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IMPROVING PCS 5.67 MEDITECH'S USER INTERFACE BY ADDING A "ONE-CLICK-ONE-SCREEN" ELECTRONIC PAGE

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IMPROVING PCS 5.67 MEDITECH'S USER INTERFACE BY ADDING A *"ONE-CLICK-ONE-SCREEN"* ELECTRONIC PAGE

A Scholarly Project Submitted to the Graduate School
in Partial Fulfillment of the Requirements
for the Degree of
Doctor of Nursing Practice

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May 2020

IMPROVING PCS 5.67 MEDITECH'S USER INTERFACE BY ADDING A "ONE-CLICK-ONE-SCREEN" ELECTRONIC PAGE

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IMPROVING PCS 5.67 MEDITECH'S USER INTERFACE BY ADDING A *"ONE-CLICK-ONE-SCREEN"* ELECTRONIC PAGE

An Abstract of The Scholarly Project By
German Abarca Paillacho

Medical organizations and physicians have been encouraged to implement different EHR systems. Initially these systems aimed to record, and store clinical data and improve its access and legibility. However, as these systems have become almost indispensable, users are demanding from these applications more complex tasks. Small practices and/or rural medical organizations often cannot afford to continuously upgrade their EHR systems or acquire modern systems. Research has shown that one way to solve this problem is to customize and add features that can facilitate user navigation. The purpose of this QI project was to investigate if integrating a *"one-click-one-screen"* electronic window displaying a snapshot of the most relevant and up-to-date patient information into PCS 5.67 Meditech was able to facilitate and improve data accessibility, information exchange, user satisfaction, patient care, and communication among the users. A pre-survey, given to 30 frequent users of PCS 5.67 Meditech, gathered their perception of the system's UI. A *"one-click one-screen"* feature was designed however it was difficult to integrate it into the system's UI because customization of this EHR system was complex beyond the local IT expertise. Nonetheless, the pre-survey data indicated that a significant number of PCS 5.67 Meditech users were dissatisfied with the performance of this EHR system. Additionally, the pre-survey data showed that the EHR system UI did not display clinical data in an efficient and user-friendly manner.

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CHAPTER I

INTRODUCTION AND PURPOSE

Description of the problem

In 2009, the American Recovery & Reinvestment Act (ARRA) was enacted by the U.S. Congress and signed into law by President Barack Obama. As part of the ARRA statute, another regulation named the Health Information Technology for Economic and Clinical Health (HITECH) assigned $19 billion to hospitals and physicians who demonstrate meaningful use of Electronic Health Records (EHR) or Electronic Medical Records (EMR) (Zlabek, Wickus, & Mathiason, 2011). Since the creation of these reforms, many medical organizations and physicians have implemented different EHR systems. As anticipated, multiple benefits have resulted from this implementation; however, some issues have also appeared.

According to HealthIT.gov (2018), EHRs can assist providers in offering higher quality and safer patient care by offering benefits such as:

- Provide accurate, up-to-date, and complete information about patients at the point of care.
- Enable quick access to patient records for more coordinated, efficient care.
- Improving patient and provider interaction and communication.
- Helping providers improve productivity and work-life balance

However, it seems like the achieving of these intended EHR benefits greatly depend on the design of the user interface (UI), specifically how user-friendly the system can be. Also, it is important to consider that EHR systems collect large amount of diverse clinical data that can make its accessibility complex and/or time consuming. Reasonably, in view of the undesirable results provided by various research studies concerning the UI of some EHR systems, one wonders if patient safety related to communication among the members of the interdisciplinary team and productivity have been enhanced or diminished.

While electronic records have been slowly developed and implemented, various research studies have investigated their efficacy. Some studies have shown that among the issues that have risen with the implantation of EHR systems and that have affected their successful adoption is their poor system UI design. It has been reported that EHR users complain about usability problems such as tedious and prolonged patient data search caused by the complex distribution of patient information in multiple sections of the EHR program. For example, Levinson, Price and Saini (2017) stated that EHR users can report that many electronic systems can create extra work because of the endless and useless prompts that require multiple clicks to go through them. Another study by Howe, Adams, Hettinger, and Ratwani (2018) cautioned that "EHR usability is a point of frustration for clinicians and can have patient safety consequences" (p. 1276). Furthermore, there is evidence that the incorporation of EHRs can have undesirable effects on communications among clinicians and between clinicians and patients (Jones et al., 2011).

Similarly, it has been reported that poor communication and collaboration among healthcare professionals are part of the most common causes of patient care errors that produce negative consequences (Lancaster, Kolakowsky-Hayner, Kovacich, & Greer-Williams, 2015). Another report published by the research/analysis firm CRICO Strategies, asserted that inadequate communication was identified as a contributing factor in 7,149 cases (30%) of 23,000 medical malpractice claims filed between 2009 and 2013 (Hoffman, Siegal & Bergquist, 2015). Therefore, it appears realistic to link poor UI design with decreased communication among the members of the healthcare team and poor productivity. This problematic combination, especially in the hospital setting or larger medical institutions, can be aggravated even more if physicians do not inform the nursing staff about changes in the patient's plan of care and/or nurses fail to notify changes in the patient's condition. Other problems intensifying this issue are unclear or incomplete nursing handoff reports and the limited patient information access that the rest of the members of the interdisciplinary team (RT, phlebotomy, radiology, PT, etc.) have. All these negative issues, in unknown proportions, have been observed in a rural hospital in the state of Kansas. This hospital utilizes the EHR system called PCS 5.67 Meditech. It is imperative to use a Quality Improvement (QI) project that can identify the nature and magnitude of these problems, design and implement solutions.

Significance to Nursing

With the adoption of EHR systems across the nation, nursing staff have become accustomed to heavy reliance on EHR systems to record, obtain, interpret, and communicate patient data. Therefore, UI designs should strive to offer uncomplicated methods to handle clinical data and deliver higher and safer patient care. If patient

information is inaccurate or difficult to access, patient safety can be jeopardized. Additionally, it is important that UI of all EHR systems should meet certain universal guidelines that improve patient safety, better communication, and simple access to patient data. More research concerning this topic can bring about significant changes.

From the nursing educational standpoint, improving EHR systems is relevant because as Nelson & Staggers (2018) reported, health care professionals must be trained in developing proficiency in topics related to informatics. The use of informatics is significant because medical professionals not only are involved in using medical applications such as the EHR, but they could participate in developing and evaluating these systems. Nurse practitioners must be familiar with the process of EHR implementation, usage of EHR systems, and even with how to evaluate and enhance these systems. Nursing professionals at every level (either registered nurses or nurse practitioners) are affected by electronic records, therefore seeking to investigate and implement ways to improve EHR must become another professional goal in their carriers.

Specific Aims and Purpose

Seeking to address the problem of poor communication among care providers, improve productivity and enhance user interface design, this scholarly project has designed a Quality Improvement (QI) project. The purpose is to investigate if adding to Patient Care System (PCS) 5.67 Meditech a *"one-click-one-screen"* electronic window displaying the most relevant and up-to-date patient information could improve patient data accessibility, user satisfaction, patient care, and communication among the members of the interdisciplinary team in a rural hospital in Pittsburg, KS. In short, this QI project seeks to improve the quality of the communication among healthcare professionals who

use and heavily rely on an Electronic Health Record (EHR) by adding a more concise/user friendly clinical data display screen.

Utilizing the PICOT methodology, the QI project could be described as follows:

P=Members of the interdisciplinary team from a local rural hospital who use PCS 5.67 Meditech software as their EHR.

I= Design of a *"one-click-one-screen"* electronic page that can be added to PCS 5.67 Meditech. This electronic page must be clear, concise, interactive, easy to access and able to be continually updated as clinical data is produced.

C= Level of communication without the *"one-click-one-screen"* PCS 5.67 Meditech feature compared to the level of communication with *"one-click-one-scree"* PCS 5.67 Meditech feature.

O= Members of the interdisciplinary team have verbalized improved communication during the use of *"one-click-one-screen"* PCS 5.67 Meditech feature.

T= Three months

Theoretical Framework

The Dyadic Interpersonal Communication Model will be used as the theoretical framework for this project. The dyadic interpersonal communication model explains the interactive process that takes place between two people (Antai-Otong, 2007). This conceptual model includes the concepts of sender and recipient, the encoder and decoder, feedback, and external factors that can modify the message in the communication process (Figure 1). It is worth noting that this communication model emphasizes the relevance of clarity and awareness of the external factors

that influence communication.

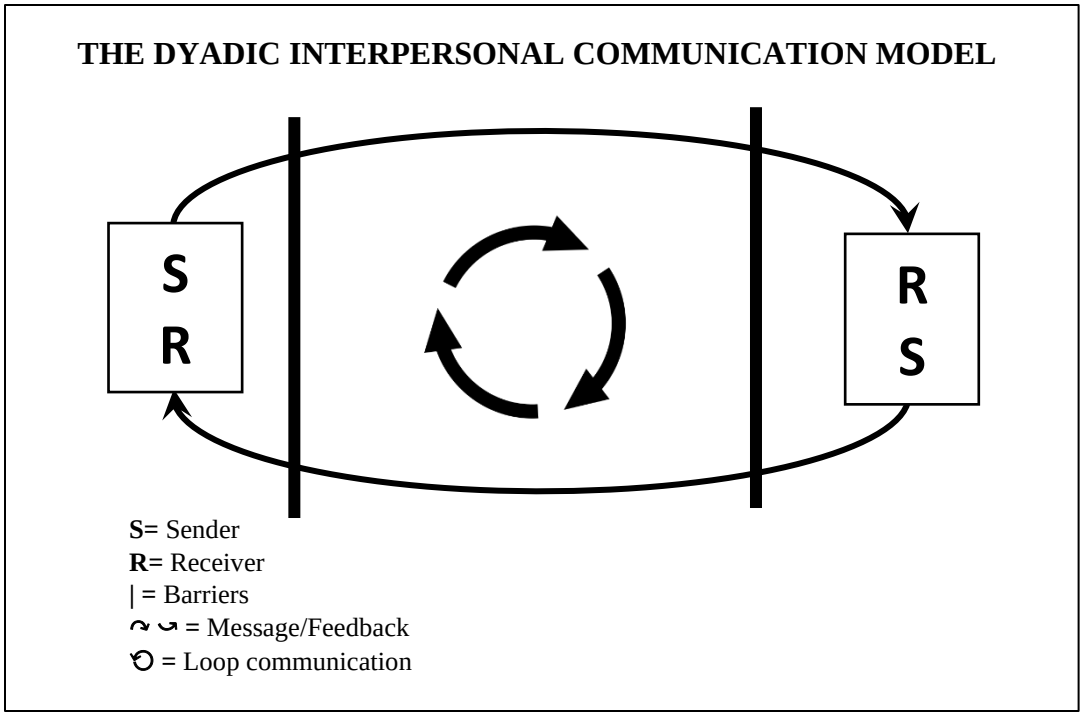

Figure 1

The Dyadic Interpersonal Communication Model. Adapted from Saaed, H.K. (2016). Principles and Elements of Interpersonal Communications. College of Pharmacy, University of Sulaimani.

