	Informational	54	2.33	54	0.86	-1.47	4.553	.000*
	Legitimate	54	1.87	54	1.19	-0.68	2.335	.023*
	Referent	54	2.31	54	2.28	-0.04	0.151	.880
	Power	54	2.35	54	1.70	-0.64	3.365	.001*
	CPOE	54	1.83	54	1.75	-0.09	0.425	.672

*Values are considered significant if p <=.05

UNIT STRUCTURE	Measures	PRE		POST		DIFFERENCE		
		N	Mean	N	Mean	From Pre to Post	Paired t-test	Sig
Team	Reward/Coercive	171	2.28	171	1.85	-0.44	3.595	.000*
	Expert	171	2.94	171	1.77	-1.17	11.075	.000*
	Informational	171	2.58	171	0.81	-1.77	14.826	.000*
	Legitimate	171	1.83	171	0.95	-0.88	7.674	.000*
	Referent	171	2.42	171	2.14	-0.29	2.628	.009*

UNIT STRUCTURE	Measures	PRE		POST		DIFFERENCE		
		N	Mean	N	Mean	From Pre to Post	Paired t-test	Sig
	Power	171	2.40	171	1.57	-0.83	11.742	.000*
	CPOE	171	1.93	171	1.72	-0.21	2.145	.033*
Hierarchy	Reward/Coercive	54	1.41	54	0.82	-0.59	2.700	.009*
	Expert	54	3.02	54	2.01	-1.00	5.806	.000*
	Informational	54	1.48	54	0.41	-1.07	4.742	.000*
	Legitimate	54	0.72	54	0.53	-0.19	0.806	.424
	Referent	54	1.18	54	1.21	0.03	-0.125	.901
	Power	54	1.55	54	1.04	-0.51	3.505	.001*
	CPOE	54	1.59	54	0.92	-0.66	2.954	.005*
Not on patient unit	Reward/Coercive	51	2.32	51	1.87	-0.45	1.715	.093
	Expert	51	2.96	51	2.08	-0.87	4.583	.000*
	Informational	51	2.36	51	0.82	-1.54	4.740	.000*
	Legitimate	51	1.94	51	1.26	-0.68	2.295	.026*
	Referent	51	2.36	51	2.35	-0.01	0.046	.964
	Power	51	2.39	51	1.75	-0.63	3.179	.003*
	CPOE	51	1.82	51	1.76	-0.05	0.274	.785

*Values are considered significant if p <=.05

PREVIOUS EHR EXPERIENCE	Measures	PRE		POST		DIFFERENCE		
		N	Mean	N	Mean	From Pre to Post	Paired t-test	Sig
Yes	Reward/Coercive	149	2.30	149	1.77	-0.53	4.048	.000*
	Expert	149	2.98	149	1.96	-1.02	8.519	.000*
	Informational	149	2.42	149	0.74	-1.68	12.384	.000*
	Legitimate	149	1.69	149	0.88	-0.82	6.697	.000*
	Referent	149	2.28	149	2.04	-0.24	1.974	.050*
	Power	149	2.33	149	1.54	-0.78	9.816	.000*
	CPOE	149	1.84	149	1.47	-0.38	3.391	.001*
No	Reward/Coercive	127	1.90	127	1.51	-0.39	2.638	.009*
	Expert	127	2.93	127	1.77	-1.16	10.640	.000*
	Informational	127	2.20	127	0.72	-1.49	8.943	.000*
	Legitimate	127	1.56	127	0.98	-0.58	3.434	.001*
	Referent	127	2.05	127	1.94	-0.10	0.684	.495
	Power	127	2.12	127	1.45	-0.67	6.506	.000*
	CPOE	127	1.85	127	1.70	-0.15	1.155	.250

*Values are considered significant if p <=.05

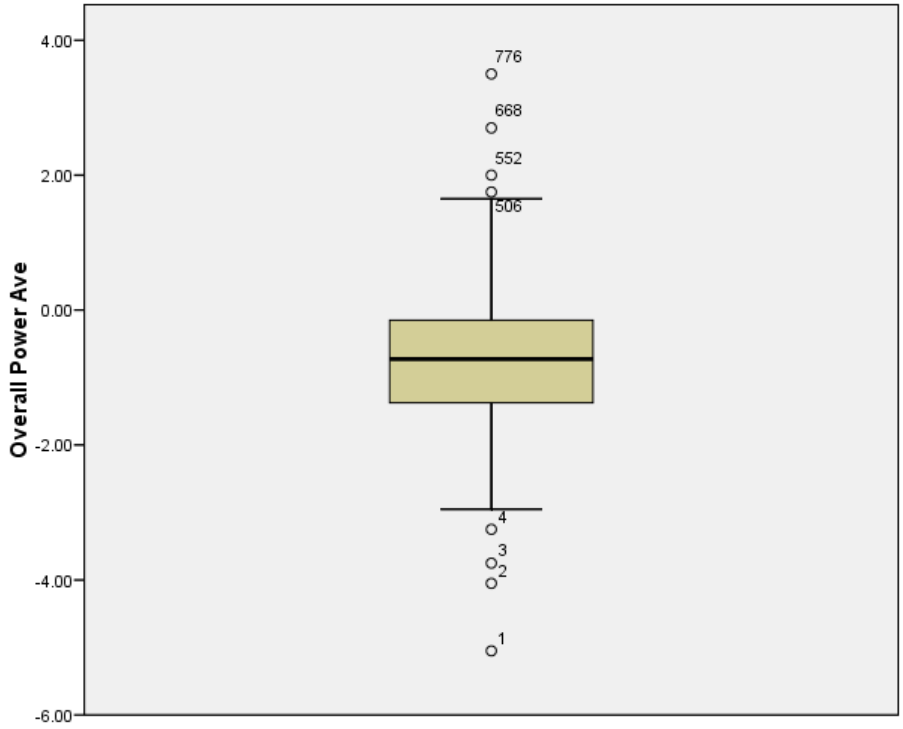
EHR EXPERIENCE POSITIVE OR NEGATIVE	Measures	PRE		POST		DIFFERENCE		
		N	Mean	N	Mean	From Pre to Post	Paired t-test	Sig
No previous experience	Reward/Coercive	127	1.9016	127	1.5079	-0.39	2.638	.009*
	Expert	127	2.9291	127	1.7736	-1.16	10.640	.000*

EHR EXPERIENCE POSITIVE OR NEGATIVE	Measures	PRE		POST		DIFFERENCE		
		N	Mean	N	Mean	From Pre to Post	Paired t-test	Sig
	Informational	127	2.2046	127	0.7194	-1.49	8.943	.000*
	Legitimate	127	1.565	127	0.9843	-0.58	3.434	.001*
	Referent	127	2.0457	127	1.9417	-0.10	0.684	.495
	Power	127	2.1213	127	1.4465	-0.67	6.506	.000*
	CPOE	127	1.8472	127	1.6978	-0.15	1.155	.250
Positive	Reward/Coercive	138	2.3587	138	1.7971	-0.56	4.003	.000*
	Expert	138	2.9493	138	1.9185	-1.03	8.382	.000*
	Informational	138	2.5388	138	0.7609	-1.78	13.441	.000*
	Legitimate	138	1.7174	138	0.9112	-0.81	6.215	.000*
	Referent	138	2.3333	138	2.0783	-0.26	2.024	.045*
	Power	138	2.3692	138	1.5591	-0.81	9.646	.000*
	CPOE	138	1.944	138	1.5317	-0.41	3.501	.001*
Negative	Reward/Coercive	11	1.6136	11	1.4545	-0.16	0.635	.540
	Expert	11	3.3864	11	2.5	-0.89	1.696	.121
	Informational	11	0.9391	11	0.5455	-0.39	0.565	.585
	Legitimate	11	1.4091	11	0.4545	-0.95	3.169	.010*
	Referent	11	1.5455	11	1.5455	0.00	0.000	1.000
	Power	11	1.8091	11	1.35	-0.46	1.945	.080
	CPOE	11	0.5855	11	0.65	0.06	-0.235	.819

