2016

# The Relationship between Knowledge Management Tools and Interprofessional Healthcare Team Decision Making

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This is to certify that the doctoral dissertation by

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Abstract

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MS, University of Akron, 2002

MBA, Ashland University, 1994

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Of the Requirements for the Degree of

Doctor of Philosophy

Applied Management and Decision Sciences

Walden University

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## Abstract

Rising costs and continued risks in patient care indicate that knowledge management (KM) tools have not been fully recognized in healthcare. A case study was conducted to determine how KM tools might support the decision-making process of interprofessional teams. The study was predominately qualitative with a quantitative supplemental component. A questionnaire was used to collect data; this questionnaire contained open-ended questions along with Baggs' Collaboration and Satisfaction about Care Decisions and Anderson & West's Team Climate Inventory instruments. Responses to open-ended questions were reviewed, categorized, and coded as part of the qualitative analysis. Descriptive statistics were completed from Likert scale responses. Participants were selected from existing interprofessional transitional care teams in clinics at a VA hospital; a total of 29 participants volunteered. The framework of decision making and KM was the basis for the study. The research concentrated on interprofessional teams' environment characteristics of trust, collaboration, and sharing. The intended goal of the study was to understand how satisfaction in the delivery of collaborative care decisions and the team climate might influence the success of using or implementing KM tools. Key findings included the importance of communication to support teams' knowledge sharing and collaboration; findings also revealed how the satisfaction in the patient care decision-making process may influence a team's climate for innovation, collaboration, and sharing. These insights may inform the development and implementation of healthcare KM tools. Through the use of KM tools to support clinical decision making, opportunities become available to improve patient care and reduce costs, which lead to a positive social change in minimizing the disparity in the healthcare delivery system.

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Dedication

I dedicate my work to my husband, Tim, for his constant support and patience.

Acknowledgments

I would like to thank my dissertation committee members: Dr. Salvatore Sinatra, Dr. David Metcalf, and Dr. Howard Schechter; I appreciate their time and valuable feedback. Most importantly to my chair and mentor, Dr. Joseph Barbeau, whose guidance was instrumental in me completing my dissertation journey. I would also like to include in my gratitude the researchers permitting me to complete my research project; both were generous in providing time and insight. Last of all, I would like to thank my family for their understanding and support throughout my time as a student.

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# Chapter 1: Introduction to the Research

## Background

In November 1999, the Institute of Medicine (IOM) found that at least 44,000 and potentially as many as 98,000 patients die a year due to medical errors (Board on Health Care Services, 1999). Shortly after the published 1999 report, a consortium that included members from the private and public sectors formed the Leapfrog Group. The group's objectives were to support the initiatives toward standards for patient safety and affordable health care (Leapfrog Group, 2015). One leap toward patient safety includes the use of computerized physician order entry. A movement was underway to incorporate innovative technology as a means to reduce medication errors.

Almost a decade after the IOM (1999) report, President Obama signed into law the American Recovery and Reinvestment Act of 2009 (ARRA). Included in ARRA was the Health Information Technology for Economic and Clinical Health Act, or HITECH. One purpose of the law has been to provide investments to support the growth of technology in health care to strive toward more efficiency (HealthIT, n.d.d). Overall, incentives were incorporated toward the use and adoption of health care information technology in general; as well as, the adoption of electronic health records (EHR) among providers (HealthIT, n.d.b).

Available knowledge to improve the care experience is not compiled often or effectively (Smith, Saunders, Stuckhardt, & McGinnis, 2012). The IOM assembled the Committee on the Learning Health Care System in America to achieve a health care system based upon ongoing learning and improvement (Smith et al., 2012). The

framework based on a continuous development, improvement and application of knowledge (Smith et al., 2012). The report, approved by the Governing Board of the National Research Council, contained seven recommendations. One recommendation involved the "digital infrastructure" or "improving the capacity to capture clinical, care delivery process and financial data for better care, system improvement, and the generation of new knowledge" (Smith et al., 2012, p. S-20). Additional recommendations included the use of clinical decision support as clinical knowledge in the clinical care decision making, involving care givers and patients as part of the patient decision making, and improving communication within and across the care continuum (Smith et al., 2012).

The Agency for Healthcare Research and Quality (AHRQ, n.d.b) noted that one way to improve health care is through the transformation of primary care in how it is organized and delivered. The delivery requires comprehensive care and requires a team, or interprofessional healthcare team (AHRQ, n.d.a) . Interprofessional healthcare teams refers to the physicians, nurses, social workers, pharmacists, dieticians, technicians, therapists, educators, and case managers who collaboratively are responsible for providing care to the patient. The need to strengthen interprofessional teams has become a main focus for policy makers and providers since there is recognition that the physicians cannot continue to complete the care requirements alone (O'Mallery, Draper, Gourevitch, Cross, & Hudson Scholle, 2015). The use of interprofessional teams not only requires integrating new team members into the existing team, but also includes empowering existing team members to work at their highest level of knowledge, ability,

and professional license (Dickenson, 2013, p. 689). Dickenson (2013) indicated that "such team-based approaches decrease medical errors, increase the level of innovation in practices, and improve quality of care, patient satisfaction, staff satisfaction, and clinician satisfaction if done well" (p. 689). The AHRQ has identified the important role for Health IT in the implementation and operationalizing of these medical homes (AHRQ, n.d.d).

It is unclear to what extent the HITECH government investment changes care to actually make it better (Sheikh, Sood, & Bates, 2015). According to the authors, there is early evidence to indicate that the investments in HIT are beginning to show benefits, but it will take more alignment of HIT initiatives with financial reform initiatives for more "radical" transformation (Sheikh et al., 2015, p. 855). The objective of the research examined in this dissertation was to hone in on the use of specific technology tools within the healthcare environment. The goal was to identify how technology tools might support interprofessional healthcare teams during the care of patients with the prospect of improving upon processes to potentially enhance effectiveness in the delivery of health care.

## Introduction

There remains an attempt to identify how the quality and safety of patient care can be improved. In addition, researchers have focused on how health care can be more efficient and effective in the delivery of quality and patient safety, yet have an outcome of lower costs. According to Wickramasinghe (2010), it has become a global priority to offer effective and efficient quality healthcare (p. 143). Although healthcare is known for

leading edge technology in the treatment of patients, healthcare is also known for the slow adoption of information technology in the delivery of healthcare (Wickramasinghe , 2010). Innovative technology continues to be sought as a potential solution to help drive quality and safety with overall reductions in cost through improved system driven efficiencies. As the author noted, "the healthcare industry can no longer be complacent regarding embracing technologies and techniques to enable better, more effective and efficient practice management" (Wickramasinghe , 2010, p. 145). Therefore, healthcare information technology (HIT) continues to be scrutinized and considered as a means to reduce errors, improve upon system delivery inefficiencies, and drive innovative tools to support clinical care.

Researchers have recently focused on clinical knowledge management (CKM) and an attempt to understand how knowledge management tools may better support clinicians in the clinical decision-making process during patient care. As Abidi (2007) summarized that healthcare knowledge management is the creation and use of healthcare knowledge to improve upon the quality of patient care (p. 68). However, as the author noted, challenges in using knowledge management in healthcare at the point of patient care is the "need for knowledge management to support and coincide as part of the care processes" (p. 68).

According to Saito, Wickramasinghe, Fujii, and Geisler (2010) "in coping with the current complex and dynamic situation in the healthcare field, it is imperative for the creation of new ideas and values to foster an innovative workplace that enables an organization's most critical resource, its knowledge workers to collaborate across and

within disciplines" (Preface xiii). The authors noted that it is imperative that knowledge management methodology be timely and appropriate to have an impact in changing the current healthcare field (Saito et al., 2010, Preface xiii). The authors stated that in "the organization embraced by socio-technical methodology, knowledge management plays a crucial role in enhancing organizational resilience/adaptability and improving organization performance..." (Saito et al., 2010, Preface xiv). Due to the increases in healthcare costs, in the number of baby boomers aging, and in the available technology tools, the authors summed that knowledge management "might be the panacea for healthcare in this 21st century" (Saito et al., 2010, Preface xiv).

## The Problem Statement

As the IOM indicated in the 1999 publication (Board on Health Care Services, 1999, p. 2), the errors experienced in the health care systems are not so much due to incompetent personnel but due to the faulty systems, processes, and conditions that lead to the errors. Medical error in 2008 cost the United States $19.5 billion (Shreve et al, 2010, p. 5). Since the IOM publication, Classen et al. (2011) indicated "research using the 'Global Trigger Tool' shows that the frequency of adverse events may be ten times higher than originally reported" (p. 581). Andel, Davidow, Hollander, and Moreno (2012) have conservatively calculated the estimates to be closer to $73.5 billion to $98 billion when looking at the totality of human life (p. 49). According to Croskerry and Nimmo (2011), emerging evidence is indicating that diagnostic decision making may not always be a reliable process and may not always be performed well. In addition, how clinical decisions are made as part the diagnosis process is not easily defined; there are

multiple explanations and theories on how this process is derived. As noted by Yang et al. (2014), "better medical decision making, improved patient monitoring systems, and effective public health surveillance are increasingly viewed by the medical community, the government, and the general population as key drivers to promote innovation and reduce costs in the arena of healthcare" (p. 54).

According to Nilakanta, Miller, Peer, and Bojja (2009), "the Centers for Medicare and Medicaid services have predicted that by 2017, total health care spending will double to more than 4 trillion dollars a year" (p. 1). This means that "1 out of every 5 dollars that the nation spends" will be directed toward health care (Nilakanta et al., 2009, p.1). These rising costs require the health care industry to closely re-examine how current processes are being managed.

With the cost of health care increasing, many people are unable to afford care. According to Martin, Lassman, Whittle, Catlin (2011), the recessions saw the slowest rate growth in the National Health Expenditure Accounts in 50 years in 2009. The recession also "placed increased burdens on households, businesses, and governments, which meant that fewer resources were available to pay for health care" (Martin et al., 2011, p. 11). Current legislation has actively attempted to resolve this problem; however, there still remains a disparity in the current health care delivery system. This environment of inefficiencies (errors) and high costs creates an opportunity to enable technology as part of a solution.

Through healthcare information technology, there is an opportunity to utilize tools to support a more effective and efficient delivery of health care. As Nilakanta, Miller,

Peer, and Bojja (2009) indicated, in order for health care business processes to become more efficient and effective, the "firm needs to understand how the knowledge of these processes is integrated with the work flow and tasks" (p. 1). The technology tools available may assist in the decision- making process and potentially streamline processes as an opportunity for cost savings. One such area of technology includes CKM. As Orzano, McInerney, Scharf, Tallia, and Crabtree (2008) indicated that through their conceptualization of knowledge management, "KM is an integrated framework focusing on effective knowledge process management to impact performance and work relationship in ways to enhance learning and decision making" (p. 491). Once the framework of knowledge management is understood, it can easily be applied to healthcare. However, Nicolini, Powell, Conville, and Martinez-Solano (2008) noted that for healthcare KM to be successful, the KM initiatives need to align with the healthcare processes.

Wickramasinghe, Bali, and Geisler (2007) noted "in order to make sense of the mass amount of data and information being generated, organizations are moving to Knowledge Management techniques and technologies; the healthcare sector is no exception" (p. 368). However, the authors acknowledged that little has been written on the topic of healthcare knowledge management in regard to adoption and implementation (Wickramasinghe et al., 2007). The problem is that while knowledge management is being considered as a means to support efficiencies and reduce costs, little has been reported on how knowledge management tools might support the clinical decision-making process. Therefore, there is a need to understand how knowledge management

tools can be used to support the collaborative clinical decision-making processes among the interprofessional healthcare team during patient care.

## Purpose of Study

The purpose of this mixed method study was to determine what requirements for CKM tools might support clinical teams during the clinical decision-making process. In reviewing the current literature on healthcare CKM, there is a gap in linking how CKM can support the decision-making process that is completed by clinicians during the care of patients. Because there is an abundant amount of information available in today's environment, there becomes a risk of information overload and not enough time in a day to stay current with the available resources.

As Juarez, Riestra, Campos, Morales, Palma, and Marin (2009) indicated, "medical services are work-overloaded environments where time is often critical and information must be available to make correct decisions" (p. 12214). The authors further noted that to improve upon medical decision making, there is a necessity to provide the correct knowledge at the correct time (Juarez et al., 2009, p. 12214). However, there remains uncertainty as how best knowledge management tools can be effective in supporting the clinical decision-making process.

Because there is a need to reduce healthcare costs while improving upon the quality and outcomes of patient care, there is a need to better utilize the knowledge that can be leveraged in making decisions involved in the processes of managing patient care. The intent of the research was to determine areas where knowledge management tools could better leverage the decision-making process to support patient care.

## Research Questions

The following includes the research questions that were to be addressed as part of the study:

*Research question #1*: What role, if any, do KM tools play in supporting the clinical decision-making process?

*Research question #2*: How does the type of knowledge tool available support decision making among the interprofessional clinical team involved in the patient care?

*Research question #3*: How does the team climate influence the implementation and use of KM tools?

*Research question #4*: How does the level of satisfaction in the interprofessional care decision-making process impact the use of KM tools?

*Research question #5*: What metrics might be used to predict the success of implementing KM tools among interprofessional teams?

## Nature of the Study

The approach to the research study used both qualitative and quantitative analysis. One healthcare system was analyzed as a case study. Groups of teams participated and completed the questionnaire. A purposive sampling was used; participants were selected based upon approval from the healthcare system.

There were participants from several interprofessional teams that volunteered to complete the questionnaires. The team members came from several of the primary care teams from the Center of Excellence Patient Aligned Care Teams (PACT). The

interprofessional team members included a mix of roles, including physicians, nursing, and social workers.

The survey research included Likert scale questions. The responses were used to complete quantitative descriptive analysis. In addition, the surveys included open-ended questions to permit the opportunity to capture narrative responses that might otherwise be missed if only a Likert scale survey was to be used.

There were two surveys presented to the survey group in one questionnaire. The surveys included instrument tools that have been previously developed; permission was obtained from appropriate owners to pursue the use of these instruments. There were six open-ended questions added after the Likert scale surveys. The decisions of using the surveys and questions were based on the objective of Research Questions 1 and 2 being addressed by open-ended questions, Research Question 3 addressed using the Team Climate Inventory (TCI) instrument, and Research Question 4 addressed using the Collaboration and Satisfaction about Care Decisions (CSACD) instrument. Research Question 5 was to be addressed by the overall research conclusions from the study results. Further details on the research project methodology and instruments are covered in more details in Chapter 3.

The mixed approach of using both the qualitative and descriptive quantitative analysis was determined to best support the objectives of the research study due to the depth that can be captured in using both the qualitative and quantitative research approaches. Based on the questionnaire design, the goal was to collect data on the clinical decision-making process and the use of CKM tools. The overall study objective

was to identify how knowledge management tools might be better utilized and potentially identify recommendations for further research development.

## Conceptual Framework

Before identifying how knowledge management tools can support the clinical decision-making process, there first needs to be an understanding on how clinical decisions are made. Because of the complexity of clinical decisions, there have been debates that there is only one existing decision-making theory to support the clinical decision-making processes that clinicians use during the treatment of patients. Several theories in decision making were reviewed in order to determine if the theories are in parallel with the clinical decision-making process. The theorists of the theories included Simon (1997), Kahneman (2003, 2000), Tversky (2000), and Reyna (2008). Theories of dual process decision making, prospect theory, fuzzy trace theory, and collaborative team-based decision making were reviewed. A review of theorists that have defined knowledge management was also included in the theoretical framework. These theorists included Choo (1998), Davenport (2000), Prusak (2000), Nonaka (1995), and Takeuchi (1995). Lastly, knowledge management in relation to healthcare was reviewed.

Once the theories were reviewed, KM tools were examined. CKM considerations were identified to determine the impact the KM tools will have in supporting the clinical decision-making process. In addition, the cultural environment to support knowledge sharing was considered. Finally, there was a review of user adoption and the relevancy this might have in the implementation of KM tools in the healthcare environment.

Out of the theories reviewed for decision making, there were several that influenced the framework for the research questions used in the research project. As noted by Bodemer, Hanoch, and Katsikopoulos (2015), in many instances in healthcare, particularly within the critical care and emergency areas, decisions are made during uncertainty "knowledge, time, and often resources are limited" (p. 195). The theories of Tversky and Kahneman (2000) on heuristics and biases and the theory of Simon (1997) on bounded rationality were the core theories relating to healthcare decision making considered when developing the research questions. In the current time of digital technology, the research questions around knowledge management tools come into play to identify how these might support the interprofessional teams in the clinical decision-making process. Identify how KM tools might be used among interprofessional teams efficiently to minimize the need for heuristics and biases. Determine how KM tools help provide the necessary information in a timely fashion and be shared quickly to support and perhaps even improve the decision-making process.

According to Anthoine, Delmas, Coutherut, and Moret (2014), in order to develop quality and safe hospital care, it is important that process improvement initiatives focus on communication and collaboration among healthcare professional teams. Furthermore, "to bring about change, professionals need to assess their levels of team collaboration, in particular their communications skills to share medical information so as to ensure coordination and continuity of care" (Anthoine et al., 2014, p. 2). This outlines the framework of knowledge management. How does the team environment support the requirements for knowledge management tools to actually be successful?

It is these theories and questions that helped prompt the research questions. After exploring the potential instruments currently available, the CSAD and the TCI were identified to be potential instruments to use in the research project. Together the instruments combined a means to analyze a team environment by studying the levels of satisfaction of decision making, collaboration, trust, innovation, and sharing among each team member. The objective was for the measurements to help provide insight to a team's environment to understand how the environment might support the use or implementation of knowledge management tools.

## Definitions

The following is a list of terminology and definitions used throughout the documentation:

*Clinical decision support systems (CDSS):* "is a computer-based system that analyzes available data to guide people through a clinical decision-making process" (Sordo, & Boxwala, 2014, p. 499).

*Clinical knowledge management (CKM)*: "enable medical stakeholders to define, select, and implement treatment(s) within the process of medical diagnosis and treatment" (Dwivedi, Bali, & Naguib, 2007, p. 6).

*Clinical knowledge management system:* "a tool that selectively provides information tailored to the characteristics or circumstances of a specific patient" (Lobach *et al*, 2012, p. 4)

*Data: "*structured records" (Davenport & Prusak, 2000, p. 2).

*Electronic health record (EHR):* "A secure, real-time, point-of-care, patient-centric information resource for clinicians. The EHR aids clinicians' decision making by providing access to patient health record information where and when they need it and by incorporating evidence-based decision support" (Wickramasinghe, Bali, Lehaney, Schaffer, & Gibbons, 2009, p. 187).

*Explicit knowledge:* "knowledge that has been rendered visible; typically captured and codified knowledge" (Dalkir, 2011, p. 466).

*Externalization:* the ability to convert tacit knowledge into explicit knowledge (Dalkir, 2011, p. 466).

*Health informatics: "*The understanding, skills and tools that enable the sharing and use of information to deliver healthcare and promote health" (Wickramasinghe, Bali, Lehaney, Schaffer, & Gibbons, 2009, p. 187).

*Healthcare information exchange (HIE)*: "the electronic sharing of health-related information among organizations" (HealthIT, n.d.c).

*Health information technology* (*HIT)*: "makes it possible for health care providers to better manage patient care through secure use and sharing of health information" (HealthIT, n.d.a). This promotes the use of electronic medical records in place of paper charts.

*Healthcare interprofessional clinicians*: Physicians, Nurses, Therapists, Technicians/Technologists, Pharmacists, Dieticians, and any other healthcare professionals that are part of the team caring for patients within a healthcare system.

*Healthcare knowledge management*: "how medical stakeholders perceive, process, and communicate information flowing from activities relating to medical practice, medical education, medical research, and medical information dissemination" (Dwivedi, Bali, & Naguib, 2007, p. 6).

*Information:* "a message, usually in the form of a document or an audible or visible communication" (Davenport & Prusak, 2000, p. 3).

*Internalization:* the ability to convert explicit knowledge into tacit knowledge (Dalkir, 2011, p. 468).

*Knowledge*: "a fluid mix of framed experience, values, contextual information and expert insight that provides a framework for evaluating and incorporating new experiences and information" (Davenport & Prusak, 2000, p. 5).

*Knowledge management (KM)*: "the creation and subsequent management of an environment that encourages knowledge to be created, shared, learnt, enhanced, organized, and utilized for the benefit of the organization and its customers" (Wickramasinghe, Bali, Lehaney, Schaffer, & Gibbons, 2009, p. 189).

*Knowledge management tools*: include the tools and techniques used to support the creation, acquisition, transferring and sharing of knowledge. From a health care perspective may include tools such as patient electronic records, data mining/business intelligence tools, mobile devices, community of practices (i.e. wiki and blogs), groupware, e-learning tools, clinical decision support tools, content management tools, evidence-based tools, artificial intelligence tools, and communication tools to name a few.

*Tacit knowledge*: knowledge "that is very difficult to articulate, to put into words or images; typically highly internalized knowledge" (Dalkir, 2011, p. 475).

## Assumptions, Limitations, Scope, and Delimitations

### Assumptions

It was assumed that the general theories of the decision-making process could be applied more specifically to the decision-making processes conducted by clinicians in the health care environment. It was also assumed that the responses obtained from the ambulatory environment would only conclude representation in this segment of health care. Assumptions regarding the study itself were that participants would be honest and accurate in their responses, that participants would have a general understanding of knowledge management, and that the participants involved in responding to the interprofessional survey questions provided direct care to patients.

### Limitations

A limitation in the study included the sampling. Since sampling all health care facilities was not feasible, a convenience sample was used. The pool of participants was to be from a single healthcare system and was selected by the healthcare system to participate**.** Another limitation was that not all health care environments were reviewed; efforts would concentrate on the ambulatory health care environment. The selection of the ambulatory environment was driven by the healthcare system having designed the teams in place for other grant research purposes. Finally, a limitation on sample size with a single healthcare organization might limit the ability to generalize findings across all healthcare organizations.