Applying this model, the researcher can discover all the factors affecting communication that originate from the EHR system and from the individuals using the system. The patient data becomes the message that flows among all the care givers caring for the patient and from the EHR system to the care givers and vice versa. Consequently, in this model the members of the interdisciplinary team can provide valuable information about how a particular EHR facilitates or hinders communication, productivity, and patient care.

Another conceptual framework that will guide this QI project is the Innovation in Healthcare Delivery Systems (Figure 2). This conceptual framework has a dual purpose: 1) Links the variables that drive the implementation of innovation in healthcare and 2) Gives researchers interested in this topic the foundation on which their studies can be built (Omachonu & Einspruch, 2010). This model depicts the six distinct purposes that

healthcare organizations put forward: treatment, diagnosis, prevention, education, research, and outreach. However, these objectives must be achieved by considering quality, costs, safety, efficiency, and outcomes. These aspects are powerful drivers of the creation and implementation of healthcare innovations. In this model, other elements directly linked to healthcare innovations are patients and healthcare providers.

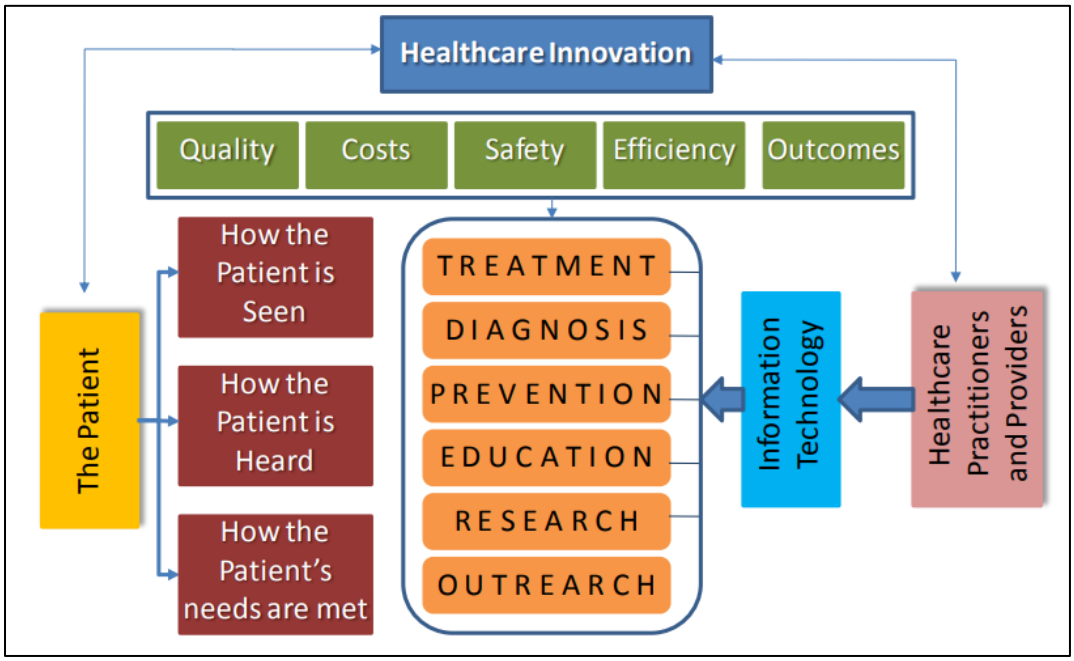

Figure 2

A *Conceptual Framework for Innovation in Healthcare (Omachonu & Einspruch, 2010, p.10). Innovation in Healthcare Delivery Systems: A Conceptual Framework.*

The healthcare innovations become tools used by care providers that if properly designed and operated can satisfy the needs of the patients and efficiently achieve the purpose of the healthcare organizations. EHRs are healthcare innovations that have achieved positive results, however Omachonu and Einspruch (2010) suggested that "much of today's health information systems were designed to function as silos, with

their own rules and formats". This original design neglected to consider that EHRs not only need to store data, but also make it readily available. This conceptual framework can assist the researcher in the investigation of how EHRs satisfy or frustrate the demands of health care organizations.

Practice Questions

In this QI project, the formulation of a research question is more suitable because the topic under consideration qualifies as an exploratory or descriptive study. Exploratory or descriptive studies seek to make the researcher more familiar with the phenomena being investigated (Terry, 2018). Furthermore, the results of this project could provide the basis for further research about the different types of EHR interface designs. The project question can be stated as follows:

Is it possible to improve communication among the members of the interdisciplinary team who work in a rural hospital and use PCS 5.67 Meditech software as their Electronic Health Record by adding a *"one-click-one-screen"* electronic page that can display the most relevant and up-to-date patient data?

1. What were the attitudes, beliefs, and perceptions of the interdisciplinary team about the quality of the current user interface displayed by the PCS 5.67 Meditech application?
2. What were the attitudes, beliefs, and perceptions of the interdisciplinary team about the quality of communication between caregivers before the addition of the *"one-click-one-screen"* feature into the PCS 5.67 Meditech application?

3. Did the addition of a *"one-click-one-screen"* electronic page displaying the most relevant and up-to-date patient data improve communication with other nurses and/or providers?
4. Did the addition of a *"one-click-one-screen"* electronic page displaying the most relevant and up-to-date patient data save caregivers time during their hours of care?
5. Did the printout of a *"one-click-one-screen"* electronic page displaying the most relevant and up-to-date patient data improve the nursing handoff report?
6. What are the attitudes, beliefs, and perceptions of the interdisciplinary team about the quality of the user interface displayed by the PCS 5.67 Meditech application after the integration of the *"one-click-one-screen"* feature?
7. What were the attitudes, beliefs, and perceptions of the interdisciplinary team about the quality of communication between caregivers after the *"one-click-one-screen"* feature integrated into the PCS 5.67 Meditech application?

Definition of Key Terms

1. Electronic Health Record (EHR): An EHR is "an electronic version of a patient's medical history that is maintained by the provider over time, and may include all of the key administrative clinical data relevant to that person's care under a particular provider, including demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data and radiology reports" (Centers for Medicare & Medicaid Services [CMS], 2012)
2. User Interface: "A user interface, also called a "UI" or simply an "interface," is the means in which a person controls a software application or hardware device.

A good user interface provides a "user-friendly" experience, allowing the user to interact with the software or hardware in a natural and intuitive way" (TechTerms, 2018).

3. Communication: The Medical Dictionary Online (2013) defines communication as "The exchange or transmission of ideas, attitudes, or beliefs between individuals or groups".
4. Innovation: West (1990) defined innovation "as the intentional introduction and application within a role, group, or organization, of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, or wider society" (as cited in Omachonu & Einspruch, 2010, p. 3).
5. Handoff: According to Wallace (2005), "handoff, also known as a "handover" or "patient care transfer," is an interactive process of transferring patient-specific information from one caregiver to another or from one team of caregivers to another for the purpose of ensuring the continuity and safety of the patient's care" (as cited in Patton, 2007, p.3).
6. Interdisciplinary team: The BusinessDictionary.com (n.d.) defines interdisciplinary team as "A coordinated group of experts from several different fields who work together toward a common business goal."

Logic Model of the Proposed DNP Project

According to Struik et al. (2014) the making of an effective EHR is a collaborative effort where the interaction among technology producers/developers, users, and administrative groups is essential. This QI project seeks to include users, IT

personnel, and administrative staff to improve the UI of PCS 5.67 Meditech. And in doing so, improve the quality of the communication among the members of the interdisciplinary healthcare team who rely on PCS 5.67 Meditech to record, store, organized and access vital patient clinical data. To guide this QI project, the Plan-Do-Study-Act (PDSA) cycle will be utilized. The first step is to conduct interviews (Survey #1) with several members of the healthcare team. The second step is to design a *"one-click-one-screen"* electronic page that can be integrated into the PCS 5.67 Meditech interface. This electronic page/window must display diverse, concise, relevant, up-to-date patient data; and must be able to be continually updated. This step requires the partnership of the Via Christi Hospital-Pittsburg IT staff. In step three we will seek follow up feedback by interviewing the participants of the study (Survey #2) and analyzing the data. The logic model depicted in Figure 3 was designed to demonstrate the strategy that will be utilized to provide a solution to the problem at hand.