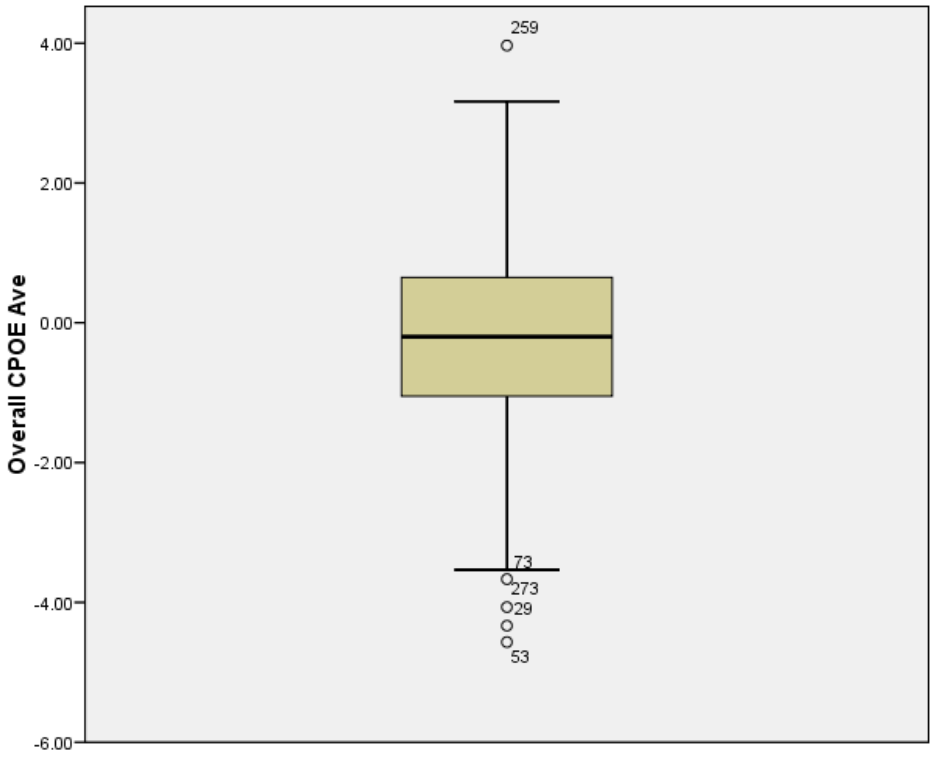
*Values are considered significant if p <=.05

APPENDIX I

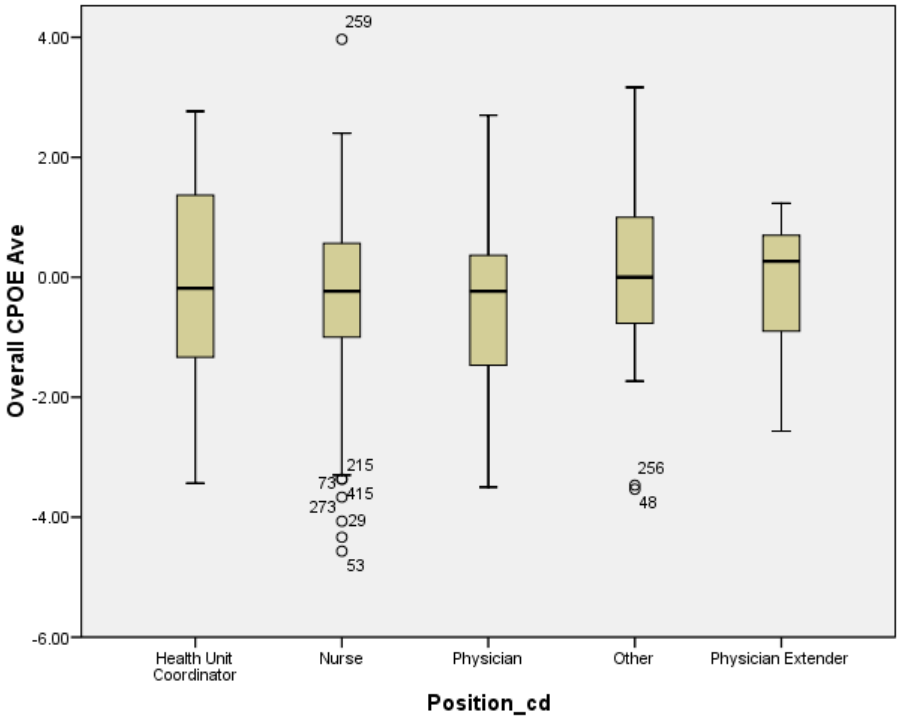
BOXPLOTS OF POWER AND CPOE



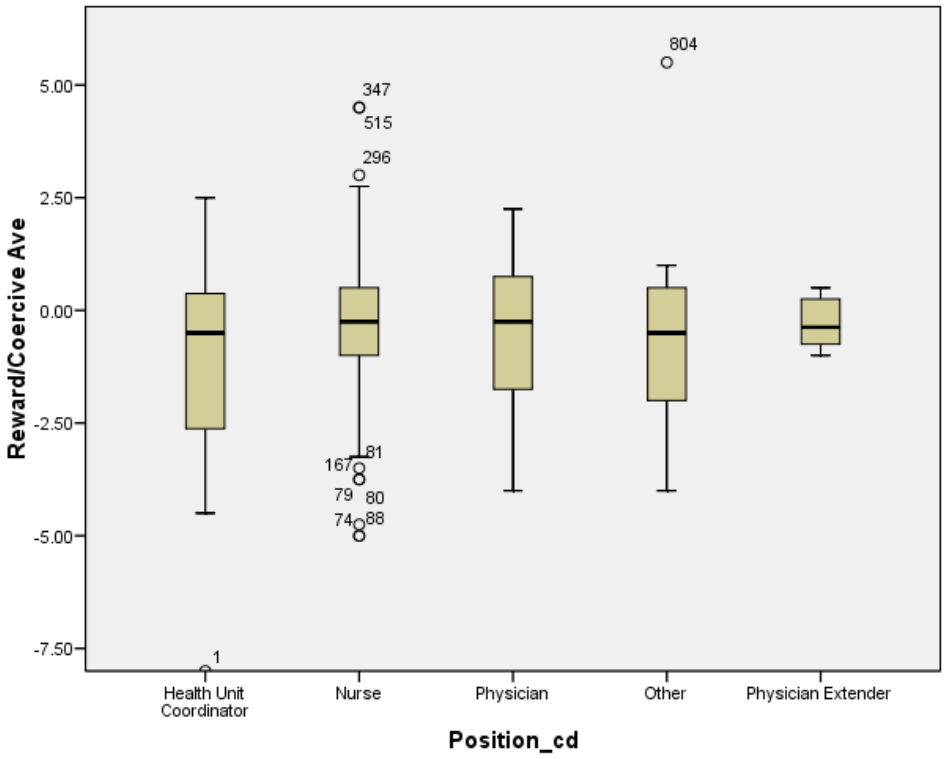
Box plot of Overall Differences in Power Perceptions.