Initial plans of the research project proposed additional team members from IT and Clinical Management to participate to gain insight on overall users' acceptance to technology and readiness of the technical environment to support KM tools technology driven. However, due to the limitation of access to these team members by the research team from the health care system, these portions of the research project was eliminated with possibilities of looking to add these team members to potential future projects.

**Scope**

The scope of the research was to determine what type of clinical knowledge management tools best support the clinicians during the clinical decision-making process by understanding how clinical decisions are made. The focus of the clinical knowledge management and decision making was to be limited to the acute health care setting within the United States. The clinical decision-making focus was to also include the collaboration involved between health care professionals. Overall, the focus was on the processes surrounding the diagnosis and treatment steps that are inherent in the decision-making process as clinicians care for a patient in these areas.

The research scope did not take into consideration the prognosis or patient outcomes as part of any study metrics. Also, the research did not consider the intervention outcomes to establish evidence but only focused on the decision making at the time of patient care. The research did not studying areas of ethics or legal components involved in the decision-making process. Finally, the shared decision-making process addressed the collaboration between interprofessional clinicians; the

research did not expand to include collaboration with the patient and/or the patient family members in regard to the collaborated decision-making process at this time.

**Delimitations**

The research did expand beyond the concept of clinical knowledge management. Clinical knowledge management concentrates on the processes involved in the clinical diagnosis and treatment of the patient; the direct care of the patient. The focus of the research was to involve clinical knowledge management tools in regard to how these tools might support the clinical decision-making process between the interprofessional collaboration that takes place during the care of the patient.

The research did not include the concept of healthcare knowledge management or the processes involved in healthcare education, research, or dissemination of information beyond the direct care of a patient. Although this broader term of knowledge management within healthcare may also impact the efficiency of the healthcare system, the direct focus of the research was on the decision-making process and collaboration that was specific to the direct care of a patient.

## Significance of Study

According to Rao and Hellander (2014), there were 84 million adults, 46 percent in the age bracket between 19 to 64, that either did not have health insurance coverage or the out-of-pocket fees were so high that they were considered underinsured in 2012 (p. 215). The authors further noted that "a new measure of poverty that takes medical expenses and social programs into account - the Supplemental Poverty Measure - found that seniors are much worse off than previously thought" (Rao & Hellander, 2014, p.

217). Effective and efficient clinical decision-making processes provide the opportunity for improvements in patient safety & quality of care; as well as, the reduction in health care cost. As healthcare costs continue to rise, many individuals find themselves unable to afford basic care; there is an obvious disparity in the current health care delivery system in respect to the ability to afford healthcare. If CKM tools could aid in the reduction in health care costs while improving the quality and safety for patient care, these tools could become one way to address this disparity in the health care delivery system. This was the implication for a positive social change.

According to Zhang, Li, Duan, and Zhao (2015), "globally, healthcare organizations fail to use evidence optimally" (p. 40). The authors contributed several reasons for a knowledge gap, one being the rate at which knowledge is growing (Zhang et al., 2015, p. 40). A second reason is due to medical knowledge's ongoing evolution (Zhang et al., 2015, p. 20). Computerized clinical decision support tools can help to improve healthcare (Ash et al., 2015, p. 1). Ash et al. (2015) noted that "hospitals and ambulatory care organizations are increasingly purchasing commercial electronic health record systems with computerized clinical decision support (CDS), or they are buying CDS directly from content development vendors" (p. 1). While CDS has enormous potential, there has not been a widespread adoption (Greenes, 2014, p. 1). But according to Fox, Gutenstein, Khan, South, and Thomson (2015), "even though effective technologies are now available, a limiting factor in their availability and adoption is the absence of repositories of knowledge for use at the point of care" (p. 71).

With meaningful use of healthcare IT, movement for more concentration on preventive/comprehensive medicine, and the use of interprofessional teams, the use of knowledge sharing, communication, and collaboration will continue to be required. These are all areas that KM tools could potentially be supportive. The importance of coordinating patient care includes the delivery of consistent recommendations, minimizing unnecessary or duplicate testing, and providing services in a timely manner (Morton et al., 2015, p. 250). Morton et al. (2015) indicated that "in future stages, the MU program will require practices to demonstrate more robust use of health IT for care coordination and in particular for exchange of information across settings of care" (p. 251).

According to an interview with Karen DeSalvo, director of the Office of the National Coordinator for Health Information Technology, she noted the importance that "health IT is more than just EHRs" (DeSalvo, 2015, p.55). She further indicated that it is time to move beyond just meaningful use and to drive interoperability across the care continuum (DeSalvo, 2015). This drive of interoperability is required to help in the reform of the current delivery system (DeSalvo, 2015). Work effort has been identified to help with this drive including the development of standards and the adoption and optimization of EHRs and Health IT (DeSalvo, 2015). Health IT can help clinicians in several ways to improve upon the quality and safety of care provided to patients, including but not limited to having the clinicians "access up-to-date evidence based clinical guidelines and decision support, and by better coordination of patient care with

other care providers through secure and private sharing of clinical information (DeSalvo, 2015, p. 57).

Understanding how CDS, EMR, and other KM tools might be used to support decision making among interprofessional teams were some of the objectives of the research project. The potential significance of the research was to identify what clinical knowledge management tools might best support the collaborative decision making processes, the barriers that might impede the technology adoption process, and what metrics to measure success of CKM tool usage. Finally, if findings are to be published within peer reviewed journals, the potential benefits might include adoption of KM tools across healthcare organizations in order for patients to benefit in the care obtained.

## Chapter Summary

In summary, the objective of Chapter 1 was to provide the reasoning used to define the gap in the current literature to base the need for the proposed research questions. Chapter 1 addressed the significance of the research, identified the problem statement, and summarized the theories relevant to the research. Chapter 1 also aligned the purpose of the study to the potential application for a positive social change in addressing the bigger picture of today's disparity in the delivery of the health care.

The remaining chapters of the proposal included Chapter 2 and Chapter 3. Chapter 2 provided details regarding the literature review and the gap identified from the literature review. The goal for Chapter 2 was to justify the reasoning for pursuing the research project. Chapter 3 outlined how the research was addressed by identifying the framework for the research and the proposed research project. The objective of Chapter

3 was to define the research to be used to address the gap identified in Chapter 2. The objective of the proposal was to provide solid documentation to support the request to move forward with next steps as a continuation of the proposed research project.

# Chapter 2: Literature Review

## Introduction

In order to understand how knowledge management tools might support decision making between interprofessional team members during patient care, it is important to understand the underlying theories. The following sections of Chapter 2 include the literature review of theories involving decision making, knowledge management and clinical knowledge management. In addition, current research involving these areas was also presented as support for proposing the research study.

In completing the literature review, searches were conducted to identify relevant articles on the subject of decision making, clinical decision making, knowledge management and clinical knowledge management. Articles were used from peer reviewed journals. The strategy of the review was to identify articles that supported the theories of the decision-making process in healthcare, the use of knowledge management in healthcare, and the elements involving decision making within the interprofessional healthcare teams.

In addition to recent articles found in journals published within the last five years, published work that was completed by the theorists was also studied. The material reviewed included books, the author(s) web site(s), and journal articles. The material selection was based upon the relevancy to clinical knowledge management, knowledge management, decision making, and interprofessional team decision making.

## Conceptual Research Framework

### Decision Making

As noted by Herbert Simon, "The work of managers, of scientists, of engineers, of lawyers…is largely work of making decisions and solving problems" (Simon et al., 1987, p. 11). He further indicated that this work includes: "choosing issues that require attention, setting goals, finding or designing suitable courses of action, and evaluating and choosing among alternative actions" (p. 11). He further categorized this work effort by indicating that "problem solving" involves the first three activities and the final activity that includes evaluation and choice selection is "decision making" (p. 11).

Herbert Simon studied decision making in organizations and from this came his administrative theory. According to Simon (1997), "administrative theory is peculiarly the theory of intended and bounded rationality" (p. 118). Simon indicated that administrative theory is "the behavior of human beings who satisfice because they have not the wits to maximize" (p. 118). Regarding intuitive thinking, Simon noted that this can be identified as a rational process (p. 331). Furthermore, Simon indicated that "intuition enables the expert's rapid recognition of and response to large bodies of knowledge assembled through training and experience" (p. 331).

Herbert Simon (1979) noted that "real human beings of bounded rationality are faced with complexity and uncertainty" (p. 3). Therefore, human beings must be content with finding a "good enough" solution when it comes to problem solving, or content to satisfice (Simon, 1979, p. 3). The satisficing is a means to cope with the complexity of the situation – it "provides a criterion for a stop rule: search ends when a good-enough

alternative is found" (Simon, 1979, p. 3). In regard to solving problems, the author described the problem solving activity as "a search through space…of knowledge states, until a state is reached that provides a solution to a problem" (p. 331). He continued that "each node reached contains a little more knowledge than those reached previously" (p. 331).

The study of decision making may be analyzed in two distinct ways: the normative analysis, which addresses rationalism and logic; and the descriptive analysis which focuses more on beliefs and preferences (Kahneman & Tversky, 2000, p. 1). Decision making involves making choices that involve some level of risk. Tversky and Kahneman (2000) studied the Prospect Theory to define the phases that occur when making a decision that includes risk (p. 46). The first phase, or framing phase, is when the "decision maker constructs the acts, contingencies, and outcomes of the decision" (Kahneman & Tversky, 2000, p. 46). It is during the second phase (valuation phase) that the "decision maker makes an assessment of the value of each prospect and selects accordingly" (Kahneman & Tversky, 2000, p. 46).

Framing can both "enrich and complicate the analysis of choice" during decision making (Tversky & Kahneman, 2000, p. 220). The authors noted that although they did not define framing theories, there is a dependency on the decision-making process based upon "how the context of the information is presented and the language used in the presentation" (p. 220). According to the authors, their research results involving framing were "consistent with the theory on bounded rationality that was originally presented by Simon" (p. 220).

Framing has been studied within the healthcare environment. In a test conducted in the Netherlands, researchers noted that "varying the message type in a brochure regarding childhood developmental dysplasia of the hip (DDH) between a gain-frame versus a loss-frame had an impact on parents' responses regarding ultrasound testing" (Witting, Boere-Boonehamp, Fleuren, Sakkers, and IJzerman, 2012, p. 190). Current practice in the Netherlands had ultrasound testing only as a preventive measure based upon specific criteria, while many other countries have adopted the ultrasound screening as standard protocol (Witting et al., 2012, p. 186). The conclusions from the study indicated that a gain-framed message in parent brochures might lead to higher participation rate for the childhood ultrasound screening (Witting et al., 2012, p. 192).

According to Tversky and Kahneman (1982), "many decisions are based on beliefs concerning the likelihood of uncertain events" (p. 3). The authors continue to note that "people rely on a limited number of heuristic principles which reduce the complex tasks of assessing probabilities and predicting values to simpler judgmental operations" (p. 3). The importance of noting this is that while heuristics may be useful, these same heuristics "may sometimes lead to severe and systematic errors; also noted as bias" (Tversky & Kahneman, 1982, p. 3).

Research by Kahneman and Tversky focused on two levels of processing judgment; one level that was automatic, or "intuition", and a second level that required deliberations, or "reasoning" (Kahneman, 2003, p. 697). This concept of two levels of processing has been an ongoing debate but the common concept is the division of one process focusing on intuition process and the other on a more deliberate reasoning

process. In the dual process model involving a System 1 and System 2, Kahneman (2003) noted that the "System 1 generate impressions of perception and thought…System 2 is involved in all judgments, whether they originate in impressions or in deliberate reasoning" (p. 699). The author further noted that the System 1 process or "impressions…are not modified by System 2" (p. 699).

Evans (2011) provided another dual-process theory definition; he defined Type 1 as "fast, high capacity, independent of working memory and cognitive behavior" (p. 87). He defined Type 2 as "slow, low capacity, heavily dependent on working memory and related to individual differences in cognitive ability" (p. 87). According to Evans, the importance to understand that "dual-process accounts are a family of theories and that there is no definitive version" (p. 87). The current "received" view of the dual-process theory is a merger of the theories that were proposed during the 1990s (Evans, 2011, p. 87). Although many of the theories may be summarized into the System 1 and System 2 concept, what remains under debate is the specific "nature of the two kinds of processing" (Evans, 2012, p. 129).

The heuristic-analytic theory has been defined with two processes: Heuristic and Analytic (Stupple, Bali, Evans, & Kamal-Smith, 2011, p. 932). Heuristic processing is driven by prior knowledge and beliefs while the analytic process involves rules-based inference (Stupple et al., 2011, p. 932). Belief bias is determined by both the heuristic and analytic selective processing (Stupple, et al., p. 932). According to the researchers, the default heuristic processing tends to accept believable conclusions and reject unbelievable conclusions (p. 932). The response time to complete processing differs

across individuals. The researchers concluded that "the capacity to generate normative responses to certain conflict problems presumably comes at the cost of having to devote extra time not only to inhibiting default, heuristic responses but also to avoiding selective-processing biases associated with analytic interventions" (p. 940).

In healthcare environment, heuristics and bias has been studied. The emergency department (ED), in particular, is a unique environment that relies on the decisions made by both individual and collective cognition (Croskerry, 2014, p. 13). There are clinical and non-clinical decisions made in the ED that include executive management decisions regarding operations and medical decisions that determine the ED effectiveness (Croskerry, 2014, p. 14). According to Croskerry, diagnostic error tends to be due to defects in knowing how to reason rather than knowing medical facts (p. 14). While most time is spent in the intuitive mode, it is here where most errors occur in our decision-making process (p. 14). As Croskerry noted, "despite the obvious to strengthen the intuitive mode of human reasoning, a general pessimism has prevailed regarding the likelihood that decision makers can overcome their hardwired and acquired biases" (p. 16). Conditions that increase vulnerability to bias includes fatigue, sleep deprivation, sleep debt, and overcrowding (p. 17). Being aware of the conditions that can influence bias help determine the appropriate mitigation approaches to improve the decision-making process. "Becoming alert to the influence of bias maintaining keen vigilance and mindfulness of one's own thinking" (Croskerry, 2013, p. 2447). The author's conclusions regarding debiasing include: "it is not easy, no one strategy will work for all

biases, some customization of strategies will be necessary, and most likely require multiple interventions" (p. 2447).

In regard to the Dual-Process Theory and clinical decision making, Croskerry and Nimmo (2011) identified some features of the System 1 mode and System 2 mode. According to the researchers, "repetition of an analytical mode (System 2) will eventually develop expertise and default to an intuitive mode (System 1)" (p. 157). Either mode can override the other (Croskerry & Nimmo, 2011, p. 157). The researchers noted that "the system is dynamic and may oscillate back and forth to produce a well-calibrated response" (p. 157). Lastly, the intuitive mode (System 1) tends to be the "default" mode (Croskerry & Nimmo, 2011, p. 157). The researchers concluded that "most biases and heuristic occur in the intuitive mode and this is where many of our thinking failures originate" (p. 157). In order to improve and reduce errors in clinical decision making, the researchers suggest strategies to de-bias and improve upon the intuitive mode (p. 161). One strategy that was mentioned in regard to improving intuitive performance included the practice to make "scientific methods intuitive", such as through the use of decision aids (Croskerry & Nimmo, 2011, p. 160).

A dual-process model that builds of the prospect theory is the fuzzy trace theory (FTT). The two process included in the FTT are gist and verbatim. Gist memory "is memory for essential meaning…a symbolic, mental representation of the stimulus that captures meaning" (Reyna, 2012, p. 334). Reyna defined verbatim memory as a contrast to gist; verbatim "is memory for surface form, for example, memory representations of exact works, numbers, and pictures" (p. 334). Reyna and Brainerd (2011) further defined

that “verbatim representation capture the exact surface form of problems or situations” while “gist representations capture the bottom-line meaning of the problem or situation” (p. 182).

In interpretation from study results, “gist and verbatim representations are extracted roughly in parallel and independently…” (Reyna, 2008, p. 851). Furthermore, the researcher indicated that “people prefer to operate on the crudest gist representation that they can to make judgments or decisions” (p. 851). Framing a question involving risk aversion, people recalling the specific details regarding risk for a procedure might not be adequately informed; Reyna indicated that “information must appeal to gist-based intuition, rather than the verbatim-based analysis” (p. 857). Reyna further noted that “precise information is frequently ineffective in changing decisions and behaviors because patients and professionals rely on gist instead….gist representation is the answer to what information means to that individual” (p. 862). In conclusion, the researcher noted that the “bridge is needed between information and action due to the filtering process in the brain...it must appeal to gist-based intuition” (p. 863).

**Knowledge Management**

Davenport and Prusak (2000) noted that “knowledge is neither data nor information, though it is related to both, and the differences between these terms are often a matter of degree” (p. 1). The authors further noted that “knowledge, data, and information are not interchangeable concepts” and that “organizational success and failure can often depend on knowing which of them you need, which you have, and what you can and can’t do with each” (p. 1). Knowledge is about the transformation of data to

information and information to knowledge (Davenport & Prusak, 2000, p. 6). The authors identified that this transformation occurs through “comparison, consequences, connections, and conversations” (p. 6). In summary, it is “how the information compares to other known information, the impact of the information in regard to decision making, how the knowledge relates to others, and what other people think about the information” (Davenport & Prusak, 2000, p. 6).

Knowledge differs from information in that it is about beliefs and commitment (Nonaka &Takeuchi, 1995, p. 58). Knowledge is about action, which according to Nonaka and Takeuchi (1995) is another difference between knowledge and information (p. 58). There is a similarity between knowledge and information in regard to that they are both about meaning (Nonaka &Takeuchi, 1995, p. 58). Sometimes information and knowledge are terms that are used interchangeably, but there is a distinct difference in the two terms (Nonaka &Takeuchi, 1995, p. 58).

When referring to knowledge, there are two forms; tacit and explicit. Explicit knowledge is the knowledge that has been captured and available in some type of form that may be shared. Explicit knowledge “can be expressed in words and numbers, and easily communicated and shared in the form of hard data, scientific formulae, codified procedures, or universal principles” (Nonaka &Takeuchi, 1995, p. 8). Tacit knowledge is a more complex form of knowledge. According to Nonaka and Takeuchi (1995), "tacit knowledge is highly personal and hard to formalize, making it difficult to communicate or to share with others"; in addition, "tacit knowledge is deeply rooted in an individual's

actions and experience, as well as in the ideas, values, or emotions he or she embraces" (p. 8).

Another author, Dalkir (2011), has defined knowledge management:

> "The deliberate and systematic coordination of an organization's people, technology, processes, and organizational structure in order to add value through reuse and innovation. This value is achieved through the promotion of creating, sharing, and applying knowledge as well as through the feeding of valuable lessons learned and best practices into corporate memory in order to foster continued organizational learning." (p. 469)

Organizational knowledge is the process of taking knowledge created by individuals within the organization and developing it as part of the organization's knowledge network (Nonaka & Takeuchi, 1995, p. 59). In addition, "organizational knowledge creation is a continuous and dynamic interaction between tacit and explicit knowledge" (Nonaka & Takeuchi, 1995, p. 70). Nonaka and Takeuchi (1995) outlined four modes that the organizational knowledge creation occurs: "(a.) socialization (tacit to tacit), (b.) externalization (tacit to explicit), (c.) combination (explicit to explicit), and (d.) internalization (explicit to tacit)" (p. 225). This continuous and dynamic interaction between the different modes has been termed as the knowledge spiral. It is important to recognize that organizational knowledge creation is completed at the individual level. However, as the authors indicated, "If the knowledge cannot be shared with others or is not amplified at the group or divisional level, then knowledge does not spiral itself organizationally" (p. 225).

Based upon the Nonaka and Takeuchi Knowledge Spiral Model, Dalkir (2011) defined the knowledge spiral as "a continuous activity of knowledge flow, sharing, and conversion by individuals, communities, and the organization itself" (p. 70). Dalkir

noted that the Nonaka and Takeuchi Knowledge Spiral Model strength is in its simplicity (p. 71). However, a weakness noted by Dalkir is that the model does not explain all levels of knowledge management, such as "addressing larger issues of how decision making takes place by leveraging both forms of knowledge" (p. 71). Dalkir referenced another model, the Choo Sense-making KM Model, as being a "holistic treatment of key KM cycle processes extending to organizational decision making, which is often lacking in other theoretical KM approaches" (p. 76).

Choo (1998) defined the "three arenas of information use as sense making, knowledge creating, and decision making" (p. 3). Sense-making, information is interpreted to determine significance (Choo, 1998, p. 3). During knowledge creation, "the main information process is the conversion of knowledge" (Choo, 1998, p. 3). And finally, the processing and analysis of alternatives is completed during decision making (Choo, 1998, p. 3). In summary, "all three modes of information use – interpretation, conversion, and processing – are dynamic, social process that continuously constitute and reconstitute meaning, knowledge, and action" (Choo, 1998, p. 3). It is the organization that effectively integrates the sense-making, knowledge creation, and decision making that is considered the "knowing organization (Choo, 1998, p. 3).

Knowledge management tools may be of a variety of different tools that are part of a KM toolkit. The tools support the knowledge creation, sharing, codification, dissemination, acquisition, reuse, and application (Dalkir, 2011, p. 268). The tools may include but not limited to mining techniques, portals, mobile devices, business intelligence, communities of practice, communication tools (i.e. blogs, groupware, and

wikis), knowledge-based repositories, artificial intelligence, decision support tools, and the list may continue. According to Dalkir (2011), the importance of the selection of the tools to include in the KM toolkit is to ensure that "the KM toolkit is consistent with the organization's overall business strategy" (p. 269).

In summary, knowledge management is not only about the implementation of tools and technology. Many times, the implementation of knowledge management involves a culture change and not focusing only on technology. According to Karim, Razi, and Mohamed (2012), "main contributions and initiatives of KM must come from the organizational members who are ready and willing to share information and generate new knowledge for the organization" (p. 787). Furthermore, it is important for organizations to "evaluate and understand how far the employees perceive and understand the concept of KM and willing to be part of the process" (Karim et al., 2012, p. 787). The success of an implementation requires several characteristics that include the support from top management, transparency, trust, and communication. Overall, there is a need for an environment that cultivates sharing and collaboration and permitting the employees to become part of the process.