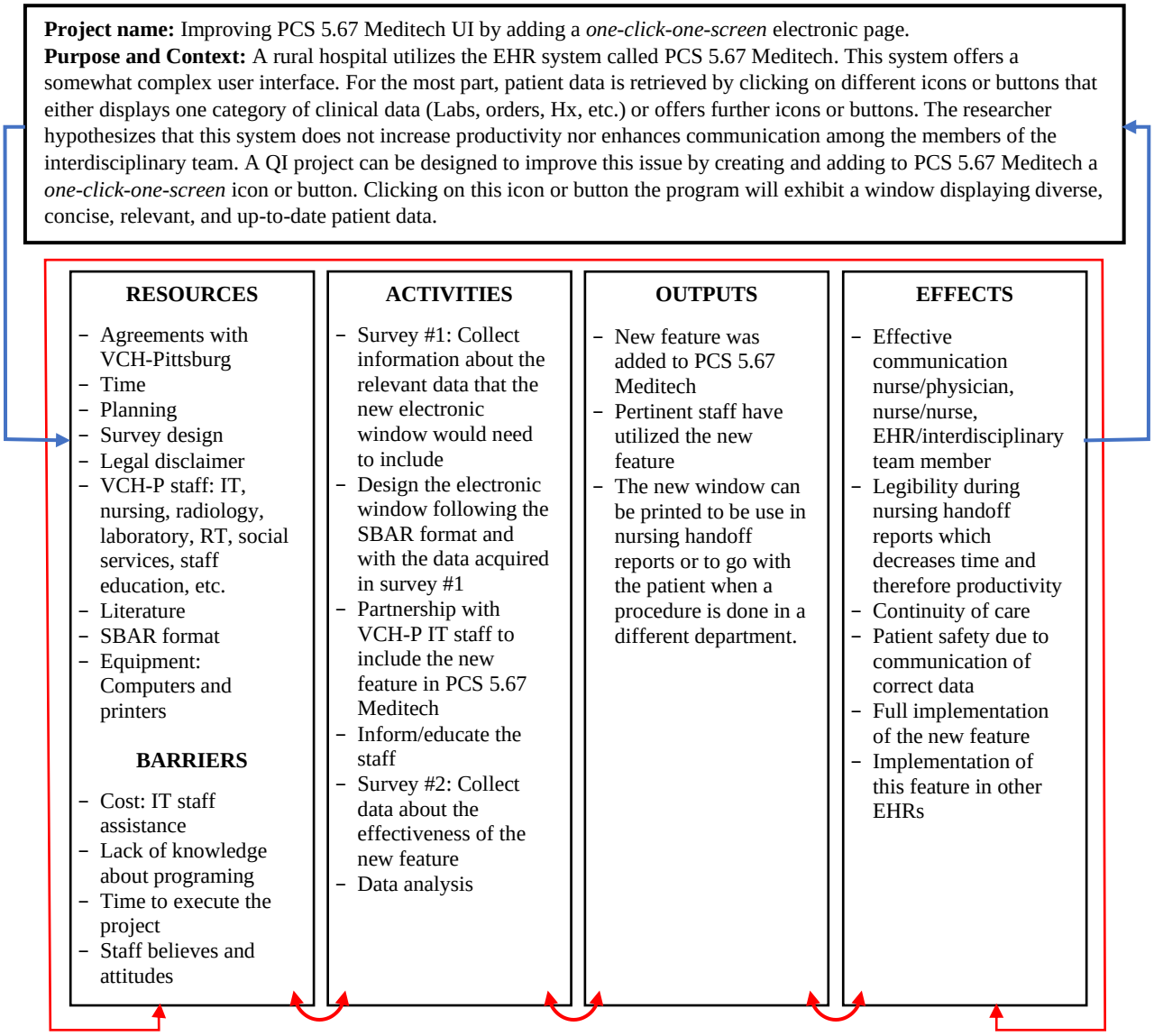

Figure 3

Project's Logic Model

Summary of chapter

Effective communication among the members of the healthcare team is fundamental in the delivery of appropriate patient care. EHR systems should offer simple access to patient clinical data and facilitate communication among healthcare professionals; however, some EHR systems have developed not-user-friendly interfaces

making access to patient data rather a complex task. QI Projects seek to systematically improve a “faulty” clinical service. Therefore, this research design can help the researcher to discover the positive or negative effects of implementing a *“one-click-one screen”* electronic page in a customizable EHR system (PCS 5.67 Meditech). It is hypothesized that the addition of this feature can make the PCS 5.67 Meditech interface more user friendly and at the same time positively affect communication and productivity. The new feature can be utilized during nursing handoff reports, nursing vs. physician interactions, and any circumstances where a member of the interdisciplinary team needs to know a complete but concise clinical picture of a patient.

CHAPTER II

LITERATURE REVIEW

Before designing and implementing any Quality Improvement (QI) project it is necessary to explore its need and its relevance. Consequently, it is essential to review the existing literature related to our QI project. The topics investigated in this literature review were Electronic Health Record (EHR) user satisfaction, EHR user interface (UI) design, advantages, and disadvantages of EHR implementation, EHR contribution to interdisciplinary information exchange, and steps given to improve EHR systems. As a recap, our QI project focuses on investigating if adding to Patient Care System (PCS) 5.67 Meditech a *"one-click-one-screen"* electronic window displaying a snapshot of the most relevant and up-to-date patient information could facilitate data accessibility, user satisfaction, patient care, and information exchange among the members of the interdisciplinary team. PCS 5.67 Meditech is an EHR system used in a rural hospital in Pittsburg, KS. An extensive search of the literature was conducted using the Pittsburg State University Axe Library Summon search tool. The following filters were applied to the search: full text online, scholarly, peer review, and journal articles. The articles were linked to the following databases: Cumulative Index to Nursing and Allied Health Literature (CINAHL), MEDLINE, ProQuest, and PubMed. Key terms used to identify

potential articles included EHR interface design, EHR usability, EHR safety, improving EHR systems, etc. Details concerning the literature search are depicted in Table 1.

Table 1

Article Search Details

Key Phrase	Number of Articles Resulted from The Search	
	Without Quotation Marks	**With Quotation Marks**
EHR interface design	2,822	11
EHR usability	1,903	130
EHR safety	7,640	43
Improving EHR systems	7,310	53
EHR and communication	8,976	118
TOTAL ARTICLES INCLUDED	23	

The review of the literature concerning EHR adoption and implementation revealed significant information. For instance, most articles pointed out the relevance of the American Recovery & Reinvestment Act (ARRA) in pursuing a safer handling of patient clinical data. In 2009, the ARRA was enacted by the U.S. Congress and signed into law by President Barack Obama (ARRA-HITECH Act FAQ's, 2019). As part of this Act, another regulation called the Health Information Technology for Economic and Clinical Health (HITECH) allocated "$19 billion to hospitals and physicians who demonstrate meaningful use of electronic medical records" (ARRA-HITECH Act FAQ's, 2019). However, according to the literature the benefits of implementing EHRs have been questioned and investigated. Researchers have studied how EHR systems affect patient care, workflow, communication, collaboration among their users, etc. (Assis-Hassid, Grosz, Zimlichman, Rozenblum & Bates, 2019). The findings revealed both positive and negative effects. Many articles agreed about the significant role that the UI design plays in the success of implementing EHR systems. Finally, extensive data has

been collected that supports the idea that EHR systems need to improve to accommodate the complex American health care system.

Implementation of EHR and Patient Safety

As stated before, American federal legislation has encouraged and enforced health care institutions and primary care providers to adopt EHR systems as part of a strategy seeking safer standards in delivering patient care. In the following section we will discuss the positive and negative aspects of implementing EHR systems.

Positive Aspects. The original purpose of adopting EHR systems was to transform the health care system from a mostly paper-based industry to one that utilizes digitalized clinical data to allow providers the delivering of higher quality of care to their patients (Menachemi & Collum, 2011). The clinical data available in EHRs includes patient demographics, progress notes, complications, medications, vital signs, past medical history, immunizations, laboratory data, radiology reports, etc.; this information is clear and legible therefore eliminating the problem of poor penmanship (Menachemi & Collum, 2011).

The three major functionalities of EHRs that offer improvement in the quality of care and reduction of costs at the health care system level are: Clinical decision support (CDS), computerized physician order entry (CPOE), and health information exchange (HIE) (Menachemi & Collum, 2011). The combination of CDS tools and CPOE systems have improved patient safety up to 83%, specifically by reducing medical errors (Menachemi & Collum, 2011). This was supported by a study that compared the communication between pharmacist and prescribers before and after the implementation of an EHR system. The study showed that the number and percentage of clarification

requests, interaction notifications, and incorrect dose notifications were lower after the implementation (Singer & Duarte-Fernandez, 2015).

Another positive feature of EHR systems is their ability to implement computerized reminders; for example, some programs can generate reminders about the patient's need for immunization, anticoagulation prophylaxis and pressure ulcer prevention (Menachemi & Collum, 2011). This was confirmed by a recent study that showed that EHR adoption was associated with better performance on process compliance and patient satisfaction (Adler-Milstein, Everson, & Lee, 2015). Although much of the early studies concerning the effects of EHR systems have focused on the impact of EHRs in large medical centers such as hospitals and large clinics, one study demonstrated that users in small to medium-sized medical practices who utilized commercial EHRs have experienced high levels of satisfaction (O'Malley, Grossman, Cohen, Kemper, & Pham, 2009). This was confirmed early on by a study done by Joos, Chen, Jirjis, and Johnson (2006); they described that the implementation of EHRs in primary care practices gave the users a sense of improvement in speed, communication, efficiency, and information synthesis capabilities. It is evident that the adoptions of EHR systems have some benefits not only in efficiency but most importantly in-patient safety. However not everything is positive, other studies have revealed negative aspects.