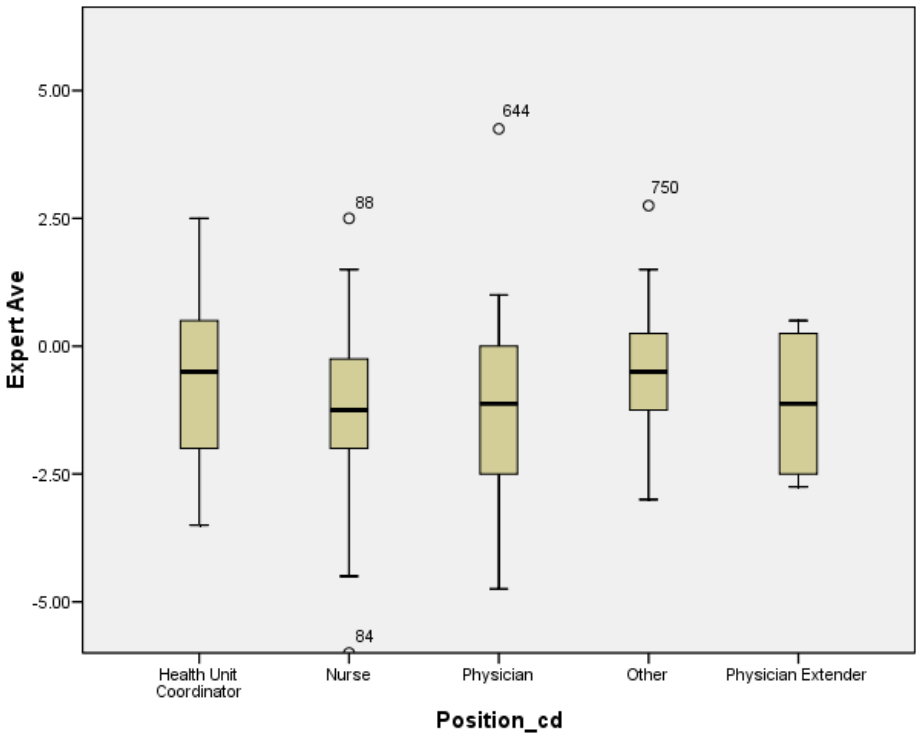
Box plot of Overall Differences in CPOE Attitudes



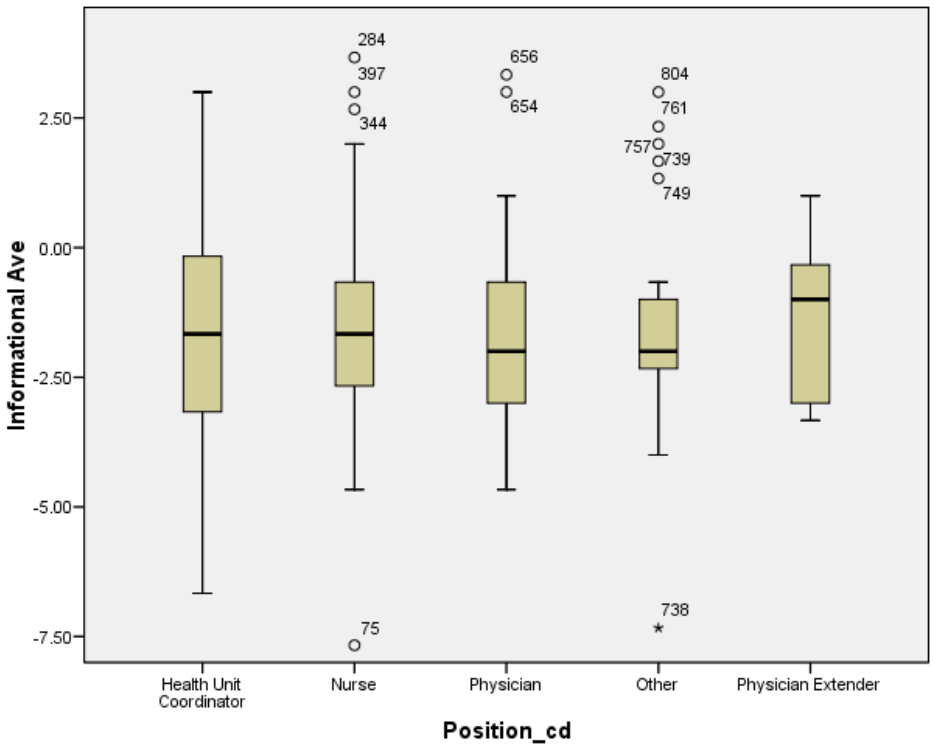
Box plot of CPOE Attitudes by Position



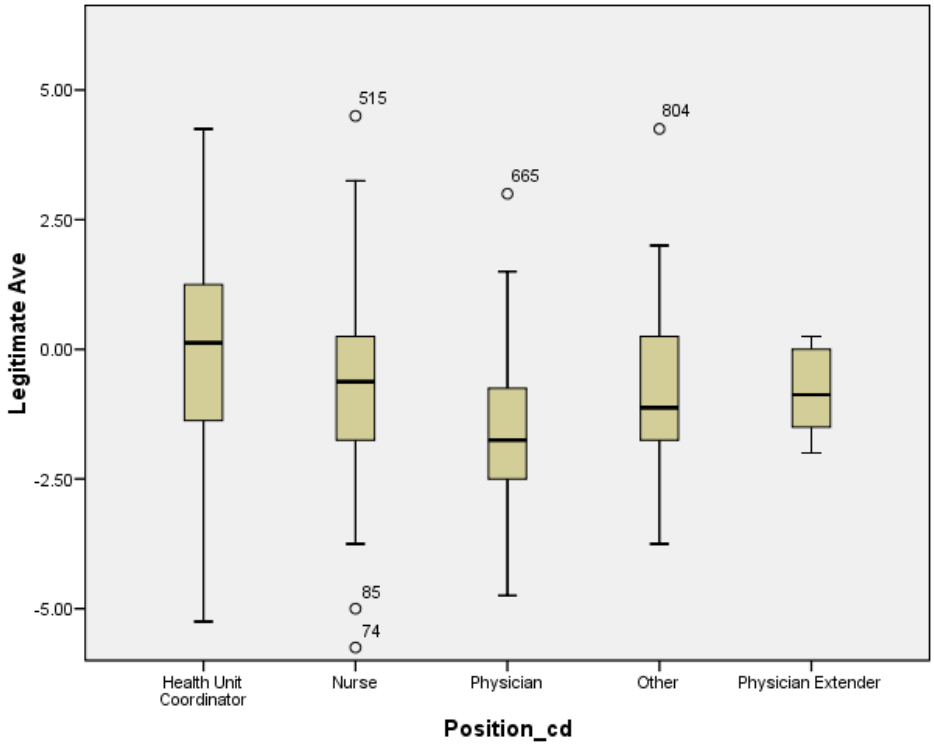
Box plot of Reward/Coercive Power Base by Position



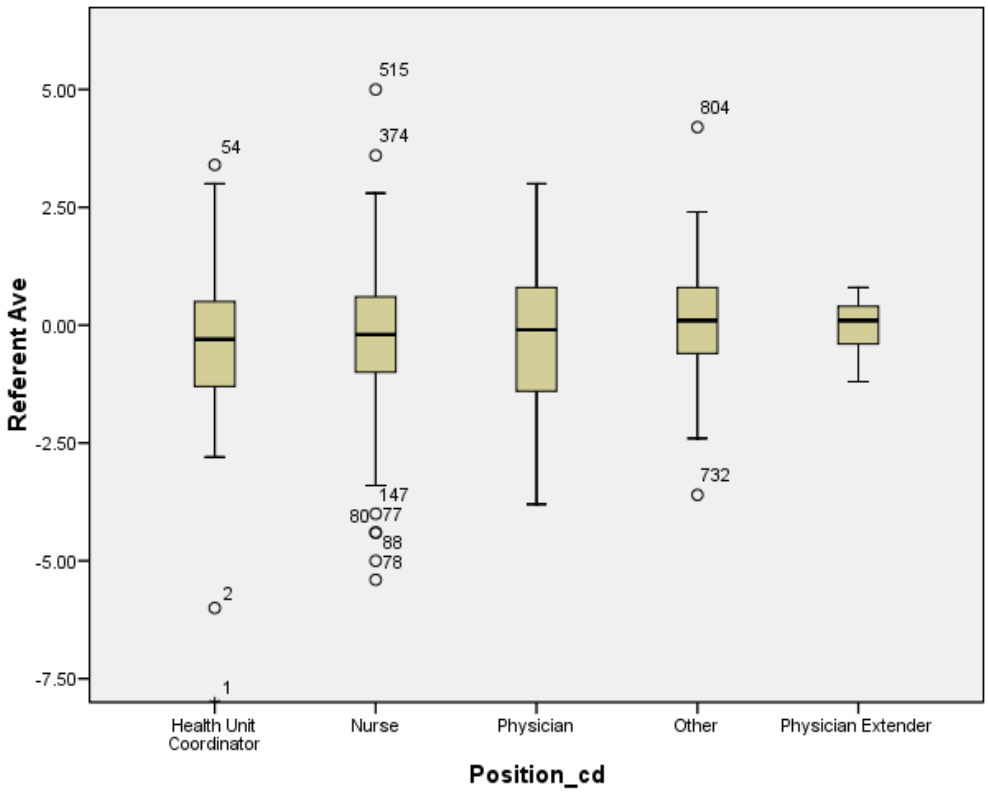
Box plot of Expert Power Base by Position