There are challenges to understanding an organization's readiness to implement KM initiatives. Karim, Razi, and Mohamed (2012) noted that "KM readiness is a concept that has been constantly investigated using various different means and perspectives" (p. 778). Yet the concept of KM readiness remains unclear and requires more research "to further strengthening its concept, methodological, and measurement approaches" (Karim et al, 2012, p. 778). Instead of focusing on the perception from the

employees regarding the success of the KM implementation, an alternative of readiness to consider is to understand the readiness through employee acceptance (Karim et al, 2012, p. 779).

**Healthcare Knowledge Management**

Mahmood, Burney, Abbas and Rizwan (2012) has indicated that **"**the healthcare industry is a knowledge based community and is connected to hospitals, physicians, patients, laboratories, pharmaceuticals, clinics, pharmacies, and customers for sharing knowledge" (p. 34). While knowledge management "can have similarities among organizations with different orientation, there are still certain characteristics and goals that are unique at each healthcare facility" (Karamitri, Talias, & Bellali, 2015, p. 2). As noted by Ali, Tretiakov, and Whiddett (2014), "healthcare organizations differ from organizations in other industries for reasons such as the need to keep up with constantly evolving medical knowledge while maintaining high ethical standards" (p. 22). A well identified challenge for healthcare is the "translation of knowledge management into practice" (Liu, Cheng, Chao, & Tseng, 2012, p. 408). As stated by Sylla, Robinson, Raney, and Seck (2012), "systematic efforts to change and incentivize information-sharing behavior should be part of an overall knowledge management strategy" (p. 62).

Glaser and Overhage (2013) noted "there is no denying the paradox that is the health care in America today: an explosion of medical knowledge, tremendous innovation in therapies and procedures, and vast computing capabilities, yet disappointing results in key performance indicators such as quality, costs and outcomes" (p. 62). "Whether through the use of content management tools, communities of practice,

or e-learning initiatives, knowledge transfer and management has become a strategic imperative in healthcare" (Glaser & Overhage, 2013, p. 61). In addition, Glaser and Overhage noted that "yet the industry still struggles with issues related to management of particular base of knowledge" (p. 61). Although great advances have been made in healthcare regarding knowledge management, much work still remains to be completed. One observation has been that "knowledge management health initiatives tend to focus on one solution…instead of a comprehensive strategy" (Kothari, Hovanec, Hastie, & Sibbald, 2011, p. 2). As noted by Gagnon et al. (2015), "it is critical for health care organizations to look for innovative solutions, as well as to develop strategies that aim to design new work practices and to manage knowledge" (p. 636).

According to Lee and Hong (2014), "hospital organizations must build and develop knowledge by stimulating the employees' knowledge sharing and continually fostering innovation in their organization" (p. 149). Demirkan (2013) noted that "IT professionals in healthcare organizations need to re-think how they use IT resources" (p. 38). He further noted that "cloud-enabled sustainable smart healthcare systems, coupled with electronic health records (big data) and emergent mobile solutions…demonstrate unprecedented potential for delivering automated, intelligent, and sustainable healthcare services" (p. 39). In a study conducted by Peirson, Ciliska, Dobbins and Mowart (2012) regarding knowledge management tools for use in public health, "the informants cautioned against an 'if you build it they will come' mentality" (p. 8). The informants indicated the importance to "build awareness and provide prompts and training so staff want to, know how to, navigate and use the system" (Peirson et al., 2012, p. 8). The

informants suggested characteristics for the tools; examples included “easily accessible, user-friendly, current and searchable” (Peirson et al., 2012, p. 8).

Orzano, McInerney, Scharf, Tallia, and Crabtree (2008) defined a framework for knowledge management to apply within the healthcare environment. In this framework, or model, the focus is “on effective knowledge process management to impact performance and work relationship in ways to enhance learning and decision making” (p. 491). The critical processes of KM included “finding knowledge, sharing knowledge, and developing knowledge” (Orzano et al., 2008, p. 492). Examples of what are enablers to these critical processes include “active networks, helpful relationships, reflective practice, trusting climate, effective communication, supportive leadership, accessible technology, and robust infrastructure” (Orzano et al., 2008, p. 492). Within this model, the researchers noted the outcomes being knowledge management in decision making, or “sensemaking”, and organizational learning (p. 492). In regard to knowledge management processes and tools, Orzano et al. (2008) found these “can be thought of as ways to organize and influence learning and decision making within practices to achieve overall health” (p. 495). The authors noted that “tremendous opportunity exists for information science to inform the better delivery of health care services” (p. 495).

Nicolini, Powell, Conville, and Martinez-Solano (2008) conducted a literature review on the healthcare sector and knowledge management (p. 245). One of the themes the researchers identified included the discussion on knowledge management tools (p. 250). The researchers identified that healthcare differs from other industries by the characteristic types of data involved: patient-centered, service data (or operational data),

and scientific data (p. 251). Depending upon the data, different KM tools and techniques are required (Nicolini et al., 2008, p. 251). Regarding patient-centered data, technologies are involved in the sharing of patient data; technologies that are not normally considered part of KM tools (Nicolini et al., 2008, p. 251). According to Nicolini et al. "while these technologies are seldom considered as KM tools, there is an emerging consensus that an efficient management of knowledge in the healthcare sector requires the integration of this class of tools…" (p. 251). In addition Nicolini et al. indicated "allowing fast, effective and automated cross-referencing between patient data and clinical resources, it is possible to streamline the clinical process, with obvious benefits for both the patient and the wider system" (p. 251).

Nicolini, Powell, Conville, and Martinez-Solano (2008) identified that enablers found in successful initiatives in healthcare included: "shared common values and culture, minimizing concerns about power and status, interdisciplinary, and loose structure" (p. 255). The common barriers found in healthcare KM included: "over management and interference from political sphere, lack of trust, poor quality relationship, professional barriers, clinical managerial conflict, insufficient technology skills, and lack of leadership" (Nicolini et al., 2008, p. 255). Many of the enablers and barriers for KM success may be found outside of the healthcare sector. However, the authors noted "two specific aspects of healthcare work pose specific challenges to the success of KM: strong professionalism and the political sphere" (Nicolini et al., 2008, p. 257).

Medical service delivery is a collaborative process where healthcare providers work to achieve outcomes in terms of access, quality, and cost that would otherwise be difficult to achieve on their own (Sheng & Chang, 2013, p. 462). In an organization, knowledge transfer is the process of an agent being affected by the experience of another agent (Sheng & Chang, 2013, p. 463). It is suggested that innovation is a result of adapting or reconfiguring existing knowledge (Sheng & Chang, 2013, p. 467). The purpose of knowledge transfer is to extend the knowledge or experience to other members to improve the ability of the members to enhance organizational performance (Sheng & Chang, 2013, p. 468).

According to Booth and Carroll (2015), "increasing recognition of the role and value of theory in improvement work in healthcare offers the prospect of capitalising upon, and consolidating, actionable lessons from synthesis of improvement projects and initiatives" (p. 1). The authors further note that "synthesis is the process of combining or 'pooling' relevant evidence from multiple similar studies in order to develop more robust, generalizable conclusions that are possible from findings of a single study" (p. 1). In addition to synthesis, evidence-based medicine is another example of the re-use of knowledge into best practices. However, implementing knowledge-based evidence derived from research is not without challenges. According to researchers from the UK, decommissioning interventions of limited clinical value depends upon a set of social processes (Shepperd, Adams, Hill, Garner, & Dopson, 2013, p.165). These processes include:

> "sensing and interpreting new evidence and integrating it with existing evidence (including tacit evidence); reinforcement by professional networks and

> communities of practice; relating the new evidence to the needs of the local context; and discussing and debating the evidence with local stakeholders before taking join decisions about its enactment and changing practices." (Shepperd et al., 2013, p. 165)

According to authors Noonan et al. (2014), "the decision to implement evidence into practice should also consider factors such as feasibility, relevance to practice and impact on patient outcomes…" (p. 584).

Kessel, Hannemann,-Weber, and Kratzer (2012) have completed research regarding knowledge management and innovative work behaviour in the treatment of rare diseases in healthcare. The authors defined "innovative behaviour as not only consisting of the initiation and realization of novel approaches but also of the accumulation of knowledge…" (p. 147). In addition, the authors noted the importance of communication between all parties regardless of role; "it allows each healthcare professional provider to share the limited knowledge he gains while working with patients with rare diseases" (p. 152).

With electronic health records being readily available, there has been optimism in the ability to use the system to share clinical data across the clinical teams through the course of intakes, order-entry, and discharge (Bar-Lev, 2015, p. 404). However, there have been implementations of electronic health record systems that have not been favorable. As noted by the author, there have been implementations that "have been shown to promote asynchronous communication in ways that separate the work of physicians from that of nursing…" (p. 404). Therefore, it is important to take into consideration not only the type of knowledge management tools being implemented, but understand the clinical workflows and processes the tools should support.

Today, “information is produced very rapidly and not all information necessarily constitutes knowledge” (Almeida, Frade, & Cruz-Correia, 2014, p. 1395). According to Almeida et al. (2014), there is a lack of including quality assurance mechanisms in the health databases “to ensure a proper evaluation and understanding of the electronic health records” (p. 1395). As noted by Yun (2013), “hospital organizations should take into consideration knowledge management systems that aim to facilitate knowledge sharing and creation should be regarded as an essential element of an innovative management strategy…”(p. 1477).

In summary, healthcare knowledge management shares many characteristics found in other industries that use knowledge management. Although healthcare knowledge management may be in early stages, it continues to gain support as to the potential possibilities in providing efficiencies in the healthcare sector. More research is required to fully understand the technology tools and techniques in the healthcare industry.

**Decision Making & Knowledge Management**

“Sound decisions rely on having the right knowledge in the right place at the right time, to be able to act effectively” (McKenzie, van Winkelen, & Grewal, 2011, p. 403). The authors indicated that “KM practices are well placed to improve decision making” (p. 403). Furthermore, the authors noted that “distinguishing different types of decision making provides a sense of different knowledge and learning requirements from each context” (p. 404). Therefore, the type of knowledge depends upon the type of decision making.

Choo and Johnston (2004) found that "sensemaking constructs the shared meanings that shape the organization's purpose and frame the perception of problems or opportunities that the organization needs to work on" (p. 77). Thereby, "working with problems and opportunities often become occasions for creating knowledge and making decisions" (Choo & Johnston, 2004, p. 77). This knowledge model indicates that an organization's knowledge is "embedded in its activities of sensemaking, knowledge creation, and decision making" (Choo & Johnston, 2004, p. 90).

Lechasseur, K., Lazure, and Guilbert, L. (2011) have suggested that in healthcare there is a specific type of knowledge that they have labeled as "combination constructive knowledge" (p. 1936). According to the authors, "this knowledge calls on practical and moral reasoning in pursuit of good and responsible practice" (p. 1936). The authors further noted that "the end result of the combinational constructive knowledge is to ensure the well-being of the person being cared for, taking into account their uniqueness and the specific circumstances (p. 1936). However, the authors indicated that this level of knowledge management requires a higher level of critical thinking (p. 1936).

McKenzie, van Winkelen, and Grewal (2011) noted that "strategies for developing people, technology/processes, collaborative relationships (internal and external), all affect the quality of knowledge available and used" (p. 407). However, decision making is not without the risk of biases. KM can have an impact to reduce biases (McKenzie et al., 2011, p. 407). In many types of biases, (such as escalation, framing, anchoring, confirming evidence, and over-confidence), KM may assist in reducing these biases by supporting collaborative decision making through additional

stakeholder's involvement or decision support tools (McKenzie et al., 2011, p. 408). It is through collaboration that knowledge is kept "vital and relevant" (McKenzie et al., 2011, p. 410). Furthermore, the authors noted the importance in understanding how collaboration may impact decision making; this sets the stage for Knowledge Managers to bring awareness to the collaborative relationships between resources and support knowledge sharing processes (p. 411). Although these techniques are defined for business decision making, there may be parallel in consideration for clinical decision-making processes.

Health data that is relevant and stored must be easily accessible when it is required to support clinical decision making (Levy & Heyes, 2012, p. 20). According to Levy and Heyes (2012), "the pivotal role of information in supporting good patient care and outcomes means that healthcare practitioners need systems that provide evidence-based and up-to-date information" (p. 21). Furthermore, the authors noted that "the future of integrated, effective, and efficient services, which offer optimal person-centered care, depends on active 'sharing': knowledge, decisions and their rationale, responsibility to minimize risks, and commitment to improve care" (p. 21).

According to Razzaque and Karoloak (2011), most medical errors are diagnostic errors (p. 238). Most clinical decision making either lacks or is made without knowledge (Razzaque & Karoloak, 2011, p. 238). The authors indicated that there is an inferential gap that clinicians must bridge when lacking evidence in making decisions (p. 238). The authors suggested that the gap width is dependent upon four elements – three knowledge related elements that include: (a) the available knowledge and it relevance to decision

making, (b) what the clinician knows at the time of the decision making, and (c) how knowledge is interpreted and translated (p. 238).

According to Champagne et al (2014), "the underlying premise for the need of evidence-informed decision making is that the use of scientific evidence should lead to higher quality decisions, to the implementation of higher quality actions and, consequently, to better outcomes" (p. 2). Kazandjian and Lipitz-Snyderman (2011) indicated that "information technology promotes the practice of EBM (evidence-based medicine) by improving provider access to clinical evidence and supporting the appropriate application of clinical evidence to a patient and context" (p. 1108). One means to incorporate knowledge management into the clinical decision-making process is through the use of evidence-based medicine by integrating the patient assessments captured in the electronic health record with clinical decision support tools outlining evidence-based guidelines for specific ailments (Bordoloi & Islam, 2012, p. 116). However, the integration of the different information technology systems is not always present (Bordoloi & Islam, 2012, p. 116). In addition, the uses of the decision support tools are not always incorporated into the clinician's clinical workflow (Bordoloi & Islam, 2012, p. 116). While success of incorporating decision support tools may be contingent upon the clinician's previous experience in using the tools, the adoption of clinical decision support tools and involvement in social learning, such as communities of practice, can have an impact on the adoption of evidence based guidelines and evidence based decision making by clinicians (Bordoloi & Islam, 2012, p. 117). In Spain, Martinez-Garcia, Moreno, Jodar –Sanchez, Leal, and Parra (2013), successfully

developed a social network platform for professionals to collaborate using a clinical decision support tool to assist in the care of multimorbidity patients (p. 982). According to Ash et al. (2012), the success of using clinical information systems in the U.S. is dependent upon meeting the needs of the major stakeholders (p. 17). Furthermore, use and adoption of clinical decision support (CDS) is "necessary for meaningful use and desired outcomes" (Ash et al., 2012, p. 17). Yet there remains a need for policy makers, health care administrator, and clinicians to come to a mutual agreement of the goals in using CDS (Ash et al., 2012, p. 17).

In summary, knowledge management supports the decision-making process. However, it is important to understand the type of decision making being conducted to identify the correct type of knowledge and knowledge management tools required to adequately support the decision-making process. In clinical decision making, it is important that the correct knowledge is easily accessible at the right time and is current.

**Interprofessional Decision Making & Knowledge Management in Healthcare**

Healthcare professionals need to have the ability to make decisions "with multiple foci, in dynamic contexts, using a diverse knowledge base, with multiple variables and individuals involved" (Smith, Higgs, & Ellis, 2008, p. 89). Clinical decision making involving only the physician is moving toward a team-based collaborative approach involving healthcare interprofessional team members, the patient, and even sometimes the patient's family. The intention of shared decision making among the interprofessional teams is "to help patients and professionals agree on choices that are effective, health promoting, realistic, and consonant with patients' and professionals'

values and preferences" (Lown et al., 2011, p. 401). Croker, Loftus, and Higgs (2008) found that multidisciplinary clinical decision making "relies extensively on the participating health professionals' prior experience of practice and collaboration, together with knowledge of self, other disciplines in the team, individuals in the team, team procedures and context" (p. 292). Dun, Cragg, Graham, Medves, and Gaboury (2013) noted that decision type and the severity of the patient influence the level of satisfaction with the decision-making process and the level of collaboration among the interprofessional team members (p. 72).

Interdisciplinary groups are comprised of team members that bring to the team their own individual perspectives and expertise (Blackmore & Persaud, 2012, p. 195). However, "the diversity of the team can lead to improved team function or lead to team dysfunction" (Blackmore & Persaud, 2012, p. 195). The criteria for team success may be defined as being "the ability and willingness to work together to achieve team goals, decision making, communication, and team member relationships" (Blackmore & Persaud, 2012, p. 195). As noted by McNeil, Mitchell and Parker (2013), "varying opinions regarding the roles within the team is a potential source of conflict" (p. 298).

With an interdisciplinary team, it is interesting to understand how knowledge brokering activities occur among the team members. In nursing, researchers have studied how the knowledge brokering occurs between advanced practice nursing and clinical nursing team members. In the study conducted by Garrish et al. (2011), the advanced practice nurse provided knowledge management activities such as generating, accumulating, synthesizing, translating, and disseminating among the clinical nurses (p.

2008). It was identified that there was a need to equip the advanced practice nurses with "appropriate knowledge and skills to support the knowledge brokering aspect of their role" (Garrish et al., 2011, p. 2011). The same type of knowledge brokering skills is required in the interactions between the interprofessional teams. However, tacit knowledge and differences in organizational contexts can make it difficult for teams to implement new knowledge making it important for to support teams with intra-organizational learning activities to help them overcome these challenges (Nembhard, 2012, p. 156). According to Rangachari et al. (2015), an appropriate communication structure is required for the most effective tacit knowledge exchange, collective learning and change when attempting to implement evidence-based practice change at the unit level (p. 67). The authors noted that "periodic top-down quality improvement interventions were effective in reframing interprofessional communication dynamics and enabling practice change" (p. 77).

A project in one Michigan hospital "embedded a member of the library staff into the clinical rounding team with the purpose to strengthen the role of health information professional and the clinician in the delivery of care" (Platts & Ransom, 2015, p. 264). According to Platts and Ransom (2015), the intent of the project was to "influence clinical decision making by impacting patient safety, length of stay, patient satisfaction, and overall patient outcomes" (p. 264). While the rounding program is still evolving, the authors noted that the program has been viewed "as adding value and supported on the units" (p. 272). Furthermore, the authors identified that the patient outcomes have been positive which reinforces the patient teaching conducted by the library staff (p. 272).

According to Ezzieane (2012), the ability for groups of individuals to work together, or teamwork, has been related to improved outcomes and reduced costs (p. 429). In reports where providers reported higher levels of teamwork, the providers were also reporting higher patient care quality (Castner, 2012, p. 186).

Gittel, Beswick, Goldmann and Wallack (2015) noted that teamwork is not the outcome of individuals on a team wanting to become better team players (p. 117). According to the authors, "to deliver value as required by the accountable care environment, healthcare organizations need to develop teamwork at multiple levels, across professional silos, across organizational silos, and with patients and their families and communities" (p. 117). The authors noted that "efforts to build teamwork are likely to benefit from both teamwork measures that provide diagnostic information regarding the current state and teamwork interventions that can respond to opportunities identified in the current state (p. 117). Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS®) is a teamwork intervention method that was designed for health care professionals to improve communication and teamwork skills (Agency for Healthcare Research and Quality [AHRQ], 2015). According to AHRQ, "the system is scientifically rooted in more than 20 years of research and lessons from the application of teamwork principles and was developed by Department of Defense's Patient Safety Program in collaboration with AHRQ (AHRQ, 2015).

The focus of TeamSTEPPS® in on delivering a successful training package that supports training to support collaborative teamwork within the interprofessional teams. The end goal is to provide safer patient care. In research involving a Neonatal Intensive

Care Unit (NICU) interprofessional team, outcomes of training resulted in "significant improvements in both attitudes toward team and teamwork knowledge" (Sawyer, Laubach, Hudak, Yamamura, & Pocrnich, 2013, p. 31).

Maxson et al. (2011) combined the TeamSTEPPS® program with the Collaboration and Satisfaction about Care Decision (CSACD) questionnaire (p. 32). The CSACD tool was used during several points during the study to monitor the training program progress. Outcomes indicated an increased awareness of good communication and improved collaboration in the patient care decision-making processes (p. 36). Utilizing the CSACD bridged the TeamSTEPPS® training program and the decision-making processes.

In order for interprofessional decision making to be successful, there is a need for communication and collaboration. A major aspect in team decision-making performance is communication (Ceschi, Dorofeeva, & Sartori, 2014, p. 215). After communication, innovation and creativity also impact team performance (Ceschi et al., 2014, p. 215). Teams should "take more into account aspects such as communication and support for innovation in order to obtain more effective learning and decision making performances" (Ceschi et al., 2014, p. 225). Lingard et al. (2007) noted that "further research is needed to characterize the ways in which interprofessional team members negotiate the challenges of information work, from information creation and transfer, to its negotiation and storage" (p. 658). The researchers indicated that "done effectively, such information work produces a critical knowledge infrastructure that supports collaborative care; done

ineffectively, it may exacerbate professional tensions between disciplines and impede effective teamwork" (p. 658).