Negative Aspects. As the adoption of EHR systems have continued, national studies have provided inconsistent findings as to whether hospital EHR adoption translates into higher quality of patient care and lower cost care (Adler-Milstein, Everson, & Lee, 2015). Despite the positive aspects that some studies have reported, other researchers have found only small positive effects or mixed results from EHR

implementation. For instance, some authors have identified potential disadvantages associated with the cost of this technology. Research by Menachemi and Collum (2011), indicated that the financial burden of adopting an EHR system is not the only negative aspect; but also there is evidence pointing to negative effects on changes in workflow, temporary loss of productivity, privacy and security concerns, and several other unintended consequences. One example of an unintended consequence is the need for systems to offer collaboration to all of their users. (Chase et al., 2014). Yet, another study showed that some current EHRs have limited ability to organized dynamic planning in a way that the medical decision-making process could affect not only present situations but also support coordination of future needs; as one of the participants of the study stated: "The ability to take an action today that will prompt providers to do something in the future is an underdeveloped capacity." (O'Malley et al., 2009). Research by Chase et al. (2014) maintained that data quality and accessibility are significant concerns that can damage the reliability of EHR systems.

Furthermore, Chase et al. (2014) recognized other concerns such as communication illusion (the belief that one is communicating effectively but is not) and issues with the diversity of communication channels offered by some EHRs. An example of this problem was presented by Upadhyay, Sittig, and Singh (2014). They analyzed the well-publicized case of the handling of the first patient infected with Ebola in the US who had traveled from Liberia and presented to the ER in a Dallas hospital; complaining of flu-like symptoms. This analysis pointed out that one of the contributors of the poor handling of this patient was the hospital's limited EHR design, lacking optimal information sharing capabilities among the interdisciplinary care team and not assisting

physicians in the diagnosis process by not presenting pertinent patient data in an easy to understand manner (Upadhyay, Sittig & Singh, 2014). It appears that the problem of data sharing, and accessibility is more evident in larger medical institutions with greater flow of patients, greater volume of treatment procedures, and greater amount of data (Upadhyay, Sittig & Singh, 2014). Assis-Hassid et al., (2019) conducted a study at a major teaching hospital in New England with over 700 beds. They reported that in their study they observed: Users of EHR systems persistently and dangerously using work arounds at critical points of care, EHR systems not being used for information sharing, and EHR systems frequently obstructing workflow and interdisciplinary team communication.

The EHR's Role in Communication and Collaboration

The complex and ever evolving American health care system makes the task of effective communication and collaboration very challenging. The nature of working together can already be a difficult task and more so when we take into consideration potential barriers such as different perspectives, opinions, priorities, cultural backgrounds, levels of education, etc. (Lancaster, Kolakowsky-Hayner, Kovacich, & Greer-Williams, 2015). It has been reported that poor communication and collaboration among healthcare professionals are part of the most common causes of patient care errors that produce negative consequences (Lancaster et al., 2015). Another report published by Hoffman, Siegal, and Bergquist (2015), asserted that inadequate communication was identified as a contributing factor in 7,149 cases (30%) of 23,000 medical malpractice claims filed between 2009 and 2013. Unfortunately, these cases included 1,744 deaths and $1.7 billion in malpractice cost (as cited in Bailey, 2016).

All these alarming facts raised the question: What is the role that an EHR system plays concerning communication and collaboration among its users? A study done by Chase et al. (2014) concluded that concerning communication and collaboration, EHRs have four distinctive roles: Repository, messenger, orchestrator, and monitor. On the other hand, the interaction among members of the health care team must reflect "collaboration behavior" which must be composed of elements such as trust and respect, communication, coordination, and adaptive collaboration; each EHR role is linked to one "collaboration behavior" as illustrated in Figure 4. (Chase et al., 2014).

EHR ROLES		ELEMENTS OF COLLABORATION BEHAVIOR
Repository	← →	**Trust and Respect**
Messenger	← →	**Communication**
Orchestrator	← →	**Coordination**
Monitor	← →	**Collaboration**

Figure 4

EHR roles linked to Collaboration Behavior

In the study done by Chase et al. (2014) the roles of an EHR system concerning communication and collaboration were tested; revealing the following results: 1) As repository the EHR had the ability to store clinical data and make it available, however because the data was poorly organized the users had a difficult time finding it; making the system unreliable. 2) As a messenger, the EHR opened more channels of communication among the health care team, however some users reported that these

channels were less effective than traditional communication because they did not offer immediate feedback, lacked clarity and/or contextual information. 3) As orchestrator the EHR aimed to coordinate responsibilities, however the success of this function depended on the accurate participation of every user. 4) Finally, as a monitor the EHR made it possible to organize ongoing reviews of processes and outcomes, however problems arose when goals between providers were different and led to conflict. In summary, Chase et al. (2014) identified performance issues of the EHR that weakened its ability to support communication and collaboration.

The Importance of the EHR's User Interface (UI)

A UI represents the way in which a person controls a software application or hardware device; a good user interface offers a "user-friendly" experience, allowing the user to interact with the software or hardware in a natural and logical way (Christensson, 2009). However, as we have seen so far, alongside the adoption of EHR systems, many studies have recognized that most of these systems do not completely meet the needs of clinical users, mainly because of the inadequate UI design. Kellogg, Fairbanks and Ratwani (2017), asserted that poor UI design has been connected to errors that jeopardize patient safety and have found that the root of this problem is linked to the isolated way EHRs systems are developed; separated entirely from the work environments in which they will need to function. Therefore, they advised that EHR systems must be designed considering the environment in which they will be functioning, the workflow of individual users, and the roles of the members of the multidisciplinary team (Kellogg, Fairbanks & Ratwani, 2017).

Chase et al., 2014 stated that one reason EHR systems are unable to satisfy the current demands of their users is because the original purpose of these systems was to be an electronic replacement of paper charting; seeking legibility and not being the multipurpose electronic tool that current medical organizations demand. Based on this circumstance, one can conclude that user-friendly EHR UI design was not originally a concern or a priority; but EHRs have needed to rapidly evolve trying to keep up with emerging requirements. Therefore it is not a surprise that multiple research studies have reported poor UI interface design as one of the major problems concerning EHR usability; mainly because of problems such as tedious and prolonged patient data search caused by the complex distribution of patient information in multiple sections of the EHR program. For example, Levinson, Price and Saini (2017) stated that some EHR users report that many electronic systems can create extra work because of the endless and useless prompts that require multiple clicks to go through them.

Similarly, Struik et al. (2014) reported that nurses and physicians who participated in their study verbalized EHR user-friendly interface as a very important factor that could affect the performance of their responsibilities; these findings, according to the researchers, are in line with other studies that reported that crucial patient data is not always immediately retrievable most likely because of hard to navigate EHR. Finally, another study by Howe, Adams, Hettinger, and Ratwani (2018) cautioned that "EHR usability is a point of frustration for clinicians and can have patient safety consequences" (p. 1276).

Improving the EHR

The literature extensively reveals that nationwide adoption of EHR system has brought positive and negative results. Perhaps one of the main complaints about EHR systems functionality has been the issue of usability (Meehan et al., 2016). Obviously, this issue has generated multiple research studies attempting to discover ways to solve this problem. Additionally, The Office of the National Coordinator for Health Information Technology (ONC), a federal agency in charge of coordinating the nationwide efforts of implementing health information technology (HealthIT.gov, 2019), has outlined standards and certification criteria for the design of EHR systems (Meehan et al., 2016). In line with these efforts, the QI project proposes to add a new feature to an existing EHR system, theorizing that this feature could enhance its usability. Therefore, comparable suggestions have been selected and examined to guide the process.

Meehan et al. (2016) proposed that the utilization of "Health Level Seven Electronic Health Records Usability Work Group" (HL7 EHR Usability work group) could assist in improving EHR programs. HL7 EHR Usability work group incorporates health care providers, EHR system vendors, government organizations, non-government organizations, standards organizations, and academic usability experts aiming to identify, suggest, apply and establish evidenced-based usability principles and standards in the designing of EHR systems (Meehan et al., 2016). Similarly, Sieja et al. (2019), established that the employment of an intensive team-based intervention called the "Sprint" process was able to improve the EHR (Epic 2015 system) efficiency utilized by a large health network in Colorado. Sprint was a QI project that had three main goals: (1) training clinicians to use existing EHR features more efficiently, (2) redesigning the

multidisciplinary workflow within the clinic, and (3) building new specialty specific EHR tools (Sieja et al., 2019).

Another attempt to improve the usability of an EHR program is the utilization of Social Knowledge Networking (SNK) to enhance one specific feature of the EHR: Med-Reconciliation (Rangachari, 2018). The aim of SKN is to increase EHR user's engagement by collecting a diverse group of practitioners to exchange knowledge related to issues encountered during the process of Med-Reconciliation (Rangachari, 2018). In short, SKN seeks to engage EHR users in discussing solutions that can contribute to a better EHR user experience. Koivunen, Anttila, Kuosmanen, Katajisto, and Välimäki (2014) had already suggested a similar idea; they proposed that it is possible to motivate health care professionals to use EHR systems by offering them a work environment conducive to group education and co-operation.

Lastly, Vawdrey et al. (2013) developed and tested a supplementary application fully integrated to an EHR that facilitated patient handoff. The application featured customizable printed reports including a variety of EHR data such as allergies, medications, vital signs, laboratory test results, isolation requirements, and code status (Vawdrey et al., 2013). It is worth noting that this application did not replace face to face handoffs, but enhanced data sharing and collaboration among medical professionals such as physicians, ARNPs, PAs, RNs, social workers, RTs, etc. (Vawdrey et al., 2013). This study is perfect example of how developing and adding supplementary elements to an existing EHR can rectify its usability.

Chapter Summary

The literature indicated that EHR implementation has brought positive and negative results. However, studies repeatedly reported that one of the biggest concerns regarding some EHR systems is their weak UI design. Nonetheless the literature also reported multiple studies in which correcting ideas have been successfully developed, tested and applied. Overall, one concept was clear, developing a user friendly EHR system requires the participation of multiple professionals such as designers, venders, users, experts, patients, etc. Furthermore, research indicated that EHR systems need to be more than storerooms of clinical data; they need to safely, accurately and efficiently display clinical data, contribute to communication and collaboration among the users, improve speed in patient care, support decision making and disease surveillance, and more.