Box plot of Informational Power Base by Position



Box plot of Legitimate Power Base by Position



Box plot of Referent Power Base by Position

APPENDIX J

COMMENTS ON EHR EXPERIENCE

HOSPITAL	POSITION	PATIENT UNIT TYPE	PREVIOUS EXPERIENCE QUALITY	COMMENT ON EHR EXPERIENCE
Pediatric	HUC	ICU	Positive	I like typing better then writing on paper. It's easy not to make a big misstake when you typing in and you can read what a doctor say and not trying to read their hand writting.
Community	HUC	Non-ICU	Positive	information tranfered to where it needs to go/negative would be-needed upgraded
Community	HUC	Non-ICU	Positive	it is an easy system
Pediatric	HUC	ICU	Positive	It is very convenient, organized, & easy to read.
Pediatric	HUC	ICU	Negative	The system was never running correctly and we did not have enough computers that worked. The batteries on the computers did not hold charges for any length of time.
Community	Nurse	ICU	Positive	After the initial learning curve, patient information is readily available,

HOSPITAL	POSITION	PATIENT UNIT TYPE	PREVIOUS EXPERIENCE QUALITY	COMMENT ON EHR EXPERIENCE
				accurate assessments are interfaced with critical equipment, EHR is legible
Community	Nurse	ICU	Positive	Because it was a logical system that one could easily follow the next step. It was patient care oriented rather than charge/payment oriented and it was built for nurses.
Pediatric	Nurse	ICU	Positive	Documentation is faster on the computer.
Community	Nurse	Non-ICU	Positive	Documentation was more accurate, accessable and readable
Community	Nurse	Non-ICU	Positive	Ease of charting
Pediatric	Nurse	ICU	Positive	Ease of use, quick retrieval of info (usually), all info available in same place
Pediatric	Nurse	ICU	Positive	Easier system to keep track of than paper charting
Pediatric	Nurse	ICU	Positive	Easier to find information needed
Community	Nurse	ICU	Positive	Easier to, find information, read notes, multiple people can be in chart.
Pediatric	Nurse	ICU	Positive	Easily accessible
Pediatric	Nurse	ICU	Positive	easy retrieval and organization.
Pediatric	Nurse	ICU	Positive	Easy to chart. Entry of orders was easy for nurses to do. I've had some problems at times with the computer system being down when orders needed entered, but the system was efficient when it was up and working.
Pediatric	Nurse	ICU	Positive	easy to document, fast
Community	Nurse	ICU	Positive	EAsy to enter data, vital signs, assessments. Other care givers could look at data while you were working in the pt screen.
Community	Nurse	Non-ICU	Positive	Easy to figure out.
Pediatric	Nurse	ICU	Positive	Easy to get quick results and confirm patient data
Community	Nurse	ICU	Positive	Easy to read notes.
Community	Nurse	ICU	Positive	Easy to use

HOSPITAL	POSITION	PATIENT UNIT TYPE	PREVIOUS EXPERIENCE QUALITY	COMMENT ON EHR EXPERIENCE
Pediatric	Nurse	ICU	Positive	everyone kept an open mind and worked together
Community	Nurse	ICU	Positive	Exceed has made charting and finding lab/test results much easier for me; dictations and results are legible and easier to understand; and are much more timely. easier to read other nurses notes and assessments. I & O much more legible and sl more accurate.
Community	Nurse	ICU	Positive	for the most part it made charting easier, faster and gave me more time at the bedside. Esp, the slaving in of VS and the way I & 0 clicked in and totaled.
Pediatric	Nurse	ICU	Positive	Generally the system was user friendly and education was adequate.
Community	Nurse	Not on a patient unit	Positive	had good teaching, organization demonstrated positive impact, believed that organization would benefit and that patients would continue to receive good care
Pediatric	Nurse	ICU	Positive	Helped to get award from paperwork
Pediatric	Nurse	ICU	Positive	I adapt easily to change and like technology.
Pediatric	Nurse	ICU	Positive	I like the instant availablility of the information when I need it. I also like that everything is in the same place, so everyone has access to all of the information as they need it.
Pediatric	Nurse	Not on a patient unit	Positive	I liked being able to look up results on my own time instead of relying on others
Pediatric	Nurse	ICU	Positive	I think the more we can get everything on computer the clearer everything is. Less errors less unknown phrases that you can not read
Community	Nurse	Non-ICU	Positive	I was a nursing student at a teaching hospital when I used EHR. I was properly trained and when questions arose I could ask other staff members.

HOSPITAL	POSITION	PATIENT UNIT TYPE	PREVIOUS EXPERIENCE QUALITY	COMMENT ON EHR EXPERIENCE
Community	Nurse	Non-ICU	Positive	I was able to learn the system easily and was an efficient user.
Pediatric	Nurse	ICU	Positive	I wish we did more with EHR I like having information at my fingertips instead of having to go through pages and pages of paper.
Community	Nurse	ICU	Positive	ICare was a designed program for our unit. Easy to use. Our RN's played an important role in the design.
Community	Nurse	Non-ICU	Positive	information is power
Community	Nurse	ICU	Positive	It assisted the patient in receiveing quality care because I had more time to spend with them.
Community	Nurse	Non-ICU	Positive	It made reading and transcribing orders safer. Tests results were easier to access
Community	Nurse	Non-ICU	Positive	It was a lot easier to deal with and time efficient compared to paper, I was in the ER and it worked really well with the MD's putting the orders in.
Community	Nurse	Non-ICU	Positive	It was a very user friendly system. Our dept was the first throughtout the Kaiser system to "go live". I found out this system later failed and they had to go to another system. Maybe it was too easy???
Pediatric	Nurse	ICU	Positive	It was easy to use, didn't waste as much paper.
Pediatric	Nurse	ICU	Positive	It was nice to know that if I needed information on a patient that was in house I could access it immeciately
Pediatric	Nurse	ICU	Positive	Legible documentation that can be easily reproduced (printed). Could access info at any computer that had the EHR program, instead of "fighting" over a hand-written flowsheet or universal form (ex. multi-disciplinary goal sheet, PIV flowsheet, FER, etc.). Could easily fix errors, instead of crossing out errors on a written document (also had the option to go back to previous