With the adoption of interprofessional team approaches in the delivery of patient care, there becomes a need for the healthcare information systems (HIS) to be designed to support collaboration among the teams (Kuziemsky & Varpio, 2011, p. xxx.e150). Kuziemsky and Varpio (2011) noted that "interprofessional collaborative care (ICC) delivery involves complex set of processes including the interaction of multiple healthcare professionals, the physical delivery of patient care, and the use of a range of information types and of communication media" (p. xxx.e150). The authors indicated that "detailed understanding about specific awareness needs to support collaboration such as how care providers engage in asynchronous collaborative processes is still missing" (p. xxx.e151). Grounded theory methodology was used by the authors to develop a model of four types of ICC awareness: (a) patient, (b) team member, (c) decision, and (d) environment (p. xxx.e152). For patient awareness, the team members need to be aware of the patient's current status and treatment plan; as well as understand the overall goal for the patient and how to achieve that goal (Kuziemsky & Varpio, 2011, p. xxx.e153). Team member awareness refers to the awareness of knowing which professions that are part of the care team, roles, limitations, and the skill sets of the individual members (Kuziemsky & Varpio, 2011, p. xxx.e154). When it comes to decision making awareness, there are two aspects defined by the authors. The first includes the deliberation process in making the decision and the second aspect is the rationale behind the decision (Kuziemsky & Varpio, 2011, p. xxx.e154). To support the ICC, there is the

environment awareness which includes awareness of the physical infrastructure, the organizational policies & procedures, and the communication channels (Kuziemsky & Varpio, 2011, p. xxx.e155). An important conclusion from the research was that the design of HIS for ICC needs to support collaboration and not just focus on the integration and transmission of data (Kuziemsky & Varpio, 2011,p. xxx.e158).

An interprofessional quality improvement initiative involving the University of Kansas Hospital involved four project pillars with one including the design of the transition of care from the hospital to the follow-up visit post discharge of pediatric patients (Scotten, Manos, Malicoat, & Paolo, 2015, p. 898). Through the use of telehealth technology, not only is the interprofessional team able to hear the noises of the patient in their normal home environment, but they are able to see the patient and family (Scotten et al., 2015, p. 898). This provides a new level of collaboration such as training the family on the use of home equipment or even assessing the patient (Scotten et al., 2015,p. 898). This initiative exemplifies an innovative approach in the use of technology and collaboration among the interprofessional team in supporting the decision making during patient care.

According to Chong, Asiani, and Chen (2013), the healthcare delivery system involves different healthcare professions that make up the healthcare team that the consumer consults with (p. 374). Légare et al. (2011) indicated that "a model for an interprofessional approach to shared decision making (SDM) could improve the quality of decision support provided to patients in team-based primary care practices; such a model would truly value patient-centered care" (p. 19). The authors proposed a new

SDM model that "stresses the importance of facilitating communication between individuals involved throughout the decision-making process so that they share knowledge and arrive at a common understanding of the issues at stake" (p. 22). Furthermore, the authors noted that "in an interprofessional approach, information exchange does not only occur among healthcare professionals, the patient, and his/her family members, but also among different healthcare professionals" (p. 22). In order for collaboration to be possible, it is important for the professionals to know the roles and responsibilities for each member on the team (Légare et al., 2011, p. 23). The challenge with the model is how the deliberation of the decision-making process may be completed when not all members are present; finding a means to support communication and deliberation through technology (Légare et al., 2011, p. 23). Finally, "future research could help by mapping how members of an interprofessional team come together to work on different parts of a larger decision-making process that occurs over time" (Légare et al., 2011, p. 23).

| | | |
|---|---|---|
| **Decision-Making** | | |
| Simon | 1997 | Models of Bounded Rationality |
| Tversky & Kahneman | 2000 | Prospect Theory |
| Kahneman | 2003 | Type I & Type II Dual Process Model |
| Evans | 2006 | Heuristic-Analytic Theory |
| Reyna | 2008 | Fuzzy Trace Theory |
| **Knowledge Management** | | |
| Davenport & Prusak | 2000 | Knowledge Management |
| Nonaka & Takeuchi | 1995 | Knowledge Spiral Model |
| Choo | 1998 | Sense-Making Knowledge Management Model |
| **Interprofessional Decision-Making & Knowledge Management in Healthcare** | | |
| Kuziemsky & Varpio | 2011 | Model of Four Types of Interprofessional Collaborative Care |
| Légare et al. | 2011 | Shared Decision-Making Model |

*Figure 1.* Theories and theorists.

## Current Research

In the study conducted by Steel and Adams (2011), research was completed to identify how naturopaths retrieved and applied supporting data during the clinical decision-making process. Interviews were conducted, recorded, and analyzed as part of the qualitative research study. The authors concluded that the "research suggests that in situations involving unstructured clinical questions…naturopaths apply deductive reasoning, and in doing so integrate modern research, traditional knowledge, clinical experience, intuition and interpersonal interactions to solve problems" (p. 83). This research study was selected to illustrate how intuition (tacit knowledge) and interpersonal interactions were important in the clinical decision-making process. The research did not explore the use of knowledge tools to support the process.

In the study conducted by Radaelli, Lettieri, Mura, and Spiller (2014), the authors explored the affects that knowledge sharing had on innovation behavior (p. 400). According to the researchers, "knowledge sharing is a fundamental mechanism for making such collaborative flows effective, allowing innovators to acquire new information and stimuli for exploring external ideas and exploring internal knowledge"(p. 400). An example of innovative work behavior in healthcare includes physicians integrating knowledge to incorporate into treatment plans of rare diseases when no clinical guidelines are defined or are limited (Kessel, Hannemann-Weber, & Kratzer, 2012, p. 150). According to Radaelli, Lettieri, Mura, and Spiller (2014), "the act of sharing knowledge activates a process of cognitive elaboration and re-elaboration that provides individuals with a new understanding of the knowledge that they already have,

and supports its mobilization for innovation purposes" (p. 401). The research consisted of surveys completed by healthcare professionals working for non-profit palliative care organizations (PCOs) in Italy that provided home-based and hospice-based care for dying cancer patients (Radaelli et al., 2014). The findings from the research indicated "how, at the individual level, knowledge sharing behaviours can also directly affect employees' capabilities to transform and exploit internal knowledge" (Radaelli et al., 2014, p. 408). In addition, the researchers noted that "individual knowledge exploitation also requires knowledge sharing to improve that individual's own understanding and comprehension" (Radaelli et al., 2014, p. 408). This research study was selected due to the illustration of the use of knowledge sharing and relationship to an innovative environment. However, the research did not focus on any knowledge management tools to support knowledge sharing or identify knowledge sharing among interprofessional teams.

Research conducted by the authors Ali, Whiddett, Tretiakov and Hunter (2012) explored the extent of the use of Information Technologies (ITs) to support knowledge sharing activities within New Zealand's healthcare organizations (p. 501). The quantitative study collected data points through the use of questionnaires, which including 11 structured questions and 2 open-ended questions. The questionnaires were completed by CIOs and the data collected was analyzed using analysis of variance. The authors noted that explicit knowledge was more commonly shared across the organizations than was tacit knowledge (p. 504). From the research, the authors suggested that "social media technologies might be effective in promoting tacit knowledge sharing in healthcare organisations" (p. 504). Although the use of technology

to support clinical decision making was not part of the study, the study was selected since it illustrated an assessment used to identify the use of IT to share both tacit and explicit knowledge within healthcare organizations.

The authors Mitchell, Parker, and Giles (2013) included a study conducted to investigate the interactions of an interprofessional tracheostomy team (p. 536). The authors noted that the research "aims to understand the mechanisms through which interprofessional tracheostomy teams generate positive effects" (p. 537). The qualitative study included interviews and "two main themes were identified: interprofessional protocol development and interprofessional decision making" (Mitchell, 2013, p. 539). The finding regarding the development of the collaborative interprofessional protocol illustrates (knowledge) adoption of evidence-based practice and the findings from the interprofessional team illustrated more informed clinical decision making (Mitchell, 2013, p. 541). This study was selected due to illustrating the need for a collaborative and trusting team environment for successful interprofessional knowledge sharing and decision making.

Dixon et al. (2013) found knowledge management to sustain the use of clinical decision support (CDS) can be daunting to small-to-medium sized healthcare organizations due to the limitation in resources, technology and finances (p. 2). The authors noted that "new methods and models for scalable and KM and knowledge dissemination for CDS are needed" (Dixon et al., 2013, p. 2). The research conducted by the authors included a pilot for 6 months using cloud technology as the framework to support creating and distributing KM for CDS (p. 2). The authors noted that important

factors learned from the pilot included areas of governance, usability, interoperability, and performance; however, the pilot was promising as a potential solution for small health organizations across geographical locations to share the burden of the use of KM technology to support CDS (p. 8). This study was selected to illustrate how innovation should be incorporated as part of an organization's knowledge management assessment.

Hannemann-Weber (2011) conducted research to investigate the knowledge sharing among interprofessional teams and the use of innovation solutions for the treatment of rare diseases (p. 265). According to the author, knowledge sharing in an innovative environment needs to be integrated into everyday workflow for interprofessional teams treating patients with rare diseases (p. 266). The author noted that "the results show that both a stable team structure and intense knowledge-sharing activities within interdisciplinary healthcare teams are significant predictors of the innovative behavior of healthcare professionals working in the context of rare diseases" (p. 270). The author summarized that "the results reveal that all involved healthcare professionals, such as practitioners, physicians, nurses, and therapists, should engage in an intensive interaction in collaborative innovation processes to maximize efficiency in the provision of health services" (p. 270). This study was selected to illustrate the correlation between an innovative environment, team collaboration, and knowledge-sharing.

Pascal, McInerney, Orzano, Clark, and Clewmow (2013) studied collaboration between providers and patients in the use of shared care plans (SCP) as part of the intervention to improve diabetes care and patient outcomes (p. 1350040-1). The case

study research involved a digital personal health record that the patient and provider shared; the research included the use of knowledge management and motivational interviewing techniques (Pascal et al., 2013, p. 1350040-3). The research blended two knowledge management views of technology & infrastructure and the effective use of social networks & communication (Pascal et al., 2013, p. 1350040-3). One challenge experienced during the implementation was some of the technical limitations with building the SCP into the electronic medical record (EMR). According to the researchers, the study showed "that one act of transformation – the implementation of a SCP in an EMR system – could signal transformation in the way we deliver healthcare in the US" (p. 1350040-12). The researchers further noted that "the hope is that the SCP…will actually translate into improved health outcomes for patients through patient involvement and collaboration with healthcare providers" (p. 1350040-12). This research study was selected due to the relation of collaboration and knowledge management between patients and healthcare providers.

Muller-Juge et al. (2013) found that "in the hospital setting, interprofessional collaboration is crucial as healthcare teams face a number of challenges, such as complexity of clinical practice, high variation in clinical demand, ever-changing teams, and heavy workload"(p. 1). As the authors further noted that the quality of patient care improves when multidisciplinary teams collaborate at its best (p. 1). The authors conducted research to "describe and compare residents' and nurses' perceptions and expectations of each other's professional roles…in order to identify aspects to be emphasized in future interprofessional education programs" (p. 2). The research included

a mixed method approach. From the research study, three themes were identified involving: (a) role in patient management, (b) role in clinical reasoning and decision-making processes, and (c) role in team" (Muller-Juge et al., 2013, p. 3). The perception of residents and nursing regarding their and each other roles were aligned involving the role in patient care. However, when it came to the clinical reasoning and decision-making processes, a gap was identified. Both professions "stressed the contrast between residents' scientific knowledge leading to a decision-making process and nurses' competence to bring the decision into action through their know-how" (Muller-Juge et al., 2013, p. 3). Although nursing reported satisfaction in their role in the decision-making process, residents indicated an expectation of more involvement in the decision-making process (Muller-Juge et al., 2013, p.4). Regarding the role in the team, both the residents and nursing were in agreement of roles and the importance in working as a team (Muller-Juge et al., 2013, p. 4). However, nursing indicated a need for residents to be more actively engaged in the team and listen more to nursing (Muller-Juge et al., 2013, p. 4). The findings from the research indicate a need to improve upon team collaboration and to have nursing play a more active role in the decision-making process to lead to the opportunity for better patient outcomes (Muller-Juge et al., 2013, p. 6). In summarizing the conclusion, the authors noted the role of culture and its influence on the success of implementing any interprofessional educational programs. The research study was selected to illustrate the importance of the team roles in the decision-making process and potential improvement in patient outcomes. However, the research did not address how

to overcome the barriers that pre-perceived perceptions or culture may have on interprofessional collaboration and communication.

Rice, Zwarenstein, Conn, Kenaszchuk, Russell, and Reeves (2010) studied the use of collaboration and communication as an interventional activity outside the use of general rounds between physicians, nursing, therapists, pharmacists, social workers, dieticians, and nurse managers. The ethnographic study was conducted in two wards in a Canadian hospital involving co-mobility elderly patients (Rice et al., 2010, p. 353). The intent of implementing a four step intervention was to aid in the promotion of interprofessional communication and collaboration on the general internal medicine wards (Rice et al., 2010, p. 350). The intervention plan was designed to contain four steps: "(a) introducing oneself to the other members; (b) state to the other interactant(s) one's own professional role; (c) state one's unique, profession and training-specific issue; and (d) elicit interactions and feedback" (Rice et al., 2010, p. 352). The goal of the intervention was to reduce anonymity, clearly define role in the patient care, and introduce the opportunity for knowledge sharing and problem solving in a collaborative effort (Rice et al., 2010, p. 352). However, the findings from the studies identified barriers in the intervention process (Rice et al., 2010, p. 355). The interventions were seldom completed through the four step series. Although responses from the participants early in the study supported the opportunity for collaboration and communication, the work fast-paced work environment did not support the completion of the intervention steps (Rice et al., 2010, p. 355). Although the intervention steps were designed to be completed in a short time period, the findings that the steps were not completed may

indicate that not enough priority is given to interprofessional communication and collaboration. According to Rice et al. (2010), "given the importance of effective communication for patient outcomes…priorities must perhaps be revaluated" (p. 356). Other findings that supported the barriers that were identified included: (a) the lack of communication and collaboration skills, as part of physician medical training curriculum; and (b) the passive resistance with nursing and the other clinical staff to be engaged in the communication and feedback processes (Rice et al., 2010, p. 358). Overall, the study did not provide any tools outside the use of the verbal communication steps defined as part of the interventional processes. The authors concluded that "introducing minimally-intrusive interventions into the existing framework of health care to be ineffective" (p. 359). They continued to note that "greater commitment to collaboration…may be necessary in order to change a seemingly well-entrenched status quo" (p. 359). This study was selected to illustrate research conducted to identify the collaboration and communication processes between interprofessional teams. The research being suggested in this proposal would identify if knowledge management tools might better support the communication and collaboration processes.

Research completed by Handzic and Ozlen (2013) focused on understanding knowledge management practices within a healthcare system by a descriptive analysis of knowledge management solutions success in respect to the decision-making environment (p. 13500.11-1). As noted by the researchers, "private and public healthcare organizations are increasingly implementing knowledge management solutions (KMS) to acquire, convert and provide access to relevant information and knowledge" (p. 1350011-

1). However, there are significant challenges in the implementation of KMS and not all initiatives are successful (Handzic & Ozlen, 2013, p. 1350011-1). The framework of the KMS research included context complexity, sophistication, adoption, and outcomes (Handzic & Ozlen, 2013, p. 1350011-3). Two hospital environments in Turkey were used to collect research data by self-evaluation surveys. One hospital was a small, research, and teaching facility (UTH). The second hospital was a large and public facility (PPH). Participants from the UTH rated their environment higher in context complexity regarding decision-making tasks (Handzic & Ozlen, 2013, p. 1350011-5). The UTH participants rated the sophistication of KMS as high while the PPH participants rated the sophistication of their KMS as moderate (Handzic & Ozlen, 2013, p. 1350011-5). While both UTH and PPH participants ranked the benefits of KMS as high, the UTH participants responded with a higher adoption rate of using the KMS to support decision making. While PPH participants reported a higher rate of knowledge enhancement, the UTH participants had a higher rating in the level of knowledge improvement reported (Handzic & Ozlen, 2013, p. 1350011-7). The researchers noted that "the UTH participants' greater reliance on more sophisticated KMS did not produce more superior knowledge and performance compared to that of their PPH counterparts" (p. 1350001-7). Important implications from the research indicates that while "KMS supports decision-making capabilities, a thorough understanding of the underlying processes is required …for the design and implementation" (Handzic & Ozlen, 2013, p. 1350011-8). While the research conducted reviewed the importance of understanding the success of implementing knowledge management solutions to support decision making, the study

did not take into consideration the decision-making process specific to an interdisciplinary team and how the knowledge management solutions might aid in supporting a team.

## Instrumentation

Because knowledge management, specifically knowledge sharing, requires a positive climate for team interactions, team trust, collaboration, and innovation, the following instruments have been identified to be used as part of the research project.

### Collaboration and Satisfaction About Care Decisions (CSACD) (see Appendix A)

The initial intent on the development of the CSACD instrument was to measure nurse-physician collaboration and satisfaction about care decision in intensive care units (Baggs, 1994, p. 176). The questionnaire contains nine questions, each requiring a response score from 1 to 7 on a Likert scale. The first seven questions are in regard to collaboration and the last two questions are in regard to level of satisfaction. A modified version of the instrument has been designed to expand the measurement between nurse and physician to the overall health care team. According to the Baggs (1994), "satisfaction was defined as the degree to which staff members were content or pleased with the decision-making process" (p. 179).

### Team Climate Inventory (TCI) (see Appendix B)

The TCI instrument was developed to measure work group climate (Anderson and West, 1998, p. 236). The instrument is broken down into four factors: Vision, Participative Safety, Task Orientation, and Support for Innovation. The initial test

version included 61 questions; a shorter version, 38 questions, has been designed with the focus more on the climate for innovation.

The TCI has been used in several healthcare team studies. In the Netherlands, Ouwens, Hulscher, Akkermans, Hermens, Grol, and Wollersheim (2008) utilized a 44-item version of the 38-version with an added fifth scale "designed to detect socially desirable answers" (p. 275). The research "validated that the TCI test is a reliable test to measure team climate in the hospital setting; further research is required to determine usefulness of instrument to measure or be a predictor of quality-improvement outcome" (p. 280).

Another Netherland study conducted by Strating and Nieboer (2009) used a 14-item short version of the TCI. The research involved quality improvement teams. According to the researchers, the results illustrate that the TCI is a useful instrument to "assess what extent aspects of team climate influence perceived team effectiveness" (p. 7).

## Summary

The literature review reflects upon the theories of decision making and knowledge management; as well as, identifies how these theories are applied within the healthcare environment. In the dual system decision making model, intuition may drive decision making for the experienced clinician, while a slower, analytical thought process might be required for areas of uncertainty. It is during the analytical thought process that the question arises if knowledge management tools might aid or support the clinicians during the decision-making process.

Current research on clinical decision making and knowledge management has been investigated as part of the literature review for Chapter 2 to understand what research has been conducted on these principals. However, there is a gap to fully understand how knowledge management tools might be leveraged to support the clinical decision-making process. More research is required and thus the basis for the research project outlined in Chapter 3.

| Author(s) | Year | Topic Area of Research | Limitations to KM/Decision-Making |
|---|---|---|---|
| Radaelli, Lettieri, Mura, & Spiller | 2014 | Understanding how knowledge sharing affects employees' innovative work behaviour | No reference to Knowledge management tools, decision making, or interprofessional teams |
| Dixon, Simonaitis, Goldberg, Paterno, M.D., Schaeffer, Hongsermeier, Wright, & Middleton | 2013 | The use of innovation as part of knowledge management assessment | Focus concentrated on clinical decision support tools |
| Handzic & Ozlen | 2013 | Understanding knowledg management implementation success based upon complexity of decision-making and sophistication of tools | Limited use of knowledge sharing or decision-making support for interprofessional teams |
| Mitchell, Parker, & Giles | 2013 | Need for collaborative & trusting team environment for successful interprofessional knowledge sharing & decision-making | Limited use of Knowledge Management tools |
| Muller-Juge, Cullati, Blondon, Hudelson, Maitre, Vu, Savoldelli, & Nendaz | 2013 | Importance of team roles in the decision-making process | Limited use of Knowledge Management tools |
| Pascal, McInerney, Orzano, Clark, & Clemow | 2013 | Collaboration and knowledge sharing between providers and patients through the implementation of shared care plans | No reference to decision-making processes or the use of interprofessional teams |
| Ali, Whiddett, Tretiakov, & Hunter | 2012 | IT technologies used to support tacit and explicit knowledge sharing | No reference of knowledge sharing to decision-making |
| Hannermann-Weber | 2011 | Correlation between an innovative environment, team collaboration, and knowledge sharing | Limited focus on decision-making |
| Steel & Adams | 2011 | Tacit knowledge & interpersonal interactions importance to decision-making | Limited use of Knowledge Management tools |
| Rice, Zwarenstein, Conn, Kenaszchuk, Russell, & Reeves | 2010 | Collaboration & communication processes between interprofessional teams | Limited use of Knowledge Management tools |

*Figure 2*. Summary of Literature Review Research.

# Chapter 3: Research Method

## Introduction

The following chapter outlines the research method for the proposed research study. The first section is a review of the research methods. Additional topics that follow include: research design and approach, sampling, data collection, instrumentation, data analysis and participant rights.

It should be noted that the original study proposed included a section of research involving knowledge management and user acceptance assessments. In order to address the research questions pertaining to the assessments, the sample population would have required access to Information Systems and Management team members. Due to the nature of the grant and project that the dissertation research work was incorporated by the participating healthcare organization, the type of team members needed to complete the additional area of questioning were not part of the existing research plans. Therefore, this portion of the dissertation research project was removed with the hope for this to become part of future research. Even with the removal of the two research questions, there remained sufficient research questions to address with the final research project.

## Summary of Research Methods

The first step in determining the best research method to complete the research project was to identify the solid research question. It is the research question that drives the selection of the research approach. According to Singleton and Straits (2010), "Once a topic is chosen and the research question set, we can discuss rules and guidelines for conducting research that will generate the most valid data and the most definitive

answers" (p. 79). In defining the methodology, every attempt is made to consider the pros and cons of the different approaches to optimize the potential outcome of the research project. The objective of the research design is to identify the best methodology that will support the research question.

When considering quantitative research methods, this includes, but is not limited to: empirical research, survey research, causal research, and hypothesis research. When considering qualitative research methods, there are several ways to define or categorize the approaches in which to carry out the qualitative research. Yin (2011) categorized ten variations in qualitative research that include action research, case study, ethnography, ethnomethodology, feminist research, grounded theory, life history, narrative inquiry, participant-observer study, and phenomenological study (p. 17).