CHAPTER III

METHODS AND PLAN

Project Design

Polit and Beck (2017) indicated that the purpose of Quality Improvement (QI) research is to enhance practices and processes within a specific organization or patient group. Moran, Burson and Conrad (2017) specified that different quality improvement methods have been effectively used in the healthcare arena. The QI project will adopt the FADE model (Focus, Analyze, Develop, and Execute/Evaluate). In the focus stage the process that needs improvement is identified, in the analyze phase the researcher collects and examines the data, in the develop stage the plan of action is determined, in the execute/evaluate phase the researcher implements the plan and measures and monitors the changes brought by the project (Moran, Burson & Conrad, 2017).

This QI project seeks to investigate if adding to an existing EHR system a *"one-click-one-screen"* electronic window displaying a snapshot of the most relevant and up-to-date patient information could facilitate and improve data accessibility, information exchange, user satisfaction, and ultimately patient care. Currently, a hospital in Pittsburg, KS utilizes a specific version of PCS 5.67 Meditech as its EHR system. It is important to mention that the author of this QI project has worked in that hospital for eight years as a Registered Nurse and has operated this specific Patient Care System (PCS) 5.67

Meditech system for the same length of time. Throughout these years, it has been noted that although this PCS 5.67 Meditech system stores and organizes patient clinical data, it lacks a friendly UI. For example, clinical information with similar attributes is grouped and stored in different parts within the system obligating the users to navigate throughout multiple sectors in order to obtain a concise picture of the patient's clinical condition (Past medical history, current medical problems, procedures, treatments, future plans, test results, etc.). This deficiency makes accessing, handling, and exchanging clinical data a lengthy, tedious, and ineffective process. This deficient UI becomes an evident hurdle when the EHR system is used for nursing handoffs, nurse-physician communication, and concise recollection of patient data by any user. The nurses in that hospital employ a handwritten SBAR (Situation, Background, Assessment and Recommendation) form to give and receive patient report and to communicate with physicians and other professionals. When filling out these report sheets, the nurses use two sources: Oral information received from other nurses and electronic data stored in PCS 5.67 Meditech. Because of the poor UI design, filling out the SBAR form with the data stored in PCS 5.67 Meditech can be a tedious-inefficient procedure. Furthermore, unintelligible penmanship can make the report sheets unclear, compromising communication among the interdisciplinary care team. Therefore, this QI project focuses on improving the quality of the communication among the members of the health care team who use and heavily rely on PCS 5.67 Meditech to record, obtain, and report important patient clinical data. To reach this goal, a *"one-click-one-screen"* electronic page will be designed and integrated to the EHR system.

Target Population

The QI project will take place in an 80-bed rural hospital, level III trauma center in the southeast area of the state of Kansas. A quota sampling method will be used, and the participants will be determined by the number of care givers working in the following hospital units: Inpatient Rehab Unit (IRU), Medical/Surgical/Pediatric Unit, and Step-Down Unit (SDU). Quota sampling is an appropriate method to use in our QI project because it combines stratification and convenience sampling. This method will allow us to conveniently choose different groups of professionals (RNs and CNA's). The participants age will range between 20-60 years of age. They must have used PCS 5.67 Meditech for at least 6 months. Participants who are recently hired will be excluded from the study. Participation in testing the new PCS 5.67 Meditech feature will be voluntary. Individuals will be asked to participate during the days they are working. Consent will be obtained on written consent forms which will be provided prior to initiating the study. The participant's identification and opinions will be kept anonymous. The researcher will uphold the three basic principles of human subject protection: respect for persons, beneficence, and justice. Finally, we will seek approval from the hospital's review board.

Instruments

In order to obtain data, the QI project requires surveying the participants, pre and post intervention. The purpose of the pre-survey (*Figure 5*) is to establish a baseline by obtaining information about the participant's professional role, demographics, years of experience, and review of PCS 5.67 Meditech usability. On the other hand, the post-survey (*Figure 6*) will be measuring if the intervention improved PCS 5.67 Meditech's usability, data accessibility and information exchange. Each pre and post survey will be

assigned the same number for comparison purposes. To assure the effectiveness of the initial survey, the investigator will follow the five steps of survey development suggested by The Loyola Marymount University – Survey Design (2019). Both, pre and post surveys, will include closed and open-ended questions, multiple choice options, and likert scale. A likert scale measures attitudes or opinions and requires a five, seven, or nine-point rating scale on a continuum from one extreme to another (Rea & Parker, 2012).

Procedure, Recruit and Survey Design

In Conjunction with the FADE model (Focus, Analyze, Develop, and Execute/Evaluate), the QI project will follow a multi-phased and descriptive plan. After receiving approval from the hospital's review board; the phase one will include the recruitment of the participants and a face to face interview using a pre-survey. The goal of the pre-survey will be to obtain preliminary data and establish a baseline concerning the satisfaction level of PCS 5.67 Meditech users. Phase two will include the designing and integration of the electronic page into PCS 5.67 Meditech. This step will require the partnership of the IT staff of the hospital. This electronic page will display a snapshot of the patient condition by revealing clear, concise, and up to date data. The page will self-populate with patient data, but also it will allow free text typing so that users can record relevant information about patient care such as changes in patient condition, upcoming procedures, summary of tests results, etc. The page will be printable, becoming a handy patient report-sheet that can be easily red, eliminating the problem of bad penmanship. In phase three the participants will be trained and allowed to use the new PCS 5.67 Meditech feature for one month. During phase four, the participants will be interviewed in person and they will complete the post-test survey. The interviews will be recorded

verbatim. In phase five we will analyze the data and draw conclusions. Finally, based on the results, the new PCS 5.67 Meditech feature can be modified and retained or discontinued.

Treatment of Data/Outcomes/Evaluation Plan

Descriptive statistics will be used to describe demographic data such as gender, age, profession, years of experience, level of education, and unit. The analysis of the data obtained from the study will be analyzed using the software SPSS. The data, results and outcomes will be illustrated by tables and/or charts in order to facilitate understanding. The participant identification and opinions will be kept anonymous.

Plan for Sustainability

Moran, Burson and Conrad (2017), explained that research sustainability depends largely on the dissemination of the results of any research study, especially through dissemination to key stakeholders. Therefore, propagation of the results of our study will be essential to ensure sustainability. Among the key stakeholders interested in the results of QI project are: Chief Nursing Officer, Nursing/RT Directors, Nursing/RT managers, Clinical Nursing Education Director, Nursing/RT/SS staff, etc. It will be of utmost importance to inform the users of PCS 5.67 Meditech about the advantages of using the new feature. Furthermore, it will be necessary to provide new employees proper training on how to use the *"one-click-one-screen"*. Finally, it is recommended to conduct cyclic surveys to confirm the benefits of the implemented new feature.

Chapter Summary

Some EHR systems require customization of their UI. It is clear that EHRs are becoming a necessary tool in delivering patient care, however the amount of data

recorded in these systems makes their utilization very complex. In turn, this complexity can affect patient care and user compliance. Therefore, it is necessary that the members of the health care actively participate in the customization of their EHR system seeking to develop a safer and more effective tool in delivering patient care. Our QI study seeks to shine some light on ways that EHR systems might improve communication within the healthcare team. The idea behind this study is to customize one part of the EHR that have proven to be ineffective or difficult to use. The project will take place in an 80-bed rural hospital, level III trauma center in the southeast area of the state of Kansas. Participants will be recruited from Inpatient Rehab Unit (IRU), Medical/Surgical/Pediatric Unit, and Step-Down Unit (SDU). Data will be obtained using pre and post surveys and face to face interviews. The data will be analyzed and disseminated to appropriate stakeholders.

CHAPTER IV

EVALUATION RESULTS

The purpose of this Quality Improvement (QI) project was to investigate if integrating a *"one-click-one-screen"* electronic window displaying a snapshot of the most relevant and up-to-date patient information into an Electronic Health Record (EHR) application could facilitate and improve data accessibility, information exchange, user satisfaction, patient care, and communication among the users of the application in a rural hospital in Pittsburg, KS. The design of the *"one-click-one-screen"* electronic window is based on the SBAR (Situation, Background, Assessment and Recommendation) format. The EHR application utilized for the project was Patient Care System (PCS) 5.67 by Meditech. To reach its purpose, the QI project adopted the FADE model (Focus, Analyze, Develop, and Execute). Unfortunately, due to unforeseen roadblocks, which will be discussed in the next chapter, the QI project could not be fully completed. Nevertheless, some phases in the model were fulfilled. In the focus stage the process needing improvement was identified. In the analyze phase, data was collected and examined. And, in the develop stage a plan of action was determined however it was not feasible at that time.

The project questions included:

1. What were the attitudes, beliefs, and perceptions of the interdisciplinary team about the quality of the current user interface (UI) used by the PCS 5.67 Meditech application?
2. What were the attitudes, beliefs, and perceptions of the interdisciplinary team about the quality of communication between caregivers before the addition of the *"one-click-one-screen"* feature into the PCS 5.67 Meditech application?
3. Did the addition of a "*one-click-one-screen"* electronic page displaying the most relevant and up-to-date patient data improve communication with other nurses and/or providers?
4. Did the addition of a "*one-click-one-screen"* electronic page displaying the most relevant and up-to-date patient data save caregivers time during their hours of care?
5. Did the printout of a "*one-click-one-screen"* electronic page displaying the most relevant and up-to-date patient data improve the nursing handoff report?
6. What are the attitudes, beliefs, and perceptions of the interdisciplinary team about the quality of the user interface displayed by the PCS 5.67 Meditech application after the integration of the *"one-click-one-screen"* feature?
7. What were the attitudes, beliefs, and perceptions of the interdisciplinary team about the quality of communication between caregivers after the *"one-click-one-screen"* feature was integrated into the PCS 5.67 Meditech application?