HOSPITAL	POSITION	PATIENT UNIT TYPE	PREVIOUS EXPERIENCE QUALITY	COMMENT ON EHR EXPERIENCE
				charting & reword or correct before submitting. EHR documentation provides for more effective time management.
Community	Nurse	ICU	Positive	Like computers
Pediatric	Nurse	ICU	Positive	Made more time for hands-on patient care
Community	Nurse	ICU	Positive	more thorough assessments with computer charting
Community	Nurse	ICU	Positive	Much easier than writing assessments. There is a single place to look up important patient information
Pediatric	Nurse	ICU	Positive	No problems. Easier to pull up info on computer than look through paper trail. also easier to read computer screen than MD handwriting!!
Community	Nurse	Non-ICU	Positive	Phyisician's did not participate nor did all of the nurses - it was mainly support staff that used the system.
Community	Nurse	Non-ICU	Negative	physicians needed a paper or hard copy as well, so you had to do quite a bit of double charting.
Community	Nurse	Non-ICU	Positive	Positive because all documentation is legible and don't have to interpret hand writing; also easy acess to patient records, lab results, etc.
Pediatric	Nurse	ICU	Positive	Positive because easy to use and information is readily available with no need to attempt to read others handwriting.
Community	Nurse	Non-ICU	Positive	Positive- clear documentation and legible
Community	Nurse	Non-ICU	Positive	Positive for pt care, negative for time needed to use.
Community	Nurse	ICU	Positive	Seemed to take less time to chart & obtain data.
Community	Nurse	Non-ICU	Positive	simpified the documentation process and "no fighting" over a patient's chart
Pediatric	Nurse	ICU	Positive	Simple to access information, and share with other disciplines as needed.
Community	Nurse	ICU	Negative	The program wasn't well designed. The EHR made charting take more time

HOSPITAL	POSITION	PATIENT UNIT TYPE	PREVIOUS EXPERIENCE QUALITY	COMMENT ON EHR EXPERIENCE
				than the paper chart had taken.
Pediatric	Nurse	ICU	Positive	Thorough computer training prior to going LIVE with the new system
Pediatric	Nurse	ICU	Positive	trained well to use it
Community	Nurse	Non-ICU	Positive	Very limited need to look up lab results for our eye specialty hospital
Pediatric	Other	ICU	Positive	Chartmax--I can look up already scaned documents from the chart & find the information that I need.
Community	Other	Not on a patient unit	Positive	Easy to use; convenient
Pediatric	Other	ICU	Positive	I had several days of training before using the system on my own.
Pediatric	Other	ICU	Positive	It was not too complicated
Community	Other	Not on a patient unit	Negative	Product was in Alpha development and not appropriate to initiate in the hospital environment.
Community	Other	Not on a patient unit	Positive	Quick and easy access to the information needed to code and perform related tasks
Community	Physician Extender	Not on a patient unit	Positive	decreased clutter from paper. Not having to share paper chart with others causing a delay in getting work done.
Community	Physician Extender	ICU	Negative	inadequate training prior to use
Community	Physician Extender	Non-ICU	Negative	Not enough training was provided; a computer was not provided to my level of providers
Community	Physician Extender	Non-ICU	Positive	speed, efficiency, cost savings
Community	Physician	ICU	Positive	the teaching/practice prior to implemintation

HOSPITAL	POSITION	PATIENT UNIT TYPE	PREVIOUS EXPERIENCE QUALITY	COMMENT ON EHR EXPERIENCE
	Extender			
Pediatric	Physician Extender	ICU	Positive	user friendly
Pediatric	Physician	ICU	Positive	able to access info from multiple hospital locations as well as home and pda
Community	Physician	Non-ICU	Positive	better record in office
Community	Physician	Non-ICU	Negative	Could not access desired data reliably at time--even with IT help
Pediatric	Physician	ICU	Positive	Ease of lab results access at anytime
Pediatric	Physician	Not on a patient unit	Positive	Easy to use and navigate.
Community	Physician	Non-ICU	Positive	EMR will cut down on "care errors"
Community	Physician	Non-ICU	Positive	facilitated patient care
Pediatric	Physician	Not on a patient unit	Positive	Improved access and legibility
Community	Physician	Non-ICU	Positive	it has been convenient to look up lab results while rounding
Pediatric	Physician	ICU	Negative	It is slow to enter. People ignore eresults because they are "in the computer"
Community	Physician	ICU	Negative	It was intermitent contact and I always had to call the help desk to get my password reset.The computer terminals were logged off and there wasn't information handy about how to "get back into the system" i.e. ID and passwords.Once in, I could find the information I needed.The screen would go to screen saver way to often (to short of time) To many passwords and ID's across the various hospitals. The EMR is probably fine but the access

HOSPITAL	POSITION	PATIENT UNIT TYPE	PREVIOUS EXPERIENCE QUALITY	COMMENT ON EHR EXPERIENCE
				problems are not!
Pediatric	Physician	Not on a patient unit	Positive	It was very efficient, checked medication doses, had no problems with communication or legibility of written orders, could easily pull up results from anywhere in the hospital and review orders, did not require to be at patient bedside.
Community	Physician	Non-ICU	Positive	Just need more time and repetition
Pediatric	Physician	Not on a patient unit	Positive	lot faster than calling on phone for results
Pediatric	Physician	Not on a patient unit	Positive	Makes accessing information easier.
Pediatric	Physician	Not on a patient unit	Positive	Mixed. It is nice to have everything available and legible. But computer's have quirks that can be frustrating.
Community	Physician	Not on a patient unit	Positive	overall its less efficient for physicians, but for acess to their PMH and meds it will be hugely beneficial in an inpt setting.
Community	Physician	Non-ICU	Positive	Positive: speed and clarity of information transmission amongst the providers/nurses, etc. Negative: Continued wasteful use of paper.
Pediatric	Physician	Not on a patient unit	Positive	The EHR I work with most at this time is pretty good. The one at my prior employer should serve as a negative example to others. The first one I worked with (~1986 with order entry) was amazingly bad. Thus, the current system is pretty darn good.
Community	Physician	Not on a patient unit	Negative	Took longer to do work
Pediatric	Physician	ICU	Positive	worked well

HOSPITAL	POSITION	PATIENT UNIT TYPE	PREVIOUS EXPERIENCE QUALITY	COMMENT ON EHR EXPERIENCE
Community	Physician	ICU	Positive	worked well
Pediatric	Resident	ICU	Negative	It takes too much time to place orders, difficult to find specific notes in the computer, too much information "lost" in the clutter.

APPENDIX K

COMMENTS ON INFLUENCES ON POWER

HOSP	GENDER	POSITION	PATIENT UNIT TYPE	UNIT STRUCTURE	INFLUENCE ON POWER - PRE IMPLEMENTATION	INFLUENCE ON POWER - POST IMPLEMENTATION
Community	Female	HUC	Not on patient unit	Not on patient unit	My ? leader and coworkers	
Pediatric	Female	HUC	Not on patient unit	Not on patient unit	My experience and encouragement by my supervisor(s).	my experience and knowledge of the department, backing up my actions
Community	Female	HUC	ICU	Team	Amount of effective training/practice time HUC's have been given	
Pediatric	Female	HUC	ICU	Team		Manager who doesn't trust me with anything restricts the amount of work I feel comfortable doing.
Pediatric	Female	HUC	ICU	Team		My job description and managment

HOSP	GENDER	POSITION	PATIENT UNIT TYPE	UNIT STRUCTURE	INFLUENCE ON POWER - PRE IMPLEMENTATION	INFLUENCE ON POWER - POST IMPLEMENTATION
Pediatric	Female	HUC	ICU	Team	I influence how much power I have. It is up to me to say what I think and how I feel. I don't just sit by and let things happen I express my opinion.	I am the one who decides how much power I have over my own work.
Pediatric	Female	HUC	ICU	Team		I can help Dr.'s and residents enter orders and solve problems.
Pediatric	Female	HUC	ICU	Team	The Nurse have lot of power over my work. And the CNC.	A lot of powder because I don't have a lot to do that need powder.
Community	Male	HUC	Non-ICU	Hierarchy		the system has its good and bad points, training was inadequet and poorly done, and that is still the case. the rns got weeks of training and we hucs got eight hours which did not even scratch the surface. The lead huc did nothing to resolve the situation. It seems to me that the rns are doing more than they need to with the system and less patient care. The Dr. are confused and frustrated. Which effect things like preop surg orders being there at the last minute or not at all. I think the overall effect will be good in the long run, but I am not sure that the current situation is all it needs to be. With this type of system it is easy to look at something quickly and assume it is something else or get it wrong enterily and once you have moved on in the information