The final consideration is a mixed method approach. Mixed method research tends to be associated with the pragmatic paradigm (Mertens, 2015, p8). A paradigm is a way of looking at the world, "composed of certain philosophical assumptions that guide and direct thinking and action" (p. 8). The pragmatists' "goal is to search for useful points of connection" (p. 36). However, Teddlie and Tashakkori (2012) indicated that "an important characteristic of mixed method research is paradigm pluralism or the belief that a variety of paradigms may serve as the underlying philosophy for the use of mixed-methods" (p. 779). According to Morse and Cheek (2014), "mixed-method research is a contested field still in development" (p. 3). According to one definition of the mixed method approach, both qualitative and

quantitative research methods are used within the same research project. The mixed method approach is not the same as a multiple methods approach where two separate studies are conducted and "then attached to an overall inductive aim" (Morse & Cheek, 2014, p. 3). The mixed method approach is designed with a "supplemental component that adds scope, depth or description to the core component" (Morse & Cheek, 2014, p. 4). The supplemental component does not stand on its own due to lacking either qualitative saturation or existing only as a set of quantitative scores (Morse & Cheek, 2014, p. 4). In integrating the two components of the mixed method approach, significant areas of the research project are expanded and strengthened (Morse & Cheek, 2014, p. 4). Therefore, the use of mixed method is considered when there may be advantages of using criteria from both research types that would otherwise be lacking should one or the other research be used alone.

An example of where mixed methods research is considered beneficial is in healthcare, particularly in health service research. Bowers et al. (2013) noted that "widespread agreement now exists that a combination of methodologies is needed to understand the circumstances under which change…works" (p. 2158). Efforts to redesign and transform healthcare delivery are "searching for ways to overcome the challenges of fragmentation, inequality, and inappropriate care use while advancing the triple aims of better health and better care at lower costs for everyone" (Miller, Crabtree, Harrison, & Fennell, 2013, p. 2125). According to the authors, mixed methods research can help health service research investigators "fully capture the complex interactions among system components, including interactions among multiple

levels of analysis over time" (p. 2125). In addition, mixed methods may also "make it easier for researchers to engage in dialogues with decision makers who formulate and implement programs of delivery system change, and to better communicate with other participants in the delivery system, including its users" (Miller et al., 2013, p. 2125).

When considering the research question for this dissertation, the mixed method appeared to be the logical selection. Overall, a case study was to be presented to investigate and define a better understanding on how knowledge management tools can be used to support the clinical decision making process among clinicians involved in the care of a patient. Two questionnaires were selected and incorporated into the single survey. In addition, open-ended questions were to be part of the survey in order to attempt to collect details of feedback that might otherwise be lost in only using a Likert-scale response. Supplemental Analysis of Variance (ANOVA) was incorporated for response comparisons to determine if statistically significant variances were present based on dependent variables of roles and teams.

The Survey Group included participants from interprofessional teams. Participation was voluntary. The first questionnaire was the Collaboration and Satisfaction about Care Decisions instrument. This modified questionnaire is based upon the original instrument created by Baggs (1994). The second questionnaire was the Team Climate and Inventory instrument. This revised version is based upon the instrument created by Anderson and West (1996). The final questionnaire was comprised of open-ended questions. The mix of participants for the survey group was based upon the recommendations and approval from the healthcare system.

In using the Likert-scale survey, quantitative data analysis using statistics, was completed from the responses obtained. In addition, qualitative analysis was to be conducted on the open-ended statements. Comparison of responses between teams and participant roles were analyzed. Integrated together, the qualitative and quantitative data was to provide more depth in the research investigation than only using a Likert scale. The objective was to use both methodologies to provide more details for the case study analysis.

Both qualitative and quantitative research methods were identified to aid in addressing the research questions. Integrating both methods together appeared to be the optimal approach to understand how knowledge management tools might better support the decision making process by the clinicians involved in the patient care. The following illustrates the logic that was used to use a case study approach. Details also include the specific details of the sampling, instrumentation, data collection, and data analysis.

## Research Design and Approach

### Case Study

According to Merriam (2002), qualitative case studies share many of the same features as other qualitative approaches in regard to "the search for meaning and understanding, the researcher as the primary instrument of data collection and analysis, an inductive investigative strategy, and the end product richly descriptive" (p. 179). The author further noted that the selection of the case is dependent upon "what it is you want to learn and the significance that knowledge might have for extending theory or improving practice" (p. 179). In regard to the research question for this dissertation, the

case study was to identify the knowledge management tools that might improve upon the clinical-decision making process with the significance that this added knowledge may improve upon the practice of patient care.

According to Yin (2014), case study as a research approach is "used to add knowledge to individual, group, organizational, social, political, and related phenomena" (p. 4). The author further noted that the use of a "how" research question does favor a case study approach as one of the research approaches (p. 10). The other research approaches that support a "how" question include histories and experimental methods; this is based upon Yin's categories of research approaches (p. 8). The case study differs from the experimental approach in that case studies do not have the ability to change behavior (p. 12). The case study overlaps with a historical approach, but according to the author, case studies add additional features of observations and interviews (p. 12).

When considering ten variations in qualitative research approaches that Yin (2011) had defined, the other nine variations were eliminated. For instance, in a narrative inquiry, a "rendition of the findings is constructed to create a sense of being there" (p. 17). Although clinical decision making could be considered a phenomenon, the purpose of the study was not to focus on only the experience of clinical decision making but understand how knowledge management can support the experience; therefore, phenomenology as an approach was eliminated for this study. Grounded theory was eliminated since the objective was not to attempt to define a new theory. In an ethnographic approach, the focus is on the responses of all the individuals in regard to the culture of the group; the ethnographic approach could be considered (p. 17). However,

instead of interpreting the patterns of the group as in ethnography, the objective in answering the research question was to provide a more in-depth understanding, as in the case study approach "in the real-world context" (p. 17).

"While defining case study research can remain problematic because it can constitute a design and a research method", it remains clear that "case study research focuses on specific situations, providing a description of an individual or multiple cases" (Cronin, 2014, p. 20). "In using case study design, the researcher can investigate 'everything' in that situation, be it individuals, groups, activities or a specific phenomenon" (p. 20). In a case study, the data and participants' views must be presented in a true representation (p. 26). As Taylor (2013) noted, "when case study research is written well, it allows the readers to reflect and analyze the findings from a study to determine its applicability to their own situation" (p. 4). Two of several items noted by the author were that case study research allows exploration of complexity through multiple data sources and case study research is situated in the real-life setting – if done well (p. 4).

In reflecting in the research methodology proposed for this dissertation, case study research seemed to be the appropriate approach in addressing the research questions. Taking the complexity of decision making in healthcare and adding the intricacies of knowledge management and interprofessional teams are everyday realities in the healthcare environment. Data collection from the real environment would seem to be the best method to help address the research questions regarding knowledge management tools and decision-making processes among the interprofessional teams.

**Identifying the Collaborator**

To complete a case study, initial plans were to find a local health care system that would be interested to collaborate and would allow the research project to be completed at their facility. Initial calls were placed at local healthcare organizations. Several institutes would permit partial team members to be approached for participation but would not permit all roles to be represented. For example, the healthcare organization might approve to permit the nurses to participate but the healthcare organization would not approve and permit access to the physicians. To identify local researchers with similar interests, searches were conducted on the Intranet. On one Clinical & Translational Science Collaboration website, a search tool was available to search by "Knowledge Management" and "Clinical Decision Making" to locate researchers on the specific topics in the local area. Today, the web tool is called SciVal Experts (Elsevier). The local VA research department had at least one researcher with the interests in knowledge management. In reaching out to the research department at the local VA system, researchers with similar interests in the dissertation research topic were identified. The one researcher was in the process of conducting plans for a grant study that ended up being a good fit to incorporate the dissertation research plans as a preliminary round of questioning for the fuller research project. Planning sessions occurred to complete the required forms. The VA Institutional Review Board (IRB) approval process was completed in September 2014. The research project was found to be exempt since the participants were employees (not patients) and no identifying data elements were being collected. The research plan was then sent to the VA Research &

Development (R&D) Committee for final approval. After obtaining the VA R&D Committee approval in December 2014, the data use agreement and appropriate Walden IRB forms were submitted to the Walden IRB Committee for final approval. No research was initiated until a final approval was received from the Walden IRB Committee. Walden's IRB approval was approved and communicated on January 5, 2015. Research initiated immediately upon receipt of the Walden's IRB email notification.

**Population and Sample**

The type of sampling used in this research project was purposive sampling; a nonprobability sample. The purpose of this type of sampling is selecting "to have those that will yield the most relevant and plentiful data, given your topic of study" (Yin, 2011, p. 88). Singleton and Straits (2010) noted that the strategy in using purposive sampling is "to identify the important sources of variation in the population and then to select a sample that reflects this variation" (p. 174). Singleton and Straits (2010) cautioned that the weakness in using a purposive sample is the ability to know the population before determining the sample to collect (p. 174). Therefore, steps were taken to work with the healthcare system to identify the appropriate participants that provided the relevant data required, yet represent the variation requirements.

For the study, there were participants from interprofessional teams that volunteered to complete the questionnaires. The team members were representation of the interprofessional teams from the ambulatory clinics that worked together in the care of the patients. The teams selected were dependent upon the approval from the health

system. Altogether, the sample population was to be comprised of a total of forty participants.

The interprofessional teams were part of the VA PACT. These teams are the new model of care used by the Veterans Health Administration and built on the concept of the "patient centered medical home staffed by high-functional teams" (U.S. Department of Veterans Affairs, n.d.). The purpose of the team-based approach is to form a trusted and personal relationship between the patient and care givers for all aspects of health care (U.S. Department of Veterans Affairs, n.d.). Overall, the PACT goal is to improve patient satisfaction, improve outcomes, and reduce costs with the focus on life-long wellness through prevention and health promotion (U.S. Department of Veterans Affairs, n.d.).

Initial consideration for the study was to incorporate residents, nursing students, physicians, nursing, and pharmacist interprofessional teams that supported the care of the homeless at a local free clinic. However, the team members rotated on a day-to-day basis. It was determined that these teams would not provide longitudinal data since they were not established teams. It was important that the data collection be obtained from teams that were established and worked together on a regular basis. Therefore, the selection of the population shifted to the PACT interprofessional teams. These team members would be easily assessable to participate and were familiar with participating in research projects in the past.

**Data Collection**

A planned session to conduct the survey was pre-scheduled for data collection. A paper-based survey packet was provided to the participants in three questionnaire parts. The first questionnaire contained a modified Collaboration and Satisfaction about CSACD instrument originally created by Baggs (1994). There were a total of nine questions on one page. The second questionnaire was the TCI instrument; based upon the instrument created by Anderson and West (1996). The questionnaire had four sections over the total of three pages. The first section had twelve questions, the second section had eight questions, the third section had eleven questions, and the fourth section had seven questions. The third and final questionnaire contained open-ended questions in regard to the use of knowledge management tools. There were a total of six open-ended questions on one sheet of paper.

Each questionnaire packet included a set of basic demographic questions at the beginning of the data collection on the very first page. Demographic information was to be filled in by the participant that included age, gender, and number of years working in healthcare. In addition, the participants were asked to include the clinical role they were representing for the survey. No names or any other specific details that might identify the participant were collected. Because of the number of participants, the actual team that the interprofessional team member was representing was coded to protect the identity of the participant; the objective was to have the participants answer the questions honestly with identity being anonymous or difficult to identify (see Figure 3).

The packets were assembled prior to the event by having the demographics, questionnaires, and open-ended questions printed on just the front side of a page. The total sheets of paper were stapled together. Each packet was a total of six pages. The stapled pages were enclosed in an unsealed envelope. Once all portions of the packet were completed, the participant would return the pages into the envelope and return the envelope back to the researcher.

Earlier efforts to have physicians circulate packets to corresponding teams and return all completed packets back to the research team was not successful. After several weeks had passed after the initial set of packets were circulated and no packets were returned, a scheduled session was planned. A four hour session in which a conference room was open for participants to drop in and complete the survey packet was scheduled several weeks in advance. A reminder email message was sent out a few days prior to the scheduled session by the research department lead and manager of the clinics. On the day of the event, signage was posted to remind the teams where to locate the conference room to participate. Donuts and a five dollar gift card to Starbucks were provided to the participants that returned a completed packet to the researcher. It should be noted that providing a gift card to participants was included in the paperwork that had been submitted for approval by the VA IRB and R&D Committees.

The scheduled session on February 14, 2015 was successful in obtaining the majority of completed packets. Approximately 25 packets were returned. However, the majority of participants that came to the scheduled session were non-physician team members. In order to increase the opportunity for physician participation, one of the

healthcare research team members attended a monthly physician meeting during the last week in February where the packets were distributed. Four additional physicians returned a completed packet. The total number of participants that completed a packet was 29.

Each packet was returned in an envelope with a provider's name on the outside of the envelope. Once the final packets were received a work session was conducted to compile the surveys. A color was assigned to each provider to represent a team and each team color was given a number. Once each packet was associated with a team color and number, the envelopes were shredded.

A database was setup in SPPS® (IBM SPPS® Statistics) to enter the Likert-scale responses. The data was entered into SPPS® (IBM SPPS® Statistics) and the raw data file was exported in Microsoft Excel. Descriptive statistics and ANOVA were completed. The first round of analysis on the Likert-scale responses was completed across all participants for each question of the CSACD and TCI instruments using SPPS® (IBM SPPS® Statistics). The descriptive and ANOVA analysis was repeated on the Microsoft Excel file to validate results. A second round of analysis was conducted at the role and team level for each CSACD and TCI instruments. The second level of analysis was completed using Microsoft Excel.

Open-ended responses were recorded into Microsoft Excel with corresponding survey responses. Provalis Research QDA Miner Lite (Freeware) qualitative software package (PROVALIS Research) had originally been proposed to be used as a tool for the qualitative analysis. The software was downloaded. After initial attempts with entering

the data into the software, it was decided that the coding and tabulation would be completed manually. Microsoft Excel was used to key in the responses from the paper surveys to obtain an electronic file. The open-ended responses were tied to the Likert-scale responses in the Microsoft Excel workbook. Integrating the open-ended responses to the responses from the CSACD and TCI was the final step in the analysis. Chapter four includes more details regarding data elements, data coding, and data analysis.

| Research Type | Purpose | Appendix |
|---|---|---|
| Demographics | Gather general information such as number of years on the team and clinical role | C |
| CSACD | Responses to team satisfaction of patient care decision-making | A |
| TCI | Responese to team climate | B |
| Open-Ended Questions | Responses to use of knowledge management tools | D |

*Figure 3.* Research Summary.

**Instrument & Measurement**

**Selection.** When considering the healthcare decision-making process, teams are actively involved in the decisions being made as part of patient care. When reviewing the literature on collaborative teams, TeamSTEPPS® was a topic that surfaced. With TeamSTEPPS®, there is focus on implementing skills that foster teamwork and communication; the focus is on learning. In order for knowledge management to be successful, teamwork and communication are also important. Instead of completing assessments for learning, the questions that seemed important to address for knowledge management included satisfaction of decision making as a team and if the team environment supported innovation, sharing, trust, and collaboration. In completing the

literature review on these topics, the Collaboration and Satisfaction about Care Decisions and the Team Climate Inventory were tools that have been used in healthcare research to measure team performance. According to an assessment of survey instruments used to measure teamwork in the health care setting by Valentine, Nembhard, and Edmondson (2015), the TCI instrument fell into a category that measured performance from "bounded" teams with concentration on "communication, coordination, and team cohesion" (p. e19). The CSACD instrument fell into a category that measured performance from larger, "unbounded" teams with concentration on "communication, contributors' expertise, respect, and social support (Valentine et al., 2015, p. e19).

Both tools seemed to address the questions around knowledge management in complimentary ways but have never been used together. The CSACD was important to include to learn more about the team dynamics and how satisfied all members of an interprofessional team was in the decisions being made by the team pertaining to patient care. The TCI had key sections that measured the environment for trust, sharing, and innovation. The main reason for selecting both, instead of one or the other, was to test together to identify if they were indeed complimentary and would be able to provide a different dimension of metrics that might be more complete than using either of the instruments alone.

**Collaboration and Satisfaction About Care Decisions (CSACD) developed by Baggs, 1992.** The CSACD instrument was selected as the methodology to measure the collaboration and satisfaction in the interprofessional team. The objective was to identify the environment of interprofessional team regarding the decision-making process to

determine if the environment positive. It was assumed that a positive environment is required to support the interactions of knowledge sharing. The goal was to determine if the interprofessional team environment was conducive to the use of knowledge management tools. (See Appendix A).

**Team Climate Inventory (TCI), developed by Anderson and West, 1994**. The TCI 38-item instrument was selected as a measurement tool in order to provide an overall assessment of the team to determine the level of effectiveness that would be involved with innovative practices. It is believed that teams able to work toward innovative solutions tend to support the interactions of knowledge sharing and collaboration. Although each team member completed the instrument, the combined results would be able to measure the overall team performance. (See Appendix B).

**Data Analysis**

The first questionnaire section to be provided to participants included the CSACD tool created by Baggs (1994). The objective of using this tool was to address how the satisfaction in the interprofessional care decision-making process might impact the use of KM tools. The second questionnaire section provided to Survey Group II included the TCI tool created by Anderson and West (1996). The objective of using this tool was to address how the team climate for innovation might influence the use of KM tools. Both section one and section two questionnaires were provided using a Likert scale.

The first analysis was to include a quantitative descriptive statistical analysis on the Likert-scale responses. As noted by Bryman and Cramer (2010), "the summated

scale provides a much finer distinction between respondents to be made" compared to a single response (p. 21). In addition, as the authors noted, the Likert scale provides an opportunity to obtain a degree of response from the participant that would not be captured in a single response tool (Bryman & Cramer, 2010, p. 21). The statistical analysis on the Likert scale responses was to be conducted to determine if any patterns in the responses between the respondents from within the same roles and/or if patterns or contrasts in responses between interprofessional teams. Overall, the objective of the Likert scale questions was to provide insight to the responses to collaborative decision satisfaction and the team climate.

The third and final section of the questionnaire contained open-ended questions. The set of questions were developed based upon the participants that had volunteered. The open-ended questions were first reviewed by three professionals from the healthcare research team to validate the questions. Feedback from the professionals was used to appropriately adjust the open-ended questions that were presented in the questionnaire. The open-ended responses were reviewed, categorized, and coded as part of the qualitative analysis. These data mining techniques, such as word counting and coding phrases, were utilized as part of the semantic analysis of the content. According to Popping (as cited by Lee & Fielding, 2010), semantic analysis permits one to not only identify presence or absence of themes but to also consider the underlying relationship between themes (p. 534). The use of Provalis Research QDA Miner Lite (Freeware) qualitative software package (PROVALIS Research, http://provalisresearch.com) was initially attempted to assist in categorizing and compiling responses as part of the content

analysis. The objective of the open-ended questions was to identify what patterns might be translated from the interprofessional team members' responses.

Finally, the demographic data captured was analyzed and reviewed. These data points helped provided additional information to use for comparison; demographics included number of years on the team, clinical role, age, and gender of respondents. The overall objective was to identify what role KM tools play in the decision making process and how the tools available might impact the interprofessional decision making process (see Figure 4). Comparison evaluations were reviewed based on roles and teams. Each question of the Likert-scale surveys was reviewed by role and team. The average responses to the CSACD questionnaire were plotted and the average responses for each of the sections of the TCI questionnaire were plotted based on teams and roles. Finally, the open-ended questions were cataloged and analyzed with an overall comparison of the responses to the analysis from the surveys. Major themed areas of the research concentration was on trust, collaboration, sharing, innovation, decision making, and overall satisfaction in team decision making. Details of the analysis and data are included in chapter four. Tables and graphs are used for data presentation in chapter four.

| Research Question | How Addressed? |
|---|---|
| 1. What role, if any, do KM tools play in supporting the clinical decision-making process? | Open-ended questions |
| 2. How does the type of knowledge tool available support decision-making among the interprofessional clinical team involved in the patient care? | Open-ended questions |
| 3. How does the team climate influence the implementation and use of KM tools? | Team Climate |
| 4. How does the level of satisfaction in the interprofessional care decision-making process impact the use of KM tools? | Decision-Making Satisfaction |
| 5. What metrics might be used to predict the success of implementing KM tools among interprofessional teams? | Overall Conclusions from Analysis |

*Figure 4.* Overview of how research questions will be addressed by survey groups.

**Reliability and Validation**

For the two instruments that were used in the study, both have been tested and proven for reliability and validation in research projects since the initial development of each. The following provides additional information on the reliability and validation for both instruments.

**Collaboration and Satisfaction about Care Decisions (CSACD) developed by Baggs, 1992.** Based on an assessment of the CSACD tool, it has been indicated that the instrument has in past studies displayed internal consistency reliability, concurrent validity, and construct validity (Heinemann & Zeiss, Eds., 2002, p. 134). The reviewers have indicated that the instrument is a strong measure of collaboration and is highly

recommended to use in research (Heinemann & Zeiss, Eds., 2002, p. 135). No data available on test-retest reliability (Heinemann & Zeiss, Eds., 2002, p. 133).

**Team Climate Inventory (TCI), developed by Anderson and West, 1994.** Based on an assessment of the TCI tool, there is considerable psychometric data available on the instrument and the data indicates it to be a sound instrument (Heinemann & Zeiss, Eds., 2002, p. 221.). The reviewers have indicated that the internal consistency and validity are well established; it is an excellent instrument choice to use in research, especially if wanting to complete assessments regarding innovation within teams (Heinemann & Zeiss, Eds., 2002, p. 221). No data available on test-retest reliability (Heinemann & Zeiss, Eds., 2002, p. 220).