Description of Population

Demographic data was divided into profession, place of employment, gender, education, and years of using PCS 5.67 Meditech application. The participant sample

included 30 healthcare professionals who provided patient care at an 80-bed rural hospital, level III trauma center in the southeast area of the state of Kansas. From these 30 participants, 23 (76.7%) were Registered Nurses (RNs) and 7 (23.3%) were Patient Care Technicians (PCTs). These participants delivered patient care in the following hospital units: 9 (30%) in the Inpatient Rehab Unit (IRU), 15 (50%) in the Medical/Surgical/Pediatric Unit, 4 (13.3%) in the Step-Down Unit (SDU), and 2 (6.7%) in the Intensive Care Unit (ICU). Concerning the gender item; there were 23 (90%) female and 7 (10%) male participants. In education, there were three distinctive levels: 14 (46.7%) RNs had associate degrees; 9 (30%) RN's had a bachelor's degree and 7 (23.3%) PCTs had finished high school and had obtained a Certified Nurse's Assistant (CNA) certification. Finally, 20 (66.7%) participants had used PCS 5.67 Meditech less than five years, 3 (10%) participants used the application between six and ten years, and 7 (23.3%) participants eleven to fifteen years. Inclusion criteria included individuals who had used PCS 5.67 Meditech for at least 6 months. Participants recently hired were excluded from the study. Participation in the study was voluntary. Upon approval from the Pittsburg State University research committee and IRB, data was collected between January 13, 2020, and March 30, 2020.

Description of Project Variables

The independent variable for this study was the integration of a "*one-click-one-screen*" feature to PCS 5.67 Meditech's interface. This new feature intended to organize patient clinical data following the SBAR format and would allow the user to see a snapshot of the most relevant and up-to-date patient information. A 15-question pre-survey was given to the participants of this study before attempting to design the "*one-*

click-one-screen" feature. The purpose of this pre-survey was to establish a base line information concerning the existing level of user satisfaction.

The dependent variables affected by the addition of the *"one-click-one-screen"* feature into the PCS 5.67 Meditech application were the user's attitudes, beliefs, and perceptions about the quality of communication among the users of PCS 5.67 Meditech being supported by this application, the efficiency of PCS 5.67 Meditech in displaying clinical data, and the quality of nursing handoff report supported by PCS 5.67 Meditech. As part of the original project's plan (FADE), it was intended to measure these dependent variables utilizing a 15-question post-intervention survey after allowing the participants to use the new feature added to PCS 5.67 Meditech.

Analysis of Research Questions

All 30 participants answered a 15-question pre-survey seeking to establish starting point information about the level of satisfaction of using PCS 5.67 Meditech. It was intended that each research question be connected to one or more of the pre and post intervention survey questions. However, due to unforeseen roadblocks only research questions one and two were answered by the pre-survey. Pre-survey questions 1-5 provided demographic data. Pre-survey questions 6-8 and 15 answered project question number one. Pre-survey questions 9-14 answered project question two. As indicated previously, due to unforeseen roadblocks the QI project could not be fully completed therefore project questions three to seven were not able to be answered in this project. Pre-survey questions six to fifteen asked the participants to rate their judgment using 1) nominal scale (yes, no, or somewhat) and 2) seven point Likert rating scales presenting

statements ranging from very satisfied to very dissatisfied, very fast to very slow, and exceptional to very poor.

Research Question One: What were the attitudes, beliefs, and perceptions of the interdisciplinary team about the quality of the UI used by the PCS 5.67 Meditech application?

The attitudes, beliefs, and perceptions of the interdisciplinary team were revealed by the data collected on pre-survey questions six through eight and fifteen. Pre-survey question six inquired about the participant's perception of PCS 5.67 Meditech's ability to display patient data at one glance (Table 2). The largest response for this question was NO (17 participants = 56.7%). Zero participants answered YES in this question. Meanwhile, pre-survey question seven investigated the level of user satisfaction of PCS 5.67 Meditech in showing patient data at one glance (Table 3). Responses neutral and dissatisfied were selected by 12 participants (40%). Pre-survey question eight explored the speed of PCS 5.67 Meditech in showing a general depiction of patient data (Table 4). The largest response for this question was slow (5 minutes). Seventeen participants = 56.7% selected this option. Only 1 participant (3.3%) selected very fast (1 minute). Finally, pre-survey question fifteen asked the participants if having a *"one-click-one-screen"* feature in PCS 5.67 Meditech application would be helpful in delivering patient care (Table 5). 29 Participants (96.7%) selected the answer YES and only 1 participant (3.3%) selected somewhat (Table 5).

Table 2

Ability of PCS 5.67 Meditech to show patient data in one glance

	Frequency	Percent
Yes	0	0%
No	17	56.7%
Somewhat	13	43.3%
Total	**30**	**100.0%**

Table 3

User satisfaction of PCS 5.67 Meditech to show patient data in one glance

	Frequency	Percent
Very Satisfied	0	0.0%
Satisfied	3	10.0%
Neutral	12	40.0%
Dissatisfied	12	40.0%
Very Dissatisfied	3	10.0%
Total	**30**	**100.0%**

Table 4

Speed of PCS 5.67 Meditech showing a general depiction of patient data

	Frequency	Percent
Very Fast (1 Minute)	1	3.3%
Fast (2 Minutes)	9	30.0%
Slow (5 Minutes)	17	56.7%
Very Slow (10 Minutes)	3	10.0%
Total	**30**	**100.0%**

Table 5

Would a "one-click-one-screen" be helpful in delivering patient care?

	Frequency	Percent
No Helpful	0	0%
Yes Helpful	29	96.7%
Somewhat helpful	1	3.3%
Total	**30**	**100.0%**

Research Question Two: What were the attitudes, beliefs, and perceptions of the interdisciplinary team about the quality of communication among caregivers before the addition of the *"one-click-one-screen"* feature into the PCS 5.67 Meditech application?

Pre-survey questions nine through fourteen addressed research question two, which asked about the attitudes, beliefs, and perceptions of the users of PCS 5.67 Meditech concerning the quality of communication among users before the QI intervention. Pre-survey questions ten through thirteen focused on 1) determining the perception of the participant concerning the quality of communication that takes place during handoff reports and 2) the perceived ability of PCS 5.67 Meditech to enhance the quality of communication during handoff reports (Table 6 and Table 7). It is important to recall that at the facility where the QI project took place, handoff reports occurred by interchanging clinical information that is recorded in a paper form following the SBAR format. Patton (2007) indicated that handoff reports should ensure continuity and safety of the patient's care. Therefore, it is essential that EHR systems not only store information but also effectively assist caregivers in accomplishing clear, concise, and comprehensive handoff reports. Pre-survey question nine and fourteen focused on determining both, 1) the perceived ability of PCS 5.67 Meditech to enhance the quality

of communication among the users and 2) the level of user satisfaction with the existing quality of communication (table 6 and table 7).

Table 6

Description of Communication using PCS 5.67 Meditech (Pre-survey questions 9-11)

Quality of Communication (Pre-survey question 9)		
	Frequency	Percent
Exceptional	0	0.0%
Excellent	0	0.0%
Very Good	4	13.3%
Good	7	23.3%
Fair	10	33.3%
Poor	5	16.7%
Very Poor	4	13.3%
Total	**30**	**100.0%**
Handoff Report Clear (Pre-survey question 10)		
	Frequency	Percent
Exceptional	0	0.0%
Excellent	1	3.3%
Very Good	4	13.3%
Good	10	33.3%
Fair	9	30.0%
Poor	5	16.7%
Very Poor	1	3.3%
Total	**30**	**100.0%**
Handoff Report Concise (Pre-survey question 11)		
	Frequency	Percent
Exceptional	0	0.0%
Excellent	0	0.0%
Very Good	2	6.7%
Good	11	36.7%
Fair	10	33.3%
Poor	6	20.0%
Very Poor	1	3.3%
Total	**30**	**100.0%**

Table 7

Description of Communication using PCS 5.67 Meditech (Pre-survey questions 12-14)

Handoff Report Comprehensive (Presurvey question 12)		
	Frequency	Percent
Exceptional	0	0.0%
Excellent	1	3.3%%
Very Good	6	20.0%
Good	8	26.7%
Fair	7	23.3%
Poor	6	20.0%
Very Poor	2	6.7%
Total	**30**	**100.0%**
Handoff Report Facilitation (Presurvey question 13)		
	Frequency	Percent
Exceptional	0	0.0%
Excellent	0	0.0%
Very Good	1	3.3%
Good	7	23.3%
Fair	10	33.3%
Poor	10	33.3%
Very Poor	2	6.7%
Total	**30**	**100.0%**
Satisfaction with Quality of Communication (Presurvey question 14)		
	Frequency	Percent
Very Satisfied	0	0.0%
Satisfied	3	10.0%
Neutral	12	40.0%
Dissatisfied	14	46.7%
Very Dissatisfied	1	3.3%
Total	**30**	**100.0%**

Pre-survey question nine addressed the topic concerning the quality of communication within the PCS 5.67 Meditech system (notes, messages, updates, etc.). The larger responses that participants selected were fair (10 participants = 33.3%) and

good (7 participants = 23.3%). 5 participants (16.7%) selected poor and 4 participants (13.3%) chose very poor. None of the participants selected excellent or exceptional. Pre-survey question fourteen, when indicating how satisfied the users were with the quality of communication between caregivers supported by PCS 5.67 Meditech, the larger answer was dissatisfied (14 participants = 46.7%). None of the participants chose the option very satisfied. In pre-survey questions ten through thirteen (quality of communication using the current handoff method and PCS 5.67 Meditech's ability to assist handoff reports), the largest responses of the participants landed on the middle of the rating scale (good and fair). The least selected options were exceptional and excellent, only 2 participants chose excellent when rating handoff's communication as clear and comprehensive. The options poor and very poor were selected but not as frequently as good and fair responses.