HOSP	GENDER	POSITION	PATIENT UNIT TYPE	UNIT STRUCTURE	INFLUENCE ON POWER - PRE IMPLEMENTATION	INFLUENCE ON POWER - POST IMPLEMENTATION
						pages it is lost on your current thinking process. The Rn seem to be able to support each other but there is a wide gap in overall understanding across the board.
Community	Female	HUC	Non-ICU	Hierarchy	I feel that my ability to know my job and my good work ethic and how well i do my job.The nurses give me alot of power because i show that i deserve it and that i can handle it.	I think that my attitude has a lot to do with how much power i have over my work and my ability to know my work and how helpful and useful i am to others for sure has a lot to do with it.
Community	Female	HUC	Non-ICU	Team	management	MANAGER
Community	Male	HUC	Non-ICU	Hierarchy	Money in the budget or lack thereof.	Co-workers
Community	Female	HUC	Non-ICU	Team	I am good at my job and I do a good job I have erned the respect of my coworkers	when i work on 8940 i have a lot that i can do but things are changing I now have to float between 2 units or off floor i really do not like this
Community	Female	HUC	Non-ICU	Team	Having a leader that allows for change and listens to her employees.	My Leader
Community	Female	HUC	Non-ICU	Hierarchy	Leadership	I feel my workload has considerably diminished since going live with computerized charting!
Community	Female	HUC	Non-ICU	Team	as a huc it seems when the mds do put in there own orders we wont have much of a job left other than answering phones and call lights(this is a big concern for them as a group	
Community	Female	HUC	Non-ICU	Team	I think right now it is hard & scary, I feel it	Our role has NO "power" and we are treated

HOSP	GENDER	POSITION	PATIENT UNIT TYPE	UNIT STRUCTURE	INFLUENCE ON POWER - PRE IMPLEMENTATION	INFLUENCE ON POWER - POST IMPLEMENTATION
					will get easier. I know it will have its ups 7 downs just like any new computer system, or computer related item. I know it will take time. but we all will adjust... its just new and people are getting anxiety.	as less important now.
Community	Female	HUC	Non-ICU	Team	Not much, Don't think that HUC's will have a jod in couple of years.	
Community	Female	Nurse	Not on patient unit	Not on patient unit		culture of trust and collaboration
Community	Male	Nurse	Not on patient unit	Not on patient unit	supervisor support	
Community	Female	Nurse	Not on patient unit	Not on patient unit		My manager. She is great.
Community	Female	Nurse	Not on patient unit	Not on patient unit	I have very little power over my work	I have no power
Pediatric	Female	Nurse	Not on patient unit	Not on patient unit	The skills I brought to my current position and the ease with which I adapt	
Community	Male	Nurse	ICU	Hierarchy	Collaboration with MD's and multidisiplinary team help empower everyone. Any concerns regarding pt care can be brought up at rounds. The mix of experienced and	Hospital administration, hospital culture, unit culture. Experience. Physicians

HOSP	GENDER	POSITION	PATIENT UNIT TYPE	UNIT STRUCTURE	INFLUENCE ON POWER - PRE IMPLEMENTATION	INFLUENCE ON POWER - POST IMPLEMENTATION
					less experienced nurses helps to impower the less experienced to improve their skils and influence the care plan.	
Community	Female	Nurse	ICU	Team	The Excellian program has changed my work in that I am more worried about charting and am beginning to worry that there will be no time for patient care with all the charting screens, flowsheets and new rules and regulations. If I could only do patient care I would be very happy.	This type of order entry is very time consuming and confusing because you can't see all the orders that are an option. You don't know if the choices are correct, you can't see the whol order set. The orders are difficult to read and sort out as to when labs are to be drawn, medication to be given and the proper time not the time the order was put in the computer. I feel that excellian in general has taken time away from patient care and made reading orders more difficult. It is hard to list labs to be drawn. It is a poor system. Doctors should not be able to place orders without at least calling the station to make the nurses aware that new orders are presen.
Community	Female	Nurse	ICU	Team	Clinical leadership that supports. Collegiality among all staff.	
Community	Female	Nurse	ICU	Team	Being an active member of the Minnesota Nurses Assn (labor union)	Developing a good rel;ationship with my immediate superior, who is an innovator.
Community	Female	Nurse	ICU	Team	Less influence. It takes more effort to communicate the needs.	
Community	Female	Nurse	ICU	Team	supervisor	multidisciplinary rounds

HOSP	GENDER	POSITION	PATIENT UNIT TYPE	UNIT STRUCTURE	INFLUENCE ON POWER - PRE IMPLEMENTATION	INFLUENCE ON POWER - POST IMPLEMENTATION
Community	Female	Nurse	ICU	Team	My willingness to bring up issues and then follow through onseeing them implemented	
Community	Female	Nurse	ICU	Team	supportive manager who will listen to me.	My experence on the floor and my abilities to use the computer effectively and efficently.
Community	Female	Nurse	ICU	Hierarchy		My work ethic and professional moral are about the only things I have power of over my work. Management and computers are to make life more streamlined and efficient but that is not how reality is.
Community	Female	Nurse	ICU	Hierarchy	none	I have no power at all to change anything!
Community	Female	Nurse	ICU	Team	having the physicians willing to listen to RN input on pts.	
Community	Female	Nurse	ICU	Team	my own attitude about my work	being provided with information to make decisions
Community	Female	Nurse	ICU	Team	I have a lot of influence when it comes to the care I give my patients: in ICU the MDs are collaberative and the other nurses good teammates. I have no influence on hospital admininstration. Decisions are made that impact my ability to do bedside care and nurses are not listened to, not brought into the decision making process and not valued. Nursing administration is a sham. There are few in nursing management that I have any respect for and they seem to have very little power to advocate for staff	

HOSP	GENDER	POSITION	PATIENT UNIT TYPE	UNIT STRUCTURE	INFLUENCE ON POWER - PRE IMPLEMENTATION	INFLUENCE ON POWER - POST IMPLEMENTATION
					and problem solve. So my area of influence is very small: whatever room my patient is in.	
Community	Female	Nurse	ICU	Team	knowledge of system	
Community	Female	Nurse	ICU	Hierarchy		Dick Pettingill
Community	Female	Nurse	ICU	Team	Time	
Pediatric	Female	Nurse	ICU	Team		In regards to CPOE, I feel it sometimes slows me down and I do not do my work as efficiently as before. There is a huge learning curve and it will take time to adjust to the changes
Pediatric	Female	Nurse	ICU	Team	experience and knowledge	
Pediatric	Female	Nurse	ICU	Hierarchy	In my role, it depedns on what I am working at and with whom i am working. In my own environment I have alot of power, when i ventrue out of my environment I fell that I have less power as individuals (especially physcians) do not feel that I have sufficent knowledge in thier particular area (although I have been a nurse for 25 years and worked in all areas) to have opinions that need to be considered.	My education and experience
Pediatric	Female	Nurse	ICU	Hierarchy	I have a strong sense of individual self and belief in self, although not everyone else sees me in the same way.	What I put into it.
Pediatric	Female	Nurse	ICU	Team	Our unit(doctors, nurses, and other	My experience I have gained and the

HOSP	GENDER	POSITION	PATIENT UNIT TYPE	UNIT STRUCTURE	INFLUENCE ON POWER - PRE IMPLEMENTATION	INFLUENCE ON POWER - POST IMPLEMENTATION
					ancillary staff) consistently works together to make nurses have more indepence in everyday work and making decisions for our patients.	respect from physicians and practitioners.
Pediatric	Female	Nurse	ICU	Team	I believe that the facility has limited how much power I have over my work. I am anticipating moving into a different position and also feel that that one will also have a large limitation of what I will be able to do. I think that all of the nursing population (staff RN, nurse practitioners, etc) are very limited as to what they can do. It seems like even though their licenses state they can do something, the facility limits them to a much lowere level of functioning.	I really don't have much power over my work. I feel very criticized and watched at all times. This facility is very policy oriented, and does not encourage self thought, reflection, motiviation. Many people work "like robots" and are unable to think through processes, they wait for the NNP or Physician to hand down their orders. All of the "power" belongs in the Charge nurses and the administration, even though they are rarely in the clinical setting.
Pediatric	Female	Nurse	ICU	Team	Consistent knowledge of pt care and needs.	Being heard and having my opinions recognized as valuable input, even if they aren't utilized.
Pediatric	Female	Nurse	ICU	Team	team work with multi-disciplinary team	
Pediatric	Female	Nurse	ICU	Team		self
Pediatric	Female	Nurse	ICU	Hierarchy	have no power but I keep pushing forward eventually will make changes	favortism is a major factor in our hospital. Its not always what you know but who you know.
Pediatric	Female	Nurse	ICU	Team	Knowledge and open communication philosophy of peers/supervisors	An awesome team of healthcare providers who are respectful, open to questions, and work well together.