**Open-Ended Questions.** The open-ended questions were developed to provide an opportunity to obtain more details regarding knowledge management tool usage among the teams. Two researchers from the healthcare organization were used to help with content validity. Since the researchers involved were familiar with the organization's environment and terminology, the development of the questions went through several iterations until the researchers approved. No test-retest step was used to test reliability. However, there was only one coder of the open-ended questions. The objective is that this provided consistency in the manner in which the responses were evaluated and documented.

## Participants Rights

The initial plans were to obtain approval from Walden's Institutional Review Board (IRB) before initiating the research project. Upon identifying the VA institute to

collaborate with the research project, it was learned that the VA institute required the IRB oversight. Therefore, the first step was obtaining the VA IRB approval. Overall process was completed in approximately nine months. Since the VA institute's IRB was providing the data collection oversight, a secondary data approval was required to be obtained from Walden's IRB. Once both of the organizations IRB approval process had been completed, the research project was initiated.

In the initial proposal, consent forms were included to circulate to the participants that outlined the appropriate Walden contacts. Because Walden's IRB was not providing oversight to the data collection, it was deemed that these forms were not required and are no longer included in the appendices. Oversight of the participant consent was provided by the VA IRB. Because the participants were volunteers and the project was exempt, notification of participants rights were included in the email message sent out to the teams when recruiting the volunteers.

The participants were assured that the responses provided in the survey were anonymous. And confidentiality was to be maintained. Anonymity was preserved since no names or personal identifiable data points were captured or stored as part of the collected data set.

## Summary

The U.S. healthcare environment is currently under scrutiny to determine ways to improve efficiencies to reduce cost and to improve upon the quality of care that is delivered. The current administration has provided funding and support as part of the ARRA to identify how these improvement efforts might be conducted through the use of healthcare information technology. One segment of healthcare information technology

that has been identified as being underutilized includes knowledge management and the tools that support knowledge management.

The current literature supports the theory of knowledge management and decision making in the healthcare clinical environment. However, there is a gap in the research regarding knowledge management tools and clinical teams involved during the decision-making process. Questions remain as to how knowledge management tools might be utilized to help support the clinical team decision-making processes to improve upon patient care. This became the intent for the research questions for this dissertation.

Yin (2009) noted the components of research design for a case study "to include the study question, propositions, unit(s) of analysis, logic linking data to the propositions and the criteria for interpreting the findings" (p. 27). In the proposed dissertation research project, the study question was defined to be how knowledge management tools support clinicians in the decision-making process during patient care. The propositions included how the type of knowledge tools available support the interprofessional clinical teams, how the team's collaboration for innovation might influences knowledge sharing, how the satisfaction in interprofessional decision making might influence the team's collaboration, and how user acceptance of technology influences the implementation of knowledge management tools. The units of analysis were to include: (a) the interprofessional team collaboration during the decision-making process by using the CSACD tool, (b) measurement of the team climate to support innovation by the TCI tool, and (c) how the acceptance of user technology and the readiness assessment for

knowledge management tools by the developed survey tool. The final components of the research plan were to be better refined during the analysis process.

The objective of the research project was to address the questions regarding knowledge management tools and clinical decision making through a case study. The goal of the research project was to conclude from the findings the opportunities that knowledge management tools may be implemented to support clinicians during the interprofessional team decision-making process. Lastly, the intent of effective knowledge management tools used during the clinical decision making process may have a positive influence on the improvements and efficiencies of patient care to support the efforts of social change in reducing the disparity in the current overall health care delivery system.

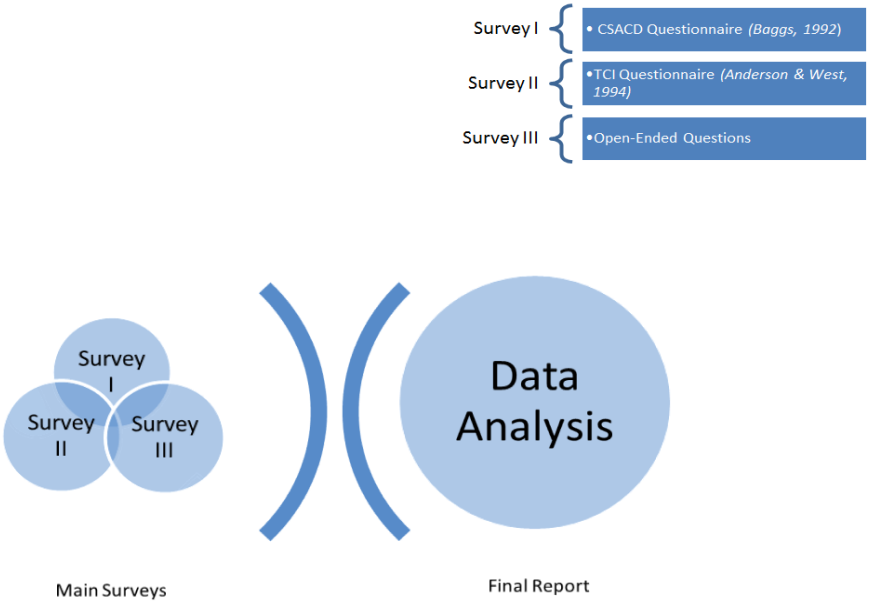


*Figure 5*. Research Project Overview.

# Chapter 4: Results

## Purpose of the Study

As noted in Chapter 1, the purpose of this research study was to determine how clinical knowledge management (CKM) tools might support the clinical decision-making process during patient care.

To summarize, there were a total of seven research questions:

*Research question #1*: What role, if any, do KM tools play in supporting the clinical decision-making process?

*Research question #2*: How does the type of knowledge tool available support decision making among the interprofessional clinical team involved in the patient care?

*Research question #3*: How does the team climate influence the implementation and use of KM tools?

*Research question #4*: How does the level of satisfaction in the interprofessional care decision-making process impact the use of KM tools?

*Research question #5*: How does the user acceptance of technology influence the success of implementing knowledge management tools?

*Research question #6*: How might a KM assessment be leveraged to understand an organization's KM readiness & KM innovative opportunities?

*Research question #7*: What metrics might be used to predict the success of implementing KM tools among interprofessional teams?

Chapter four summarizes the research project and how the study was conducted. The content will be broken into the following sections: IRB Process, Pilot Study,

Research Setting, Demographics, Data Collection, Data Analysis, Evidence of Trustworthiness, and Study Results.

## IRB Process

The research study was conducted in collaboration with a researcher from the local Veterans Hospital. A nine month review process was completed that included an IRB exemption and R&D Committee review board review. The VA provided oversight in the study structure and the data collection. A second IRB review was completed through the IRB board at Walden University. The second review cycle was for the use of secondary data provided by the VA under a data use agreement (Walden IRB approval number 12-01-14-0152154).

## Pilot Study

To validate the open-ended questions used as part of the questionnaire, the questions were reviewed by three researchers from the VA. The researchers involved in the review were actively engaged in interactions with the participants on a regular basis. Based on the feedback from the researchers, the open-ended questions were adjusted to align with the terminology used by the participants from the VA. One of the researchers had also conducted observations on several of the interprofessional teams prior to the surveys being circulated. Her input from her observations was taken into consideration when re-designing the questions to better fit the VA teams' work environment.

In addition to the open questions, the questionnaire included two existing instruments: CSAD (created by Baggs, 1992) and the TCI (created by Anderson and West, 1994). Permission was provided by the corresponding instrument authors to use in

this research project (see Appendices E & F). Because the instruments have been validated and are currently being used in research, no further validation was completed as part of this study.

## Research Setting

The local VA Medical Center is one of five VA Healthcare Systems located in the state. This particular VA Medical Center site offers primary, secondary, and tertiary care to veterans in the local area. The participants that were used for the study were volunteers from several of the primary care teams from the Center of Excellence PACT (Patient Aligned Care Teams). The team members came from the VA Center of Excellence and are routinely selected to participate in many of the VA research project. No known conditions at the VA Medical Center were identified to influence the responses from the participants.

The management team from the Center of Excellence supported the project as long as the participation was voluntary. This research project was combined with the first phase of research being conducted for an approved grant by a VA Quality Scholar Fellow. A data use agreement was signed to permit data obtained from the questionnaire to be shared. Since I was appointed as a research co-investigator, activities were managed by the Primary Researcher, the VA Quality Scholar Fellow.

Initial research plans identified that the acute, or inpatient environment would be the area selected to conduct the research. Due to limitations to access of interprofessional team members from the inpatient area, this initial plan had to be modified. The VA had interprofessional teams created in the outpatient setting as part of the patient transitional

care teams. These teams belonged to the Center of Excellence. Because these teams already existed, were accustom to participating on research projects, and had previously been identified as the participants for the research grant that this research project was being added, the outpatient environment was used to conduct the research project.

## Demographics

The following outlines the demographic characteristics that were considered relevant to collect for the study (see Figure 6).

| Characteristic | Definition |
|---|---|
| Team ID | Teams initially grouped by provider. Each provider was randomly assigned a color. Each color was randomly associated with a numeric value. Team ID ranged from 1 thru 13. |
| Role | Team members fell into one of the following role types:<br>NP (Nurse Practitioner) LPN (Licensed Practical Nurse)<br>Physician PCAs (Patient Care Assistant)<br>RN (Registered Nurse) Other |
| Gender | Male or Female |
| Years in Healthcare | Translated to months/Entered numerical value |
| Years at Organization | Translated to months/Entered in months |
| Months on Current Team | Entered numerical value |

*Figure 6.* Demographics.

The demographic information was collected in the first section of the questionnaire. At the time of completing the questionnaire, the participant was instructed to leave the first demographic inquiry line entry for Team ID blank. When completed with the questionnaire, the participant placed the questionnaire into an envelope and scribed the provider name on the outside of the envelope. The providers were randomly assigned a color by another member of the VA Research team. A number was then

provided for each color. The appropriate numeric value was recorded on the returned questionnaire. The envelopes were shredded upon completing the assigned team ID. The key for defining the team ID was securely maintained by a manager from the research team according to VA protocol.

## Data Collection

### Plans for Data Collection

Initial survey packets were created that contained a total of five pages. The first page contained demographic data and a survey instrument used by the Primary Researcher. The second page included the questions from the Collaboration and Satisfaction about Care Decisions instrument. The third, fourth, and fifth pages contained the questions from the TCI instrument. The plan was to distribute the surveys by the Primary Researcher at the physician weekly team huddles; the Primary Researcher was also a physician. Once the surveys were returned, the plan was to schedule meeting times to interview the participants and ask the open-ended questions.

During the first two weeks in January 2015, the Primary Researcher attended several of the physician huddles and provided each physician with packets of the questionnaires to distribute to their interprofessional teams for completion. By the beginning of February, no questionnaires had been returned. In addition, there was uncertainty when the teams would be available to be able to coordinate the face-to-face interviews.

New questionnaire packets were created. The updated questionnaire contained the same five pages that were used in the January circulation. An additional sixth page

was added that contained the open-ended questions. Correspondence to the team was provided in advance to communicate to the teams regarding a survey session being planned for February 13, 2015 from 8 am to 11 am to complete the survey packets. Locations were reserved on the date and signs posted. In addition, communication was provided to the participants that upon completion of the surveys, there would be donuts available and each participant would receive a $5 gift card for Starbucks. A total of 24 surveys were handed out and 22 were returned on February 13th. Participants took about 15 to 20 minutes to complete the survey. Two participants asked to take the survey with them to return later.

Due to the limitation of physicians that participated on the February 13th survey session, another session was planned on February 23rd. During a monthly physician meeting, the survey packets were distributed. Five additional surveys were returned from the physicians. In addition, two of the outstanding surveys from the 2/13 session were also returned. The total count of surveys returned was a total of 29. This was nine more participants that initially planned.

**Participants**

A total of 29 participants from 13 different Patient Aligned Care Teams participated in completing the questionnaires. The following outlines the breakdown of participants based on roles and teams (see figures 7 and 8).

| Role | Count | Percent | Cumulative Percent |
|---|---|---|---|
| NP (Nurse Practitioner) | 2 | 6.9 | 6.9 |
| Physician | 6 | 20.7 | 27.6 |
| RN | 10 | 34.5 | 62.1 |
| LPN | 6 | 20.7 | 82.8 |
| PCAs | 2 | 6.9 | 89.7 |
| Other | 3 | 10.3 | 100.0 |

*Figure 7*. Frequency: Participant Count by Role.

| Team ID # | Count | Percent | Cumulative Percent |
|---|---|---|---|
| 1 | 2 | 6.9 | 6.9 |
| 2 | 3 | 10.3 | 17.2 |
| 3 | 4 | 13.8 | 31.0 |
| 4 | 2 | 6.9 | 37.9 |
| 5 | 1 | 3.4 | 41.4 |
| 6 | 1 | 3.4 | 44.8 |
| 7 | 3 | 10.3 | 55.2 |
| 8 | 1 | 3.4 | 58.6 |
| 9 | 1 | 3.4 | 62.1 |
| 10 | 4 | 13.8 | 75.9 |
| 11 | 3 | 10.3 | 86.2 |
| 12 | 2 | 6.9 | 93.1 |
| 13 | 2 | 6.9 | 100.0 |

*Figure 8.* Participant Count by Team.

**Data Recording**

Data was captured on a paper questionnaire form. Each questionnaire was stapled and placed inside a file envelope to complete a packet. Each participant was provided a packet. Once the questionnaire was completed, the participants returned their questionnaire in the envelope. There were two main sessions for data collection. The first session occurred on February 13th from 8 am to 11 am. Participants arrived at the

conference room as their schedule permitted. Upon completing the questionnaire, the participant was offered a donut and a $5 Starbuck gift card. The second session occurred on Monday, February 23rd. Packets were provided to interested physicians during a monthly physician meeting. The Physicians were also offered a $5 Starbuck gift care upon completion and return of the questionnaire.

**Data Coding**

At the end of the session on February 13th, a Manager from the research department removed each questionnaire from the individual envelope and labeled the questionnaire with a color based on the color assignment for the providers. Only the Manager was aware of the color assignment. The envelopes were shredded and the Manager maintained the color key in a locked file. This step was repeated after the data collection completed on February 23rd.

On February 27th, a database within SPPS® was created to capture the responses from the two Likert scale instruments used. A coding scheme was defined for each demographic field (see Figure 9). Each survey question was provided a label (see Figures 10 and 11). Entries were keyed into the database based upon either the number from the coding scheme or the Likert scale numeric result. In addition to the entry in SPPS®, the codes were also exported into an excel spreadsheet. The response to the open ended questions were logged into the excel spreadsheet by manually entry.

| Code | Definition | Data Format |
|---|---|---|
| ID | Team ID<br>Each color was provided a numeric number | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 |
| Role | Each role was given a numeric value | 1 = NP<br>2 = Physician<br>3 = RN<br>4 = LPN<br>5 = PCAs<br>6 = Other |
| Gender | Gender of participant | Male = 0<br>Female = 1 |
| YRS HC | Years in Healthcare (months) | Numeric Value |
| YRS ORG | Years at the Organization (months) | Numeric Value |
| TEAM MO | Months on Current Team | Numeric Value |

*Figure 9.* Coding scheme.

| Label | Instrument | Question |
|---|---|---|
| CSACD1 | Collaboration and Satisfaction About Care Decisions | 1 |
| CSACD2 | Collaboration and Satisfaction About Care Decisions | 2 |
| CSACD3 | Collaboration and Satisfaction About Care Decisions | 3 |
| CSACD4 | Collaboration and Satisfaction About Care Decisions | 4 |
| CSACD5 | Collaboration and Satisfaction About Care Decisions | 5 |
| CSACD6 | Collaboration and Satisfaction About Care Decisions | 6 |
| CSACD7 | Collaboration and Satisfaction About Care Decisions | 7 |
| CSACD8 | Collaboration and Satisfaction About Care Decisions | 8 |
| CSACD9 | Collaboration and Satisfaction About Care Decisions | 9 |

*Figure 10.* Labels for Collaboration and Satisfaction about Care Decisions.

| Label | Instrument | Question |
|---|---|---|
| TCIP11 | Team Climate Inventory, Part I | 1 |
| TCIP12 | Team Climate Inventory, Part I | 2 |
| TCIP13 | Team Climate Inventory, Part I | 3 |
| TCIP14 | Team Climate Inventory, Part I | 4 |
| TCIP15 | Team Climate Inventory, Part I | 5 |
| TCIP16 | Team Climate Inventory, Part I | 6 |
| TCIP17 | Team Climate Inventory, Part I | 7 |
| TCIP18 | Team Climate Inventory, Part I | 8 |
| TCIP19 | Team Climate Inventory, Part I | 9 |
| TCIP110 | Team Climate Inventory, Part I | 10 |
| TCIP111 | Team Climate Inventory, Part I | 11 |
| TCIP112 | Team Climate Inventory, Part I | 12 |
| TCIP21 | Team Climate Inventory, Part II | 1 |
| TCIP22 | Team Climate Inventory, Part II | 2 |
| TCIP23 | Team Climate Inventory, Part II | 3 |
| TCIP24 | Team Climate Inventory, Part II | 4 |
| TCIP25 | Team Climate Inventory, Part II | 5 |
| TCIP26 | Team Climate Inventory, Part II | 6 |

| | | |
|---|---|---|
| TCIP27 | Team Climate Inventory, Part II | 7 |
| TCIP28 | Team Climate Inventory, Part II | 8 |
| TCIP31 | Team Climate Inventory, Part III | 1 |
| TCIP32 | Team Climate Inventory, Part III | 2 |
| TCIP33 | Team Climate Inventory, Part III | 3 |
| TCIP34 | Team Climate Inventory, Part III | 4 |
| TCIP35 | Team Climate Inventory, Part III | 5 |
| TCIP36 | Team Climate Inventory, Part III | 6 |
| TCIP37 | Team Climate Inventory, Part III | 7 |
| TCIP38 | Team Climate Inventory, Part III | 8 |
| TCIP319 | Team Climate Inventory, Part III | 9 |
| TCIP310 | Team Climate Inventory, Part III | 10 |
| TCIP311 | Team Climate Inventory, Part III | 11 |
| TCIP41 | Team Climate Inventory, Part IV | 1 |
| TCIP42 | Team Climate Inventory, Part IV | 2 |
| TCIP43 | Team Climate Inventory, Part IV | 3 |
| TCIP44 | Team Climate Inventory, Part IV | 4 |
| TCIP45 | Team Climate Inventory, Part IV | 5 |
| TCIP46 | Team Climate Inventory, Part IV | 6 |
| TCIP47 | Team Climate Inventory, Part IV | 7 |

*Figure 11*. Labels for Team Climate Inventory.

**Exceptions from Initial Research Plan**

The initial research plan included two groups of participants. The first group (or Survey Group 1) was to contain members of management from the Information Service/Technology team and members of management that managed the interdisciplinary team member participants. The community partner granting permission to add this research plan to an existing research grant only included access to the participants that fell into the Survey Group 2. Because of the limitation in accessing participants meeting the criteria of the participant type for Survey Group 1, the first group was dropped from the research plan. Recommendations are for further research to be conducted that include this population group for survey responses.

Because Survey Group 1 was not included, the knowledge management assessment was not developed. This eliminated the need to complete a phone survey and

pilot study as part of the validation process. Because of no pilot, the open-ended questions that were included for Survey Group II were validated by three professionals from the community partner research team that was well versed in interprofessional teams and knowledge management.

Although the use of Provalis Research QDA Miner Lite (Freeware) qualitative software package (PROVALIS Research) was planned and data analysis attempted, this tool was not pursued in the final analysis and conclusions.

## Data Analysis

In the CSACD instrument (Appendix A), there were a total of nine questions. According to Baggs (1994), the focus of each question is as follows: 1) Plan together, 2) Open communication, 3) Decision-making responsibilities, 4) Cooperation, 5) Concerns, 6) Coordination, 7) Collaboration, 8) Satisfaction in decision-making process, and 9) Satisfied in overall decision (p . 180). Each question had seven levels of responses for the participant to select one.

In the TCI instrument (Appendix B), there were a total of four parts and 38 questions; Part I had 12 questions, Part II had eight questions, Part III had 11 questions, and Part IV had seven questions. According to Anderson and West (1996), Part I focuses on participation or "how participative the team is on its decision-making procedures…and how safe team members feel to propose new and improved ways", Part II focus is on how well the team supports innovation, Part III focus is on the team vision and how clear and attainable the vision is, and Part IV focus is on the team orientation or on the team commitment to "achieve high standards of performance" (p. 59).

The first level of data analysis was to review the demographic data and the Likert scale results. The results were keyed into SPSS® (IBM SPSS® Statistics) and exported into Microsoft Excel. Descriptive statistics were completed (see Table1 thru Table 5). While SPSS® was used to complete the initial descriptive and preliminary ANOVA statistical analysis; the analysis was repeated using Microsoft Excel. Additional ANOVA statistical analysis was completed using only Microsoft Excel. All results presented were completed through the Microsoft Excel statistical data tools analysis.