Chapter Summary

The purpose of this Quality Improvement (QI) project was to investigate if integrating a *"one-click-one-screen"* electronic window displaying a snapshot of the most relevant and up-to-date patient information into an Electronic Health Record (EHR) application could facilitate and improve data accessibility, information exchange, user satisfaction, patient care, and communication among the users of the application in a rural hospital. Due to unforeseen roadblocks, which will be discussed in the next chapter, the QI project could not be fully completed. Nevertheless, following the FADE model, the phases Focus, Analyze, and part of the Develop phase were fulfilled. Data analysis was completed using IBM SPSS Statistics. Descriptive analysis of participants profession, place of employment, gender, education, and years of using PCS 5.67

Meditech application was evaluated. A total of 30 participants consented to participate in the study. A 15-question pre-survey was used to obtain base line data concerning the user satisfaction of the EHR system and the quality of communication enabled by the same system. Most of the responses selected by the participants tended to lean towards dissatisfaction with the performance of PCS 5.67 Meditech application associated with the speed of showing clinical data, the ability to display data at one glance, improving the quality of communication among users, and assisting with the effectivity of handoffs reports.

CHAPTER V

DISCUSSION

Relationship of Outcomes to Research

The purpose of this Quality Improvement (QI) project was to investigate if integrating a *"one-click-one-screen"* electronic window displaying a snapshot of the most relevant and up-to-date patient information into an Electronic Health Record (EHR) application could facilitate and improve data accessibility, information exchange, user satisfaction, patient care, and communication among the users of the application in a rural hospital. Due to unforeseen roadblocks the QI project could not be fully completed. Nevertheless, following the FADE model, the phases Focus, Analyze, and part of the Develop phase were fulfilled.

In the Focus phase, it was determined that Patient Care System (PCS) 5.67 Meditech user interface (UI) could be improved specifically in its ability to 1) display patient clinical data at one glance and in one click, 2) enhance communication among its users, and 3) assisting with the effectivity of handoff reports. In the phase Analyze, a 15-question pre-survey was designed to collect baseline information concerning the user satisfaction with the performance of PCS 5.67 Meditech. The aim of the pre-survey was to gather information about the performance of PCS 5.67 Meditech in the following areas 1) efficiency (speed, conciseness, and comprehensiveness) in displaying patient

clinical data at one glance and in one click, 2) improving quality of communication among its users, and 3) assisting with the effectivity of handoffs reports. An analysis of the results of the survey confirmed that the majority of users were displeased with the performance of PCS 5,67 Meditech in those selected areas. Likewise, 29 (96.7%) out 30 participants considered that adding a *"one-click-one-screen"* feature to PCS 5.67 Meditech would be helpful in delivering patient care (Table 4).

In phase Develop, a partnership with the institution's information technology (IT) department was established. The aim of this partnership was to 1) design a *"one-click-one-screen"* electronic window able to display a snapshot of the most relevant and up-to-date patient information. And 2) integrate the new *"one-click-one-screen"* electronic window into PCS 5.67 Meditech and make it available for usage. Several efforts to integrate the new feature were attempted unsuccessfully. Mainly because this task was too complex for the local IT department to handle and needed the assistance of the central IT department located 3 hours away in a different city. Therefore, the local IT department indicated that the change that this QI project proposed was "not feasible" at that time. Nonetheless, the data collected by the pre-survey was analyzed and the results indicated very relevant information that will be discussed in this chapter. Two research questions were examined in this project. Each question was answered thoroughly and completely.

Research Question One

Research question one asked: what were the attitudes, beliefs, and perceptions of the interdisciplinary team about the quality of the UI displayed by PCS 5.67 Meditech.

The responses to pre-survey questions six through eight and fifteen suggested that the majority of participants believed PCS 5.67 Meditech's UI should improve in the area of displaying patient data in one window. It is worth noting that 29 out of 30 participants, who have used PCS 5.67 Meditech for at least 6 months, overwhelmingly indicated that having a *"one-click-one-screen"* feature in PCS 5.67 Meditech would be helpful in delivering patient care. According to HealthIT.gov (2018), EHRs are supposed to assist providers in offering higher quality and safer patient care by offering several benefits that include enabling quick access to patient records for more coordinated, efficient care. Therefore, these results are significant, and they can be used as evidence to promote changes in the UI of this particular EHR system. Furthermore, these results should spark curiosity in those who design, maintain, and use EHR systems.

Research Question Two

Project question two was answered by pre-survey questions nine through fourteen; following is a detailed discussion of the results of those questions. The results indicated that as far as the participants of this study were concerned, there was room for improvement in PCS 5.67 Meditech's ability to enhance communication among its users. In the early years of EHR adoption it was determined that the incorporation of EHRs had undesirable effects on communications among clinicians and between clinicians and patients (Jones et al., 2011). Therefore, If outdated EHR systems do not evolve their UI to keep up with the present user demands regarding communication among users or are not able to be customized to offer a better user experience, then they become inefficient and dangerous, jeopardizing patient care.

Across the facility the participants were required to use a standard paper form (SBAR) to give patient report. Therefore, caregivers prepare a SBAR form and give patient report by reading the form and using it as an outline; however, problems of penmanship legibility are frequently seen, and the clearness, conciseness, and comprehensiveness of the message can be affected. Patton (2007) indicated that handoff reports should ensure continuity and safety of the patient's care; therefore, it is essential that EHR systems effectively assist caregivers in accomplishing such important tasks. This is validated by the results of pre-survey question thirteen.

Finally, as indicated previously, due to unforeseen roadblocks the QI project could not be fully completed therefore project questions three to seven were not able to be answered in this project. However, we continue to assert that the addition of a *"one-click-one-screen"* feature onto PCS 5.67 Meditech can greatly change these results.

Observations

Noteworthy observations of the QI project are 1) Upgrading or changing EHR systems can be a complex undertaking. The elevated cost and the logistics needed to perform this undertaking can become obstacles to acquiring a user friendly EHR system. The organization where this QI project took place had been planning to switch to a more modern and user friendly EHR system, however cost and the logistics had hindered this aspiration. 2) Initially EHR systems were introduced mainly to record and store large amounts of clinical data, and to improve the problem of penmanship legibility; however as the medical institutions have come to heavily rely on these systems and computer technology has rapidly advanced, EHR users demand more functionality from these systems. 3) It is challenging to implement a QI project where multiple administrative

groups and processes need to be involved, especially if these groups are significantly separated from each other. For instance, the local IT department located in the institution where the QI project was taking place was not capable of making the necessary changes in PCS 5.67 Meditech application to facilitate continuity of this project. The local IT department was able to make small changes but relies on the supervision and support of a bigger IT department located 3 hours away. This bigger IT department was not very accessible because it managed the EHR system in its own facility and also supported other various facilities that used different EHR systems. This organizational structure did not facilitate changes and became a roadblock to complete the QI project. This is significant because it has been proven that the lack of processes to monitor and improve the EHR within a health system can jeopardize patient safety and furthermore, the success of EHR implementation should be a shared responsibility where all stakeholders (IT department, vendors, clinical staff, administration, etc.) participate (Sitting et al., 2018). Likewise, providing real-time IT support is considered to be vital for EHR implementation success (Boonstra et al., 2014).

Evaluation of Theoretical Framework

This IQ project utilized two theoretical frameworks. First, the Dyadic Interpersonal Communication Model which explains the interactive process of communication taking place between the sender and recipient or the encoder and decoder (Antai-Otong, 2007). This communication model highlights the importance of clarity and awareness of the external factors that influence communication. Applying this model to our project, the patient clinical data becomes the message that flows among all the users and travels from the EHR system to the users and vice versa. The results

obtained from the pre-survey concerning the quality of handoff reports and the ability of PCS 5.67 Meditech to enhance or hinder communication validated the Dyadic Interpersonal Communication Model. For example, handoff reports can improve if clarity, conciseness, and comprehensiveness are enhanced. To accomplish this, the EHR system used by healthcare providers must offer effective assistance free of distractions such as a poor UI.

The second theoretical framework used in this project was the Innovation in Healthcare Delivery Systems. This conceptual framework links the elements (quality, costs, safety, efficiency and outcomes) that drive the implementation of innovation in healthcare and gives researchers interested in this topic the foundation on which their studies can be built (Omachonu & Einspruch, 2010). Healthcare innovations, such as EHR systems, have become tools used by care providers that if properly designed and operated can satisfy the needs of the patients and efficiently achieve the purpose of the healthcare organizations. Based on the results of our pre-survey, PCS 5.67 Meditech does not completely fulfill the goal of the Innovation in Healthcare Delivery Systems model, specifically in the elements related to efficiency and outcomes.

It is worth noting that this project faced a significant roadblock linked to the lack of responsiveness from both, local and central IT departments. This confirmed what researchers had previously observed, that appropriate collaboration and support from IT departments and an interdisciplinary team is vital in the implementation process of EHR systems (Sitting et al., 2018; Boonstra et al., 2014). Inadequate training and expertise of local IT departments can result in unnecessary dependence from central IT departments. This lack of autonomy can significantly hinder the implementation of innovations.

Evaluation of Logical Model

According to Struik et al. (2014) the crafting of an effective EHR system is a collaborative effort where the interaction among technology producers, developers, clinical staff, and administrative groups is essential. This QI project was successful in including PCS 5.67 Meditech users and the organization's administrative staff, however poor support from the IT department became a significant roadblock. Therefore, the original aim of the QI project to improve the UI of PCS 5.67 Meditech and improve the quality of the communication within the application and among the users was unfulfilled. Although the logic model designed to mark the road for the advancement of this project predicted some barriers; it did not predict the specific roadblock already discussed in the observations section.