HOSP	GENDER	POSITION	PATIENT UNIT TYPE	UNIT STRUCTURE	INFLUENCE ON POWER - PRE IMPLEMENTATION	INFLUENCE ON POWER - POST IMPLEMENTATION
Pediatric	Female	Nurse	ICU	Team	Nursing leadership has limited me in what I can do for staff. Medical team more supportive of my work and efforts.	Experience and proving your knowledge each day with patients.
Pediatric	Female	Nurse	ICU	Team		R E S P E C T!!!!
Pediatric	Female	Nurse	ICU	Team	Knowledge and respect from co-workers.	
Pediatric	Female	Nurse	ICU	Team	Management.	
Pediatric	Female	Nurse	ICU	Team	The length of time I've been here and my confidence level. If the physicians know me well and know where my comfort zone is, I have more power over my work and don't have to lean on them as much.	
Pediatric	Female	Nurse	ICU	Hierarchy		my own personal drive and determination plus excellent CNC support on the 5th floor night shift
Pediatric	Female	Nurse	ICU	Hierarchy	too many guidelines and rules to follow, no autonomy allowed	
Pediatric	Female	Nurse	ICU	Team	I believe that the physicians trust me and my decision making. I know that they know i would never make a decision that i was unsure of without discussing it first with them. I believe that i have developed a good rapport with them and trust them with everything. I love my job.	
Pediatric	Female	Nurse	ICU	Team	management	attitudes of co-workers and medical staff
Pediatric	Female	Nurse	ICU	Hierarchy		relationships with staff/ validation through performance of skills

HOSP	GENDER	POSITION	PATIENT UNIT TYPE	UNIT STRUCTURE	INFLUENCE ON POWER - PRE IMPLEMENTATION	INFLUENCE ON POWER - POST IMPLEMENTATION
Pediatric	Female	Nurse	ICU	Team	Experience and senority	
Pediatric	Female	Nurse	ICU	Hierarchy	CPOE has not officially started yet, but I do worry that in the long run MDs will not ask for direct nurse input since they will not have to stay at the bedside to write orders.	
Pediatric	Female	Nurse	ICU	Hierarchy	I became a relief CNC which gives me a little more say and independence.	
Pediatric	Female	Nurse	ICU	Team	Physicians respect for the nursing role & verbal acknowledgment of our experience/knowledge when deciding a plan of care for a patient.	
Pediatric	Female	Nurse	ICU	Team	My confidence in myself and my assessment skills. I am not afraid to voice my concerns.	
Pediatric	Female	Nurse	ICU	Team	My ablility to learn and educate myself by using the resources that I have here. Also my belief in further education and knowledge, and that that is only controlled by me.That nursing is a profession and I can further it with my accomplishments.	THe management and their decisions on certain things
Pediatric	Female	Nurse	ICU	Team	We attempt to have a team based approach with involvement of all healthcare personel. We have ability to input ideas for change.	
Pediatric	Female	Nurse	ICU	Hierarchy	Knowledge	
Pediatric	Female	Nurse	ICU	Team	The physicians have worked hard to keep	The physicians that I work with

HOSP	GENDER	POSITION	PATIENT UNIT TYPE	UNIT STRUCTURE	INFLUENCE ON POWER - PRE IMPLEMENTATION	INFLUENCE ON POWER - POST IMPLEMENTATION
					nursing a large part of decision making process. They work hard to keep nursing involved and respect the nurses clinical input.	
Pediatric	Female	Nurse	ICU	Team	teamwork and open communicaton	
Pediatric	Female	Nurse	ICU	Team	the confidence that the physician have in my skills as a nurse. they trust and ask for my opinion/ideas when caring for a patient.	
Pediatric	Female	Nurse	ICU	Team		I feel I have the same amount of power that I always did even before CPOE. I like the CPOE as it makes my work more efficient.
Pediatric	Female	Nurse	ICU	Team	The power I practice with comes from experience and faith that I have developed in my critical thinking and allowing me to individualize my patient care.	My critical thinking has led me to new ideas to improve patient care outcomes.
Pediatric	Female	Nurse	ICU	Team	whether I take initiative to do (whatever is in question) or not	
Community	Female	Nurse	ICU	Team	I am a ACM	
Community	Female	Nurse	ICU	Hierarchy	I have a leader (manager) who is very open and Supportive. Because of our manager it is a good place to work.	
Community	Female	Nurse	Non-ICU	Team	increased bureaucracy at the top of the organization for whom I work.	
Community	Female	Nurse	Non-ICU	Team	there are some areas were I am dependent upon the decisions of board members who are deciding on policies but my	The volume of information that's available has a large influence. The more knowledge I have, the better I am able to advocate for

HOSP	GENDER	POSITION	PATIENT UNIT TYPE	UNIT STRUCTURE	INFLUENCE ON POWER - PRE IMPLEMENTATION	INFLUENCE ON POWER - POST IMPLEMENTATION
					suggestions and questions to the borad members have been well recieved. Taking initiative empowers more than sitting back and waiting to be told. I can't possiblly control everything but it makes me feel better knowing that my input is welcomed and valued.	myself and my patients.
Community	Male	Nurse	Non-ICU	Team	information is power	individual networking and knowledge of system mechanics.
Community	Female	Nurse	Non-ICU	Team	good leadereship and a team approach to patient care	
Community	Female	Nurse	Non-ICU	Hierarchy	knowledge	
Community	Female	Nurse	Non-ICU	Hierarchy	Corp. has predetermined the program with little imput to change from our hosp. until a new update goes up. The upper adm. level does not value direct care givers. Sees us as a cost rather than a cost saver.	manager
Community	Female	Nurse	Non-ICU	Team	my education, values and morals	
Community	Female	Nurse	Non-ICU	Team	Experience in nursing, yrs worked in position	
Community	Female	Nurse	Non-ICU	Hierarchy	upper management	I have more charting since the inplementation of Excellian, over 20 different windows are utilized in caring for each patient increasing the charting and the time neccessary to document. The doctors dislike the system as it increases their charting and

HOSP	GENDER	POSITION	PATIENT UNIT TYPE	UNIT STRUCTURE	INFLUENCE ON POWER - PRE IMPLEMENTATION	INFLUENCE ON POWER - POST IMPLEMENTATION
						order entry. The cost of the system has created a financial burden for the hospital. Layoffs in nursing and patient care areas are occuring as a direct result from the expense of the system. The managers complain about the amount of over time created as a result the amount of time neccessary to document patient care. Everyone on the unit feels under appreciated and with out influence regarding our job.
Community	Female	Nurse	Non-ICU	Team		The almighty TIME CLOCK.
Community	Female	Nurse	Non-ICU	Team	expectations of senior management regarding expected results.	The overall financial stability of Allina or United Hospital. My ability to meet my leadership accoutabilities.
Community	Female	Nurse	Non-ICU	Hierarchy	My supervisor	
Community	Female	Nurse	Non-ICU	Hierarchy	Whether or not I feel I have power, there is alot of room for better communication between different staff groups. I do feel the different groups work fairly well with each other, but there is rrom for improvement.	I think the atmosphere of a unit really influences feelings related to one's job-how you feel about your co-workers, your manager, your job. I think my unit works very well together and respect their coworkers.
Community	Female	Nurse	Non-ICU	Hierarchy	the amount of respect received from management and physcians	
Community	Female	Nurse	Non-ICU	Team		Most physicians finally having a positive attitude towards CPOE
Community	Female	Nurse	Non-ICU	Hierarchy	Union contract knowledge base and competency approachable responsive	