Table 1

*CSACD Descriptive Statistics*

| CSACD | Count | Mean | Sample Variance | Sample SD |
|---|---|---|---|---|
| Question 1 | 29 | 5.24 | 3.98 | 1.99 |
| Question 2 | 29 | 5.45 | 3.54 | 1.88 |
| Question 3 | 29 | 5.31 | 3.01 | 1.73 |
| Question 4 | 29 | 5.21 | 3.96 | 1.99 |
| Question 5 | 29 | 5.45 | 3.54 | 1.88 |
| Question 6 | 29 | 5.28 | 3.56 | 1.89 |
| Question 7 | 29 | 5.14 | 3.34 | 1.83 |
| Question 8 | 29 | 5.31 | 2.29 | 1.51 |
| Question 9 | 28 | 5.57 | 2.77 | 1.67 |

Table 2

*TCI Part I Descriptive Statistics*

| TCI Part I | Count | Mean | Sample Variance | Sample SD |
|---|---|---|---|---|
| Question 1 | 29 | 4.34 | 0.59 | 0.77 |
| Question 2 | 29 | 4.21 | 1.24 | 1.11 |
| Question 3 | 29 | 4.29 | 1.06 | 1.03 |
| Question 4 | 29 | 4.34 | 0.73 | 0.86 |
| Question 5 | 29 | 4.17 | 1.00 | 1.00 |
| Question 6 | 29 | 4.31 | 0.86 | 0.93 |
| Question 7 | 29 | 4.45 | 0.61 | 0.78 |
| Question 8 | 29 | 4.41 | 0.54 | 0.73 |
| Question 9 | 29 | 4.24 | 1.26 | 1.12 |
| Question 10 | 29 | 4.28 | 0.92 | 0.96 |
| Question 11 | 29 | 4.31 | 0.58 | 0.76 |
| Question 12 | 29 | 4.28 | 0.64 | 0.80 |

Table 3

*TCI Part II Descriptive Statistics*

| TCI Part II | Count | Mean | Sample Variance | Sample SD |
|---|---|---|---|---|
| Question 1 | 29 | 4.14 | 0.69 | 0.83 |
| Question 2 | 29 | 4.00 | 1.14 | 1.07 |
| Question 3 | 29 | 3.97 | 1.03 | 1.02 |
| Question 4 | 29 | 3.93 | 1.07 | 1.03 |
| Question 5 | 29 | 3.66 | 1.23 | 1.11 |
| Question 6 | 29 | 3.93 | 1.14 | 1.07 |
| Question 7 | 29 | 4.14 | 1.05 | 1.03 |
| Question 8 | 29 | 4.03 | 1.03 | 1.02 |

Table 4

*TCI Part III Descriptive Statistics*

| TCI Part III | Count | Mean | Sample Variance | Sample SD |
|---|---|---|---|---|
| Question 1 | 29 | 6.41 | 0.54 | 0.73 |
| Question 2 | 29 | 6.10 | 0.88 | 0.94 |
| Question 3 | 29 | 6.10 | 1.02 | 1.01 |
| Question 4 | 29 | 5.76 | 1.26 | 1.12 |
| Question 5 | 29 | 5.93 | 1.14 | 1.07 |
| Question 6 | 29 | 5.72 | 1.06 | 1.03 |
| Question 7 | 29 | 6.10 | 1.38 | 1.18 |
| Question 8 | 29 | 5.93 | 1.35 | 1.16 |
| Question 9 | 29 | 5.86 | 1.77 | 1.33 |
| Question 10 | 29 | 5.38 | 2.03 | 1.42 |
| Question 11 | 29 | 5.76 | 2.26 | 1.50 |

Table 5

*TCI Part IV Descriptive Statistics*

| TCI Part IV | Count | Mean | Sample Variance | Sample SD |
|---|---|---|---|---|
| Question 1 | 29 | 5.62 | 2.74 | 1.66 |
| Question 2 | 29 | 5.28 | 2.99 | 1.73 |
| Question 3 | 29 | 5.52 | 2.33 | 1.53 |
| Question 4 | 29 | 5.17 | 3.58 | 1.89 |
| Question 5 | 29 | 5.66 | 2.81 | 1.67 |
| Question 6 | 29 | 5.59 | 2.89 | 1.70 |
| Question 7 | 29 | 5.76 | 1.62 | 1.27 |

Initial ANOVA was completed on the total sums of each of the role responses for the CSACD, total TCI, and four parts of the TCI results. Based on the F and P-value results and α of 0.05 for each section, the statistical data did not indicate a strong difference existing between the provider groups (see Table 6).

Table 6

*ANOVA by Roles*

| Test Area | F | P-value |
|---|---|---|
| CSACD | 1.711651 | 0.173792 |
| TCI, Part I | 0.50584 | 0.768802 |
| TCI, Part II | 0.882506 | 0.508493 |
| TCI, Part III | 0.551819 | 0.735387 |
| TCI, Part IV | 1.159803 | 0.35856 |
| TCI, Total | 0.790173 | 0.567555 |

A second analysis was conducted. Results from both the CSACD and TCI were analyzed by roles and by teams to determine if this differed in the overall findings. ANOVA was completed for each response by role and by team (see Table 7). Based on the F and P-value results for each section and α of 0.05, the statistical data did not support a difference between the role groups. However, based on the F and P-value results and α of 0.05, several of the responses by the teams indicated a statistical difference between groups; therefore, the assumption could not be made that there were no differences between groups. The questions included all from the TCI Part I, questions 4,5,6,7, and 8 from TCI Part II, and 1,2,3,4, and 6 from TCI Part IV. The average of each response by

role and by team was graphed. All 9 questions from the CSACD were graphed in one graph and the TCI questions were graphed by Parts (see figure 12).

Table 7

*ANOVA by Roles and Teams for Each Question*

| Question | Role F | P-value | Team F | P-value |
|---|---|---|---|---|
| CSACD, #1 | 1.564056 | 0.209759 | 1.114908 | 0.403759 |
| CSACD, #2 | 1.143094 | 0.366408 | 1.102405 | 0.410828 |
| CSACD, #3 | 2.066983 | 0.106625 | 1.108571 | 0.407328 |
| CSACD, #4 | 1.895831 | 0.134179 | 1.21783 | 0.349411 |
| CSACD, #5 | 2.135134 | 0.097333 | 1.162354 | 0.342132 |
| CSACD, #6 | 1.215645 | 0.33395 | 0.813836 | 0.601154 |
| CSACD, #7 | 1.454395 | 0.242988 | 0.890451 | 0.545899 |
| CSACD, #8 | 1.977989 | 0.120145 | 0.958904 | 0.499219 |
| CAACD, #9 | 1.556084 | 0.213795 | 1.426948 | 0.263113 |
| TCI Pt I, #1 | 0.675145 | 0.646496 | 4.617143 | 0.004518 |
| TCI Pt I, #2 | 0.801678 | 0.559968 | 13.04 | 1.11E-05 |
| TCI Pt 1, #3 | 0.615711 | 0.689074 | 3.507368 | 0.015635 |
| TCI Pt 1, #4 | 0.854111 | 0.526199 | 4.2208 | 0.006904 |
| TCI Pt 1, #5 | 0.33397 | 0.887128 | 8.190769 | 0.000205 |
| TCI Pt 1, #6 | 0.385177 | 0.853544 | 3.76 | 0.0011608 |
| TCI Pt 1, #7 | 0.357726 | 0.871941 | 4.448302 | 0.005399 |
| TCI Pt 1, #8 | 1.037931 | 0.419264 | 4.632727 | 0.004445 |
| TCI Pt 1, #9 | 0.545541 | 0.739957 | 3.30717 | 0.0199332 |
| TCI Pt1, #10 | 3.99225 | 0.844252 | 2.571429 | 0.051337 |
| TCI Pt 1, #11 | 1.735841 | 0.166448 | 8.855385 | 0.000128 |
| TCI Pt 1, #12 | 0.569365 | 0.722618 | 3.083944 | 0.026321 |

(*table continues*)

| Question | Role | F | P-value | Team | F | P-value |
|---|---|---|---|---|---|---|
| TCI Pt 2, #1 | | 1.171746 | 0.35041 | | 2.388571 | 0.065802 |
| TCI Pt 2, #2 | | 1.363547 | 0.2759 | | 1.614897 | 0.197163 |
| TCI Pt 2, #3 | | 1.053807 | 0.410898 | | 1.570248 | 0.210349 |
| TCI Pt 2, #4 | | 0.500205 | 0.77288 | | 3.353412 | 0.018835 |
| TCI Pt 2, #5 | | 1.089902 | 0.39239 | | 2.963902 | 0.030665 |
| TCI Pt 2, #6 | | 0.762153 | 0.586288 | | 3.24 | 0.021654 |
| TCI Pt 2, #7 | | 0.715637 | 0.61841 | | 3.917808 | 0.009683 |
| TCI Pt 2, #8 | | 0.440657 | 0.815481 | | 4.116571 | 0.007745 |
| TCI Pt 3, #1 | | 1.163218 | 0.356974 | | 0.798644 | 0.612434 |
| TCI Pt 3, #2 | | 0.723707 | 0.612539 | | 1.532308 | 0.22246 |
| TCI Pt 3, #3 | | 1.137931 | 0.368864 | | 1.164082 | 0.376943 |
| TCI Pt 3, #4 | | 0.856694 | 0,524572 | | 1.971368 | 0.117995 |
| TCI Pt 3, #5 | | 0.646976 | 0.666537 | | 1.829819 | 0.149079 |
| TCI Pt 3, #6 | | 0.8098 | 0.554649 | | 0.800971 | 0.611294 |
| TCI Pt 3, #7 | | 0.675862 | 0.645989 | | 1.963871 | 0.119263 |
| TCI Pt 3, #8 | | 0.315302 | 0.898655 | | 2.285361 | 0.075865 |
| TCI Pt 3, #9 | | 0.337672 | 0.884798 | | 1.032161 | 0.452438 |
| TCI Pt 3, #10 | | 0.322917 | 0.893999 | | 1.485217 | 0.237943 |
| TCI Pt 3, #11 | | 0.458962 | 0.802508 | | 1.887084 | 0.133107 |
| TCI Pt 4, #1 | | 1.137125 | 0.369248 | | 3.682162 | 0.012711 |
| TCI Pt4, #2 | | 1.090673 | 0.392003 | | 3.50209 | 0.015734 |
| TCI Pt4, #3 | | 1.794397 | 0.1533819 | | 2.8192 | 0.036977 |
| TCI Pt4, #4 | | 0.781244 | 0.573486 | | 2.737662 | 0.041149 |
| TCI Pt4, #5 | | 0.894241 | 0.501299 | | 2.149474 | 0.91704 |
| TCI Pt4, #6 | | 0.594036 | 0.704695 | | 3.536389 | 0.01889 |
| TCI Pt4, #7 | | 1.043346 | 0.416395 | | 2.2037 | 0.084996 |

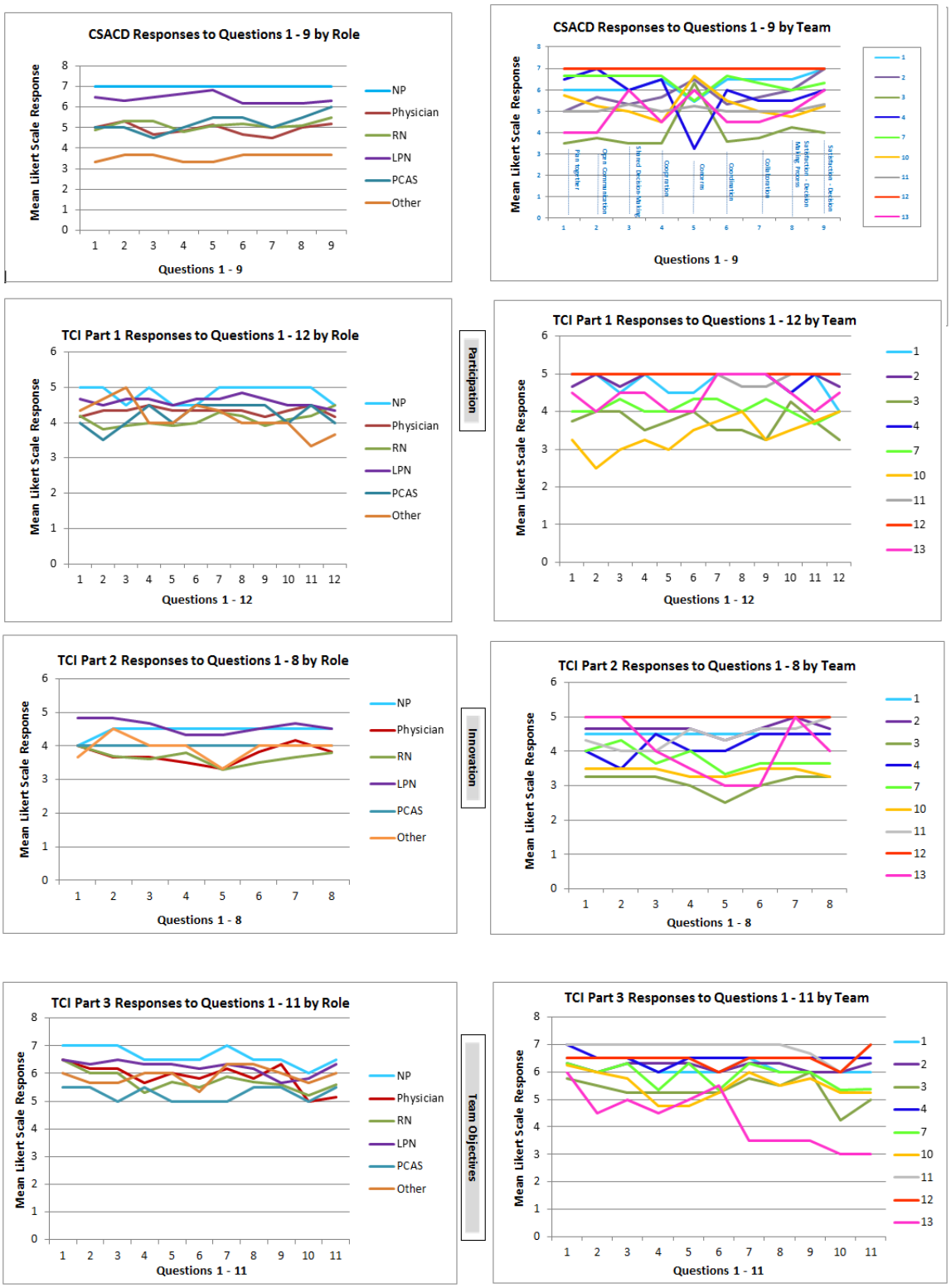


*Figure 12*. CSACD & TCI Average scores by role and by team.

The responses from the third open-ended question were reviewed to identify the most common tools identified for each ranking, along with the most common out of all three (see figures 13 and 14).

| | | |
|---|---|---|
| **Top #1** | Mode: 3 | Lync/Secure Messaging/Instant Messaging |
| **All** | Mode: 3 | Lync/Secure Messaging/Instant Messaging |
| **Top #2** | Mode: | EMR/CPRS, Lync/Secure Messaging/Instant Messaging, and Direct Conversation/Face-to-Face/Interivew/Going over Schedule/Talking to Doctor/Knock on Door |
| **Top #3** | Mode: 2 | Huddle |

*Figure 13*. Common Tools.

| # | **Number 1 Breakout** |
|---|---|
| 5 | EMR |
| 5 | Huddle |
| 4 | Direct Conversation/Face-to-face/Interivew/Going over Schedule/Talking to Doctor/Knock on Door |
| 1 | Shared Medical Group |
| 1 | Alerts |

| | **Number 2 Breakout** |
|---|---|
| 5 | EMR/CPRS |
| 5 | Direct Conversation/Face-to-face/Interivew/Going over Schedule/Talking to Doctor/Knock on Door |
| 5 | Lync/Secure Messaging/Instant Message |
| 3 | Huddle |
| 3 | Task Tracker |
| 2 | Alerts |
| 1 | Scheduled Telephone/Phone |

| | **Number 3 Breakout** |
|---|---|
| 7 | Huddle |
| 5 | Lync |
| 4 | Direct Conversation/Face-to-face/Interivew/Going over Schedule/Talking to Doctor/Knock on Door |
| 2 | Email |
| 1 | Alerts |
| 1 | CMT |
| 1 | Decision Support |
| 1 | Scheduled Telephone/Phone |
| 1 | Software to measure severity of patient diagnosis |

*Figure 14*. Breakout of Tools.

Responses for why the top three tools were used the most included: easy to use, accessible, convenient, and reliable. Communication was the common reason for the tools identified that helped the teams the most in the decision-making process. In most responses, the

same tools that supported the core teams were the same tools that supported the communication between the core and peripheral teams. Regarding the best tool for sharing, communication was critical (see figure 15).

| | Breakout |
|---|---|
| 8 | Converstation/Knock on Door/Talking to Doctor/Direct Contact/Going over Schedule/Face-to-Face/Live Interviews |
| 6 | Lync/Secure Messaging/Instant Messaging |
| 4 | EMR/CPRS |
| 3 | Huddle |
| 2 | Task Tracker |
| 1 | Alerts |
| 1 | Epic staff messaging |

*Figure 15*. Breakout of Best Tool.

Regarding the best tool for sharing, the team comments included:

- "would be nice if it could integrate regular day to day tasks as well as pt related to help us individually balance out our days"
- "alerts if appropriate"
- "email if brief"

Additional comment regarding the tools used:

- "use of decision support systems"
- "consults"
- "mini meetings"

Common comments around communication and the decision-making process included:

- "immediate response"
- "constant contact"
- "ability to communicate has helped us to function very well"
- "facilitates communication and info transfer among team members as patients are managed appropriately"
- "facilitates access & save time"
- "keeps team updated"
- "ease of communication, especially since all of us have different separate responsibilities outside our team dynamic"
- "Sometimes there is a change at the last minute (whether by pt or provider) and we notify each other of the change."
- "questions answered"
- "assistance in getting quick help"

In the graphical analysis of the CSACD by role, the peripheral team members responded lower than their colleagues regarding the agreement in the level of cooperation, collaboration, open communication, and decision making. The peripheral team responses for Part I of the TCI supported the role response to the CSACD responses. However, the peripheral team responses to the other parts of the TCI did not reflect the lowest roles scores. Physicians tended to respond lower that the other roles regarding innovation (TCI, Part II) and team commitment (TCI, Part IV). The PCAS responded with the lowest scores regarding a shared team vision (TCI, Part III). NP scored high responses on the CSACD and all parts of the TCI.

In the graphical analysis of the CSACD by team, teams 3 and 13 had the lower responses. However, the responses from team 13 on the TCI regarding participation in the team decision making did not reflect a low score. Team 3 and Team 10 had the lowest responses for participation (TCI, Part I), innovation (TCI, Part II), and a team shared vision (TCI, Part III). Both Team 3 and Team 13 had the lower scores regarding team commitment (TCI, Part IV). Team 12 scored high responses on the CSACD and all parts of the TCI.

Based on the written responses from the participants, the top of the three tools being used by the team was Lync, a recently implemented secure messaging system. Overall, the team identified communication being an important factor in the decision-making process. While the electronic medical record (EMR) and other systems were identified tools used for information sharing, direct communication was identified as the best.

## Evidence of Trustworthiness

### Credibility

Participant credibility was built into the research plan by having the participants volunteer to participate. The participation was anonymous and there were no penalties for not participating. The group of participants that were available to participate was from teams that were structured for research opportunities within the learning organization. The participants were frequently involved in research projects.

### Transferability

The structure of the team member roles that were selected to participate were consistent and represented across all the teams that had the opportunity to participate. The objective of the standard teams was the hope that findings from the teams could be generalized across teams.

### Dependability

The open questions were adapted to conform at the level the teams were able to relate and respond. The evolution of the questions was a response to the necessary change to accurately obtain feedback from all team members.

### Confirmability

The initial research responses appeared to correlate with some of the observation findings obtained from the Primary Researcher. It is believed that the findings would be supported by the other researchers involved in the research project.

## Study Results

The following outlines the research questions proposed for the study and the outcomes from the research relating to the research questions.

**Research question #1**: **What role, if any, do KM tools play in supporting the clinical decision-making process?** Based on the responses received from 29 interprofessional team members, KM tools that support the clinical decision-making processes tend to be the tools that support the communication among the team members and promotes the information sharing. Many respondents had identified the need of the tools to be reliable, easy to use, accessible, and convenient to be successful.

**Research question #2: How does the type of knowledge tool available support decision making among the interprofessional clinical team involved in the patient care?** In the environment that the participants worked, there appeared to have been a recent implementation of the secured messaging system, Lync. This was noted as one of the top tools used by the interprofessional teams due to the instant communication it provided among the team members, even if the team members were not present in the immediate clinic space. While the electronic chart and tools with the electronic chart were noted as additional tools used, permitting direct communication was the top tool noted. Examples of comments obtained from the participants:

- "ability to communicate has helped us to function very well"
- "facilitates communication and info transfer among team members as patients are managed appropriately"

Future research studies might be helpful to explore how the communication tools are used to capture knowledge and re-use in the interprofessional environment.

**Research question #3: How does the team climate influence the implementation and use of KM tools?** Based on the 13 teams surveyed, the TCI graphical analysis of the responses illustrates the difference climates among the different teams. Many of the teams responded with strong responses regarding team participation, team commitment, openness to innovation, and striving for team performance excellence. In addition, these team climates supported the responses from the CSACD instrument that was measuring the level of team commitment, coordination, collaboration and satisfaction with the decision-making processes. Attributes identified on both of these instruments indicate an environment of trust, willingness to share, try new ideas, and collaborate among the team members. These particular teams would be good environments to introduce new technology and processes to strive toward performance excellence – good candidates for implementing knowledge management tools.

There were several teams that responded low to understanding the overall team's objectives or vision. These same teams also scored lower regarding the response to the overall team's commitment. These teams might be candidates for team building exercises to help define for all members of the teams the objectives of the teams and discuss ways to monitor the team's performance. However, these same teams also scored lower on participation. This may also be indicative that not all team members identify themselves as part of the decision-making process and there may be barriers such as lack of trust and sharing that is occurring (see figure 16).