Project Limitations

The method chosen for the QI project was the FADE model (Focus, Analyze, Develop, and Execute). Unfortunately, due to roadblocks the QI project could not be fully completed. Although the data collected by a 15-question pre-survey was relevant, they were not able to be substantiated by the adding of the *"one-click-one-screen"* feature and the follow up post-survey. These facts represent a significant limitation of this project. Another limitation in the study included the small sample size of 30 participants. Obtaining the responses from a larger sample could derive in a more accurate perception of the PCS 5.67 Meditech system. Although the participants were randomly selected, another limitation is the potential for participant response bias because the participants of the study are colleagues of the researcher.

Implications for Future Projects

It has been recommended that to ensure EHR implementation, the system must be user-friendly regarding simplicity of use, efficiency in use, and functionality (Boonstra et al., 2014). Therefore, more research needs to be done concerning the ability to customize EHR systems. In order to accomplish this, IT local support is essential. The design of this QI project was ideal; however, it did not predict all the potential roadblocks. Therefore, it is important, in the planning phase of any project to carefully predict any possible barriers and have a plan to overcome them. Perhaps, anticipating the poor IT support could have changed the layout of this QI project. Nevertheless, this QI project should be replicated and completed in other institutions with similar EHR systems and with better IT support. One strategy for overcoming similar roadblocks can be the creation of an interdisciplinary team that could collaborate with the operation of the EHR system. This team could unveil the need for more training and autonomy which can stimulate changes in the structure of the organization.

Implications for Practice

EHR systems are important tools in the healthcare industry. There are many advantages in using these systems. Nonetheless, EHR systems need to be frequently examined and if found deficient, they need to undergo a thorough improvement process so that they might be able to hold the demands of the complex American health care system. Perhaps one way to accomplish this is to create guidelines or standards for EHR usability. The results of our study showed that a significant number of EHR users were displeased with the performance of a particular application. Designing and executing studies like this one can unveil evidence needed to promote EHR customization or even a

better design. Administrative staff in medical institutions using EHR systems should ensure that their IT departments are equipped to give the necessary support and are able to handle customization of their systems according to the suggestion of their users. This initiative could greatly improve the efficiency of their EHR systems.

Conclusion

The purpose of this Quality Improvement (QI) project was to investigate if integrating a *"one-click-one-screen"* electronic window displaying a snapshot of the most relevant and up-to-date patient information into an Electronic Health Record (EHR) application was able to facilitate and improve data accessibility, information exchange, user satisfaction, patient care, and communication among the users of the application in a rural hospital. Although the study could not be fully completed, the collected evidence suggested that PCS 5.67 Meditech UI is not a very user-friendly system and that it could benefit from customization. A significant number of PCS 5.67 Meditech users indicated that the EHR system should be able to assist them in improving the quality of communication during handoff reports. A significant number of PCS 5.67 Meditech users indicated that the EHR system UI does not display clinical data in an efficient and user-friendly manner. A significant number of PCS 5.67 Meditech users indicated that they are not satisfied with the quality of communication among the users of PCS 5.67 Meditech, furthermore they are not satisfied with the PCS 5.67 Meditech's ability to enhance communication. Finally, a significant number of PCS 5.67 Meditech users indicated that integrating to their system a *"one-click-one-screen"* feature showing a snapshot of the general patient information could be helpful in delivering patient care.

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APPENDIX

Appendix A
Improving PCS 5.67 Meditech User Interface by Adding a *"one-click-one-screen"* Electronic Page
PRE-SURVEY

Participant Number ____

Thank you for taking the time to participate in this survey about improving PCS 5.67 Meditech user interface by adding a ***""one-click-one-screen""*** electronic page. This survey should take about 10 minutes to complete and your answers will be confidential. This survey is conducted by Germán Abarca RN-BSN, current DNP student at Pittsburgh State University, Pittsburg, KS, as part of his DNP is scholarly project. Please read the following questions and answer accordingly

1. What is your professional role in the healthcare team?
___RN ___PCT ___RT ___SS

2. What is your level of education?
___Associate degree
___Bachelor's degree
___Master's degree
___Other, please explain _____

3. In what unit do you work?
___IRU ___Medical/surgical ___CSD

4. How many years have you used PCS 5.67 Meditech?
___0 to 5
___6 to 10
___11 to 15
___16 to 20
___Greater than 20 years

5. What is your gender?
___Male ___Female ___Prefer not to answer

6. Does PCS 5.67 Meditech allow you to see at **ONE GLANCE** and/or **IN ONE SCREEN** a general depiction of the clinical status of a patient (Admission date, diagnosis, allergies, vital signs, medical history, precautions, neuro/respiratory/GI/GU status, activity, IV access, immunization, etc.)?
___Yes ___No ___Somewhat

7. Overall, how satisfied are you with the ability of the PCS 5.67 Meditech to show you at ONE GLANCE the necessary clinical status of a patient?
___Very satisfied
___Satisfied
___Neutral

___Dissatisfied
___Very dissatisfied

8. Once you have logged in, if you would need to obtain a general depiction of the clinical status of a patient, (Admission date, diagnosis, allergies, vital signs, medical history, precautions, neuro/respiratory/GI/GU status, activity, IV access, immunization, etc.) how fast would PCS 5.67 Meditech allow you to do so?

___Very fast (1 minute)
___Fast (2 minutes)
___Slow (5 minutes)
___Very slow (10 minutes)

Please rate your agreement with the following stamen using the following scale:
7 = Exceptional, 6 = Excellent, 5 = Very Good, 4 = Good, 3 = Fair, 2 = Poor, 1 = Very Poor

9. Which best describes the quality of **communication** between caregivers within the PCS 5.67 Meditech system?	7	6	5	4	3	2	1
10. Only for RNs and PCTs: With the **current handoff report** how CLEAR is the communication?	7	6	5	4	3	2	1
11. Only for RNs and PCTs: With the **current handoff report** how CONCISE is the communication?	7	6	5	4	3	2	1
12. Only for RNs and PCTs: With the **current handoff report** how COMPREHENSIVE is the communication?	7	6	5	4	3	2	1
13. Only for RNs and PCTs: Which best describes PCS 5.67 Meditech's ability to facilitate **handoff reports**?	7	6	5	4	3	2	1

14. I am satisfied with the quality of **communication** between caregivers within the PCS 5.67 Meditech systems?

___Very satisfied
___Satisfied
___Neutral
___Dissatisfied
___Very dissatisfied

15. Would a "***"one-click-one-screen""*** showing a snapshot of the general patient information (Admission date, diagnosis, allergies, vital signs, medical history, precautions, neuro/respiratory/GI/GU status, activity, IV access, immunization, etc.) be helpful to you in delivering patient care?

___Yes, it would be helpful
___Somewhat helpful
___No, it would not be helpful at all

Appendix B
Improving PCS 5.67 Meditech User Interface by Adding a *"one-click-one-screen"* Electronic Page
POST-SURVEY

Participant Number ____

Thank you for taking the time to participate in this survey about improving PCS 5.67 Meditech user interface by adding a ***""one-click-one-screen""*** electronic page. This survey should take about 10 minutes to complete and your answers will be confidential. This survey is conducted by Germán Abarca RN-BSN, current DNP student at Pittsburgh State University, Pittsburg, KS, as part of his DNP is scholarly project. Please read the following questions and answer accordingly

1. Does PCS 5.67 Meditech allow you to see at **ONE GLANCE** and/or **IN ONE SCREEN** a general depiction of the clinical status of a patient (Admission date, diagnosis, allergies, vital signs, medical history, precautions, neuro/respiratory/GI/GU status, activity, IV access, immunization, etc.)?

___Yes ___No ___Somewhat

2. Overall, how satisfied are you with the ability of the PCS 5.67 Meditech to show you at ONE GLANCE the necessary clinical status of a patient?

___Very satisfied
___Satisfied
___Neutral
___Dissatisfied
___Very dissatisfied

3. Once you have logged in, if you would need to obtain a general depiction of the clinical status of a patient, (Admission date, diagnosis, allergies, vital signs, medical history, precautions, neuro/respiratory/GI/GU status, activity, IV access, immunization, etc.) how fast would PCS 5.67 Meditech allow you to do so?

___Very fast (1 minute)
___Fast (2 minutes)
___Slow (5 minutes)
___Very slow (10 minutes)

Please rate your agreement with the following stamen using the following scale:
7 = Exceptional, 6 = Excellent, 5 = Very Good, 4 = Good, 3 = Fair, 2 = Poor, 1 = Very Poor

4. Which best describes the quality of **communication** between caregivers within the PCS 5.67 Meditech system?	7	6	5	4	3	2	1
5. Only for RNs and PCTs: With the **current handoff report** how CLEAR is the communication?	7	6	5	4	3	2	1

6. Only for RNs and PCTs: With the **current handoff report** how CONCISE is the communication?	7	6	5	4	3	2	1
7. Only for RNs and PCTs: With the **current handoff report** how COMPREHENSIVE is the communication?	7	6	5	4	3	2	1
8. Only for RNs and PCTs: Which best describes PCS 5.67 Meditech's ability to facilitate **handoff reports**?	7	6	5	4	3	2	1

9. I am satisfied with the quality of **communication** between caregivers within the PCS 5.67 Meditech systems?

___Very satisfied
___Satisfied
___Neutral
___Dissatisfied
___Very dissatisfied

10. Would you consider the "***"one-click-one-screen""*** showing a snapshot of the general patient information (Admission date, diagnosis, allergies, vital signs, medical history, precautions, neuro/respiratory/GI/GU status, activity, IV access, immunization, etc.) be helpful to you in delivering patient care?

___Yes, it would be helpful
___Somewhat helpful
___No, it would not be helpful at all

11. What would you change in the design of the ***""one-click-one-screen""*** feature of PCS 5.67 Meditech?

12. Please comment on the addition of the ***""one-click-one-screen""*** feature to PCS 5.67 Meditech