HOSP	GENDER	POSITION	PATIENT UNIT TYPE	UNIT STRUCTURE	INFLUENCE ON POWER - PRE IMPLEMENTATION	INFLUENCE ON POWER - POST IMPLEMENTATION
					clinically knowledgable management	
Community	Female	Nurse	Non-ICU	Team	Our job title, management is restricting	
Community	Female	Nurse	Non-ICU	Team		willingness to learn and understand Excellian
Community	Female	Nurse	Non-ICU	Team	Inadequate staffing issues have limited my ability to do my job and have caused a multitude of related problems including staff not working well as a team.	Management decisions
Community	Female	Nurse	Non-ICU	Team		nothing
Community	Female	Nurse	Non-ICU	Team	programs designed to encourage a team atmosphere	
Community	Female	Nurse	Non-ICU	Team	My peers and my leader	
Community	Female	Nurse	Non-ICU	Team	my knowledge and experience	
Community	Female	Nurse	Non-ICU	Team	the people and process of new ways of doing things. Research based care.	How at come up with a solution to a problem, glass half full.
Community	Male	Nurse	Non-ICU	Hierarchy		Physician buy in to our role.
Community	Female	Nurse	Non-ICU	Hierarchy	Nothing	
Community	Female	Nurse	Non-ICU	Team	MNA	
Community	Female	Nurse	Non-ICU	Team	Having more experience, having a boss that encourages me	
Community	Female	Nurse	Non-ICU	Team	automny in practice	
Community	Female	Nurse	Non-ICU	Team	Positve attitude. Good leadership and opportunities.	knowledge in certain areas
Community	Female	Nurse	Non-ICU	Hierarchy	Management style that gives me a feeling of empowerment; support opportunity for continuing learning	

HOSP	GENDER	POSITION	PATIENT UNIT TYPE	UNIT STRUCTURE	INFLUENCE ON POWER - PRE IMPLEMENTATION	INFLUENCE ON POWER - POST IMPLEMENTATION
Community	Female	Nurse	Non-ICU	Hierarchy	Management Support, management follow up	
Community	Female	Nurse	Non-ICU	Hierarchy	Rights granted through MNA contract,relationship with nsg leader and relationship with team members.	
Community	Female	Nurse	Non-ICU	Team	Nothing	
Community	Female	Nurse	Non-ICU	Hierarchy	management	Upper level management
Community	Female	Nurse	Non-ICU	Team	Management that listens and feels that staff has good ideas/input.	
Community	Female	Nurse	Non-ICU	Hierarchy	autonomy	Having autonomy
Community	Female	Nurse	Non-ICU	Team	professional organization	strong nursing organization and excellent administration that supports nursing
Community	Female	Other	Not on patient unit	Not on patient unit	The supervisors and managers communication to staff	Physician
Community	Female	Other	Not on patient unit	Not on patient unit	The largest influence giving coding professionals power over our work is the computer. Having medical records,research information, transcribed reports and test results at our finger tips has enabled coders to move from the office to home to work and still have almost instant contact between them, other departments and their department leaders. Coders are now able to choose the time of day they want to code rather than be	The President, Vice President and Director I work under also the Revenue Cycle Depart. of Allina and CMS

HOSP	GENDER	POSITION	PATIENT UNIT TYPE	UNIT STRUCTURE	INFLUENCE ON POWER - PRE IMPLEMENTATION	INFLUENCE ON POWER - POST IMPLEMENTATION
					confined to office hours. It is great!	
Community	Female	Other	Not on patient unit	Not on patient unit	Position, title, Education, ability to influence, demonstration of outcomes.	
Community	Female	Other	Not on patient unit	Not on patient unit	Quality training and positive work environment. Positive managment and encouragment.	Work is limited to following the system don't feel I have power over anything.
Community	Female	Other	Not on patient unit	Not on patient unit	The amount of knowledge i have. The more I know about the system the more power i have.	we dont have a manager breathing down our necks at all times
Pediatric	Female	Other	Not on patient unit	Not on patient unit	How well I am able to work by myself and how quickly I learn things.	my knowledge
Pediatric	Female	Other	ICU	Team	Learning the systems necessary to be accurate and organizing time and duties to ensure jobs are done on time and accurately.	For me, years of experience and consistant work habits have built trust and confidence with my co-workers.
Pediatric	Female	Other	ICU	Team	Some elements of micro-management that exist in the organization influences my power over my work.	
Pediatric	Female	Other	ICU	Team	Proven competency over time	Experience and consistency
Community	Female	Other	Non-ICU	Hierarchy	Administrative decisions	
Community	Male	Other	Non-ICU	Team	education and experience	
Community	Female	Other	Non-ICU	Team	My ability to have input, and feel in control	my personal attitude
Community	Male	Physician	Not on patient	Not on patient unit	How I apply myself, but also what our systems are.	

HOSP	GENDER	POSITION	PATIENT UNIT TYPE	UNIT STRUCTURE	INFLUENCE ON POWER - PRE IMPLEMENTATION	INFLUENCE ON POWER - POST IMPLEMENTATION
			unit			
Community	Female	Physician	Not on patient unit	Not on patient unit	The RNs who seem to go out of their way to place obstacles in my way. No longer an attitude of "How may I help you" but instead "What can I do now to obstruct this physician in the practice of medicine and patient care"	
Community	Female	Physician	Not on patient unit	Not on patient unit	Allina mandatory work requirements.	
Pediatric	Female	Physician	Not on patient unit	Not on patient unit	experience	Experience
Pediatric	Female	Physician	Not on patient unit	Not on patient unit	People are the most important determinant because it is they who make the culture and political climate of the workplace.	Change of leadership and structure in our organization.
Pediatric	Male	Physician	Not on patient unit	Not on patient unit		I do not work in the ICU
Pediatric	Male	Physician	Not on patient unit	Not on patient unit	Our administration and their sometimes lack of ability to utlilize our input.	The lack of well thought-out, intelligent responses to questions posed to the administration.
Pediatric	Male	Physician	Not on patient unit	Not on patient unit	Time Management	
Community	Male	Physician	ICU	Team	The hospital systems I need to work in.	

HOSP	GENDER	POSITION	PATIENT UNIT TYPE	UNIT STRUCTURE	INFLUENCE ON POWER - PRE IMPLEMENTATION	INFLUENCE ON POWER - POST IMPLEMENTATION
Pediatric	Male	Physician	ICU	Team	knowledge and positional authority	
Pediatric	Male	Physician	ICU	Hierarchy	Administrative attitude	
Pediatric	Male	Physician	ICU	Team	Daily contact at multiple levels to discuss patient care	Implementation of long term goals of this organization are inappropriate to the stated mission of this organization
Pediatric	Female	Physician	ICU	Team	success with patient care	my two initials m.d.
Community	Female	Physician	Non-ICU	Hierarchy	having knowledge	
Community	Female	Physician	Non-ICU	Hierarchy	Electronic medical records has greatly increased physician work load, decreased our productive time and therefore pay, and has now resulted in physicians being asked to do the jobs of unit secretaries, coders, data entry people,etc. without compensation for our time.	
Community	Male	Physician	Non-ICU	Team	Lack of understanding/ support as a more senior physician without a lot of computer skills	
Pediatric	Female	Resident	ICU	Hierarchy		the people I work with

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