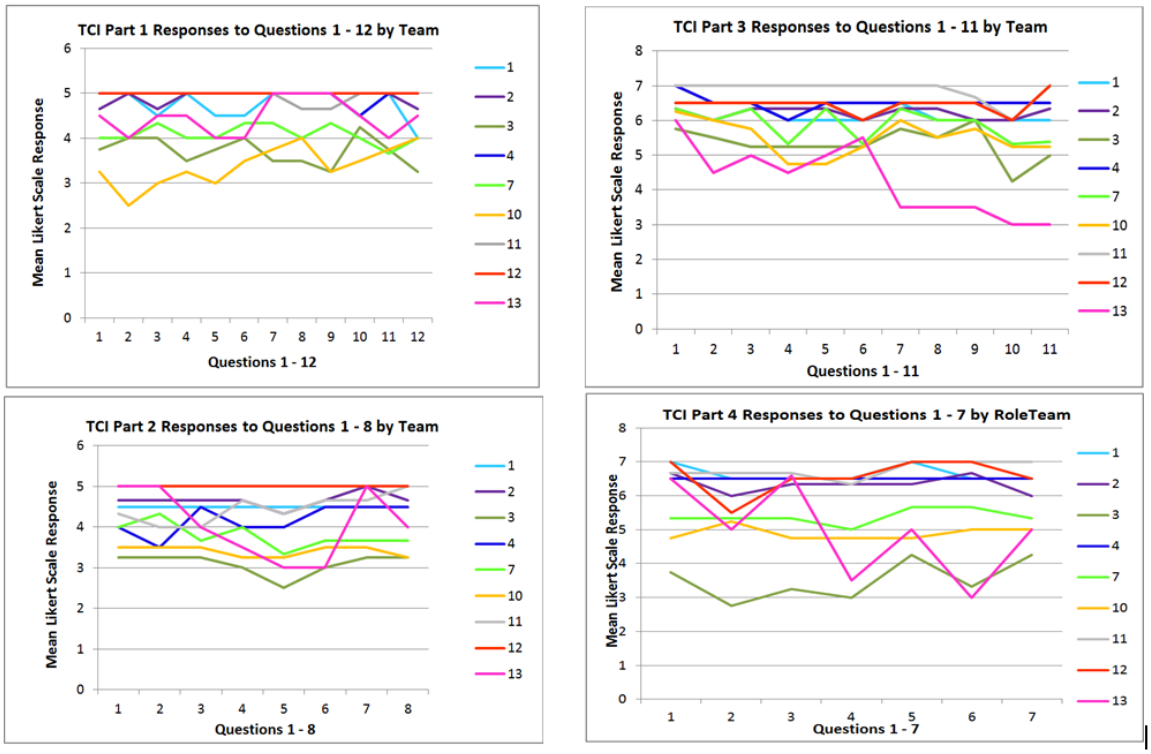


*Figure 16.* TCI Team Responses.

**Research question #4: How does the level of satisfaction in the interprofessional care decision-making process impact the use of KM tools?** The responses from the CSACD instrument support the environment that would be required to support knowledge management tools. The CSACD instrument took into consideration how well a team planned, coordinated, collaborated, communicated, and was overall satisfied with the team's decision-making process. These are all key contributors to an environment that is enriched to support the use of tools to share, store, and re-use knowledge gleaned by the team.

In reviewing the responses of the CSACD by role, the responses illustrate the disconnection that the peripheral team might be experiencing when it comes to the overall patient care decision-making process (see figure 17).

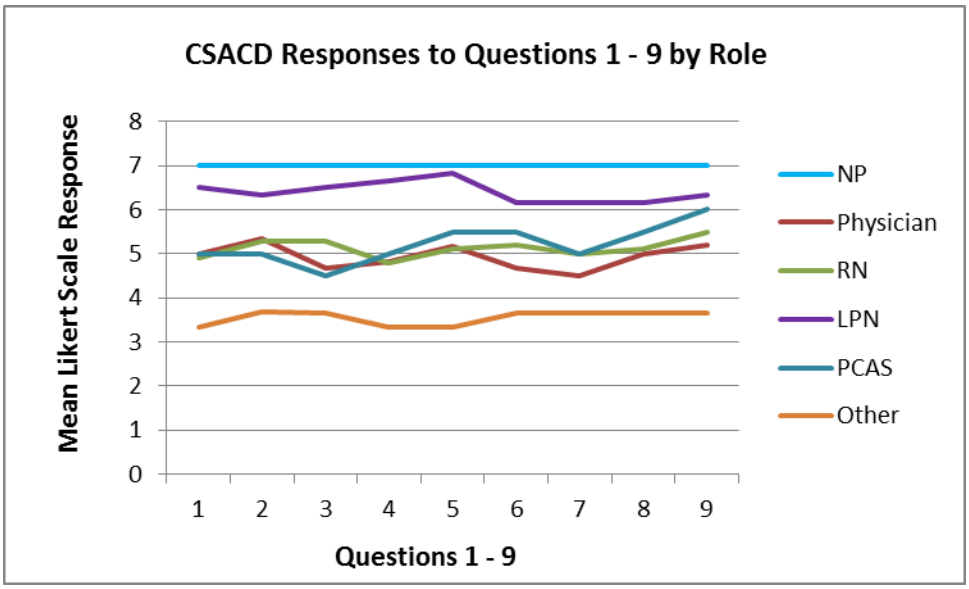


*Figure 17*. Other Team Disconnect.

By understanding this attribute, concentration can be focused on how to remedy the engagement of the peripheral team members with the core teams.

**Research question #5: How does the user acceptance of technology influence the success of implementing knowledge management tools?** This part of the research did not get completed.

**Research question #6: How might a KM assessment be leveraged to understand an organization's KM readiness & KM innovative opportunities?** This portion of the study did not get completed.

**Research question #7: What metrics might be used to predict the success of implementing KM tools among interprofessional teams?** Based on the responses from the 29 participants, the metrics measured by both the CSACD and TCI instruments may be a good starting point. The tools helped identify areas within some of the team environments that might require additional team building support prior to engaging the

teams on any major implementations that requires an environment promoting sharing, trusting, and collaboration.

## Chapter Conclusion

The research project took about one year to complete from the time of the initial conversations establishing a community research partner through the data analysis as outlined in this this chapter. In the following chapter, further discussion, conclusions, and recommendations will be presented.

# Chapter 5: Discussion, Conclusions, and Recommendations

## Summary

The purpose of this mixed method study was to determine how clinical knowledge management (CKM) tools might support clinical teams during the clinical decision-making process.

*Research question #1*: Based on the responses from the participants in the study, the main ways that KM tools play a supporting role in the clinical-decision making process is by supporting communication and through knowledge sharing.

**Research question #2.** Based on the responses from the participants, the tools available that support communication and knowledge sharing were the tools identified as either the top or best tools by the participants. The tools included secure messaging, electronic medical record (EMR), huddles, and direct conversations.

**Research question #3**. Based on the responses from the participants, the team climate may have an impact on the level of team participation in the decision-making process, on the level to try new innovative processes, on the level of team trust, and on the amount of sharing and collaboration experienced by the team.

**Research question #4.** Based on the responses from the participants, there was an indication that the level of satisfaction could influence how engaged the team members are in the decision-making process.

**Research question #5**. Based on the responses from the participants, there is an opportunity to use the TCI and CAACD instruments as metrics to understand the team environments prior to proceeding with any KM implementations.

## Conclusions

Knowledge management is somewhat in its infancy in the healthcare environment. There are opportunities where KM tools may be implemented to support interprofessional teams in the decision-making process of patient care. The results from this research project have substantiated the need for KM tools, along with identifying key requirements in the design of the KM tools. Ease of use and accessibility are key components required for KM tools to be utilized successfully using among interprofessional teams in the health care setting. Understanding the teams using the tools should also be considerations.

In addition, this research has provided some metrics to consider before implementing KM tools or initiatives to optimize the success of the implementation. Concentration on the functionality of the KM tools will not be sufficient. It is important to understand the team climate, such as the level of collaboration, trust, and innovation, to factor into the implementation.

The objective of this research study was to potentially identify insight to areas where there were gaps in the current research. While gaps continue to exist in understanding how knowledge management and KM tools can support interprofessional teams in the decision-making process, the research project was able to reduce some gaps. The study provided an opportunity to survey interprofessional teams to gain insight on the use of knowledge management tools. Many responses were focused on the communication and sharing of information and further questions would have been helpful to understand how the interprofessional teams shared among the teams and not just within the teams. In addition, further questions would have been helpful to understand

how the interprofessional teams managed lessons learned and the re-use of knowledge. While further research is required, overall the project was successful in completing its objectives.

## Significance of the Study

As stated by Davenport and Prusak (2000), knowledge is not data nor is it information (p. 1). Nonaka and Takeuchi (1995) identified one mode to the knowledge spiral includes socialization (p. 225). In order to achieve the transformation of information into knowledge and to have the ability to socialize to permit tacit-to-tacit knowledge exchange, it is important for communication, trust, and collaboration to be present.

Many responses from the team members noted the importance of communication in a timely way to share information. In all the tools used by the teams, face-to-face and huddle meetings were commonly identified as important communication tools. While the team references "information", this may illustrate where the teams are transforming information into knowledge.

The teams noted the importance of tools being reliable, easily accessible, and easy to use. This list includes the requirements to support the team members in the fast-paced healthcare environment. Mobility was not specifically mentioned by teams, but this would be an opportunity to provide KM support to the teams as they huddle or require alternative, virtual forms of communication.

In a study conducted by Ragazzoni et al (2002), Team Climate Inventory results were obtained from Italian business and healthcare workers to be compared to previous studies conducted on similar workers from England; the study concluded that the TCI

instrument was consistent in collecting responses from individuals for comparison. The TCI averages collected in this research project was comparable to the data collected from the English teams. The averages for participation and team vision were higher in these project teams compared to the data reported in the Italian study.

According to Orzano, McInerney, Scharf, Tallia, and Crabtree (2008), KM critical processes include "finding knowledge, sharing knowledge, and developing knowledge" (p. 492). The researchers also indicated that enablers to these KM processes include "active networks, helpful relationships, reflective practice, trusting climate, effective communication, supportive leadership, accessible technology, and robust infrastructure" (p. 492). While not all enablers were incorporated into this research project, many of the enablers were reinforced by the responses obtained from the team members. The scores from the TCI responses indicated that the majority of teams presented high scores in participation, innovation, team objective/vision, and team task orientation – all reflective of a trusting environment and strong relationships between team members. In addition, the response to the open-ended survey questions indicated the importance of open communication among the team. All of these attributes are significant and critical in supporting a knowledge management environment.

Collaboration is required for knowledge management. CSACD tool was used to identify the overall satisfaction among team members when it came to making decisions on the care of the team's patients. Overall scores from the core teams reflected a high sense of satisfaction in the decision-making process. The scores from the peripheral team members were not as high in satisfaction compared to the scores from the core team members. Having a distinction between core and peripheral team members lead to

assumptions that there might be more work required to engage the peripheral team – whether this is a perception on the peripheral team or an actual deficit would require more research to determine. In summary, the overall scores from the CSACD indicated that the teams responded in a favorable manner regarding the decision-making process for patient care. The satisfaction in the decision-making process is a positive attribute to support knowledge management processes.

According to Choo (1998), there are three ways for information to be used in a knowledge organization; this includes sense-making, knowledge creating, and decision making (p. 3). All three of the information uses were reflected in the responses obtained from the team members. As information is collected in the electronic medical records, the teams require communication to complete sense-making, create knowledge from the team's interactions, and ultimately complete decision making for care of the patient. The team members repeatedly identified the need for close interactions among other team members and the need for open communication as key responses to support knowledge sharing among the team. The ability to understand how the interprofessional team members work together in using the information is helpful to identify or design potential KM tools to implement for supporting the team members.

Kuziemsky and Varpio (2011) indicated the requirements for interprofessional collaboration care delivery involved multiple healthcare professionals, the physical delivery of patient care, the use of a range of information types and of communication media (p. xxx.e150). This criterion has been displayed in this research project based on the roles of the team members providing care to patients, the different modes of information, and the mediums used for communication among the team members. While

communication and information sharing were key concepts noted by the team members, there were many tools identified that supported the range of information types and communication media. For instance, information types included the EMR, secure text messaging, clinical decision tools, and task managing tools. Communication media included face-to-face, phone, pager, and secure text messaging. The tools that were identified as successful by the participants were the tools that provided immediate communication, easy to use, and reliable. All of these are characteristics support the conclusions that the "knowledge management tools or systems must be designed to provide on-demand and just-in time identification of relevant knowledge to relevant knowledge agents, where, when and how they need it" (Woodman & Zade, 2012, p. 192).

Knowledge may be "viewed as a valuable resource that is allocated by individuals and becomes the team's property when shared" (Kessel, Kratzer, & Schultz, 2012, p. 149). The authors further noted that "we consider knowledge sharing to be an interactive communication process between team members who rely on each other to accomplish common goals" (p. 149). The authors identified that there is a relationship between safe team environments, team creativity, and knowledge management. If team members have concerns with patient care decisions, the team member should feel safe to be able to voice concerns to the team, share existing knowledge, and search for a new and better solution (Kessler et al., 2012, p. 153). The team climate survey results completed in this research indicated team environments that enabled trust and collaboration. The research completed in this project identified that most teams were satisfied with the decision-making processes in place and indicated strong communication channels in place to share information.

## Data Analysis and Answering the Research Questions

### Research Questions

**Research question #1: What role, if any, do KM tools play in supporting the clinical decision-making process?** Based on the responses obtained from the participants, communication was a significant factor in supporting the interprofessional teams in the decision-making process. While Politi and Street (2011) have noted that elements of trust, persuasion, collaboration, information exchange, and negotiation affect decision making (p. 579), the responses from the teams note how the communication tools support many of these elements. Direct communication was noted as being one of the important means for sharing between the interprofessional team members. Direct communication included face-to-face meetings, huddles, and team meetings. According to McNaughton (2013), interprofessional teamwork simulation coursework have found that online and face-to-face team meetings improved factors such as promoting clear communication, accessibility, and trust (p. 421). Huddles were also identified as a mechanism for providing an opportunity for team sharing by the participants. Elias, Barginere, Berry, and Selleck (2015) noted that "huddles provide not only an opportunity for more coordinated and collaborative patient centered care, they also build relationships among members of the interprofessional team as views and insights are shared" (p. 1).

Participants also noted the importance of using a secured messaging tool that had been recently implemented as a means to improving communication between the interprofessional team members when members were not necessarily located within the same clinic space. The EMR system was another noted tool that provided opportunity for

access and sharing knowledge among the interprofessional team members by the clinical documentation within the patient charts.

**Research question #2: How does the type of knowledge tool available support decision making among the interprofessional clinical team involved in the patient care?** The responses from the participants indicated the importance that communication, current access to the team members, and the timeliness in keeping everyone current were important characteristics for the current knowledge tools that supported the decision making process among the interprofessional teams. The teams' awareness of how the knowledge management tools provided "coherent and timely support for decision making" overcame one of the major challenges identified by Myllarniemi, Laihonen, Karppinen, and Seppanen (2012) in the approaches of KM in healthcare processes. Razzaque, Eldabi, and Jalal-Karim (2013) noted that "knowledge management aims to providing cost effective, efficient and timely well-informed knowledge, when and where needed in support of medical decision making" (p. 507). The responses from the team support the authors' conceptual framework for social networking as an initiative to aid medical decision making (p. 500). Overall, the team's responses indicated how communication supported the knowledge brokerage among the group as part of the day-to-day professional practice in supporting the decision-making process (Currie & White, 2012, p. 1335).

**Research question #3: How does the team climate influence the implementation and use of KM tools?** Many of the team responses supported team participation, team commitment, team openness to innovation, and team performance excellence. These attributes are indicative of an environment supporting trust, collaboration, and a wiliness to share. These are important factors to have in place to support the implementation and use of knowledge management tools. Therefore, a general statement would be that a high team climate response from teams would most likely indicate a climate that would support the implementation and use of KM tools.

**Research question #4: How does the level of satisfaction in the interprofessional care decision-making process impact the use of KM tools?** The majority of team responses from the CSACD survey illustrate an overall high level of satisfaction in decisions, cooperation, collaboration, ability to voice concerns, and open communication. These are all attributes that support knowledge management. Therefore, a general statement would be that a high collaboration and satisfaction about care decisions from teams would most likely indicate a climate that would support the implementation and use of KM tools (see figure 18).

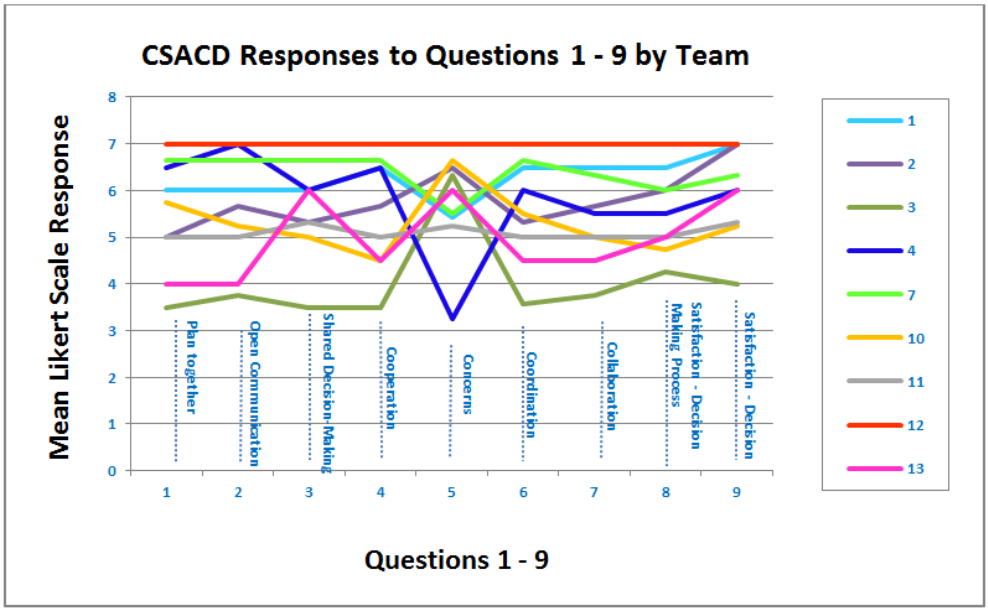


*Figure 18.* CSACD Team Responses.

**Research question #5: What metrics might be used to predict the success of implementing KM tools among interprofessional teams?** Both the CSACD and TCI surveys include metrics that might be used to predict success for implementing KM tools among interprofessional teams. Understanding the team climate environment is an important element to understand when designing and implementing KM tools. CSACD also indicates additional satisfaction among team members regarding the decision-making process. If elements from these surveys indicate a low response, the metrics might be helpful to identify what preliminary efforts might be required as part of a project readiness step to improve upon the team climate prior to any implementation. Having the ability to test and understand the climate of the teams could provide opportunities for team building steps prior to investing the time and money on designing and implementing KM tools to decrease risks and increase the achievement of success in implementation and adoption of the KM tools.

## Implications

According to Kumar, Ghildayal, and Shah (2011), "…recent rapid cost growth coupled with an economic slowdown and growing federal fiscal deficit, will influence the financial well being of the US healthcare system significantly in the comping years" (p. 367). The authors noted that "there are 42 million people in the US without insurance and every year more than one million file for bankruptcy because of an inability to cover medical costs" (p. 380). In addition, "healthcare costs are increasing at an annual rate of 7 percent per year…if sustained, this will bankrupt the Medicare program in 9 years and increase the nations' overall healthcare bill to $4 trillion in 10 years" (Kumar et. al, 2011, p. 381). Furthermore, the authors noted that "societal factors such as, income level, insurance status, access to healthcare, cultural-communication and language barriers and partnership in decision making are the major contributors to the healthcare service disparities" (p. 381). Barriers could be overcome by the use of strategies and tools to promote increased quality and cost reductions (Kumar et al., 2011, p. 382).

Based on Gross Domestic Product (GPD) figures from 2006, the US ranked highest among all other members of the Organisation for Economic Co-operation and Development (OECD) (Kumar, Ghildayal, & Shah, 2011, p. 369). Despite the high level of spending, "the US does not appear to provide substantially greater health resources to its citizens, or achieve substantially better health benchmarks, compared to other developed countries" (Kumar et al., 2011, p. 369). The researchers attributed some of the higher US GPD spending rate due to "diverse population and geographical related disparities, government regulations, and the emphasis on quality delivery and innovative drugs" (p. 370).

There is a need in health care to continuously identify ways to improve the quality of patient care while reducing costs. According to Chen (2013), "the rapid growth of population is placing a mounting demand and burden upon the current healthcare industry" (p. 95). There also continues to be disparities in the current healthcare delivery system. With the technology currently available, there are opportunities to identify how technology can be harnessed to assist in providing efficiencies. As noted by the author, "through the development of information technology (IT), current and future medical data and information can be leveraged to develop knowledge-based solutions…and the development of more efficient and more efficient methodologies to diagnose and treat patients in a timely manner" (p 96). With the disparities experienced by the healthcare delivery system, an opportunity to reduce this disparity by improving the quality of patient care and reducing the costs as a means of impact to social change.

## Limitations of the Study: Assumptions, Limitations, and Delimitations

### Assumptions

It was assumed that the general theories of the decision-making process could be applied more specifically to the decision-making processes conducted by clinicians in the health care environment, including interprofessional team decision making. While initial planning assumed that the acute environment would be used for the research, the outpatient environment interprofessional teams were the participants made available by the health care system. It was assumed that the responses obtained from the outpatient environment would only conclude representation in this segment of health care.

Assumptions regarding the study itself were that participants would be honest and accurate in their responses, that participants would have a general understanding of

knowledge management, and that the participants involved in responding to the interprofessional survey questions provided direct care to patients. Another assumption was that if core interprofessional team members were part of multiple interprofessional teams, the team member would select one of the teams to base the responses against instead of generalizing responses between the multiple teams. Additional questions were included in the questionnaire to address other research questions being addressed by the Primary Researcher as part of the overall research grant. It is assumed that these additional questions did not impact the responses provided to the research questions included in this research project.

**Limitations**

There were several areas of limitations with the design of the research study. For instance, participant sampling was completed within a single healthcare system. Since sampling all health care facilities was not feasible, a convenience sample was used. The pool of participants was to be from a single healthcare system and was selected by the healthcare system to participate**.** The majority of the interprofessional team members worked full-time at the single healthcare system. This included the members from nursing, PCA, and peripheral teams. However, many of the physicians that participated in the research study practiced at other healthcare systems within the area. This provided an opportunity for input to include reference to other EMR systems in many of the open-ended question responses. Overall, there are some limitations in making generalized conclusions across all of health care environments.

Participant limitations also include the gender of the participants. Since participation was voluntary, the selection process did not support a balance of male and

female participants; only one participant was male. In addition, the team roles were not balanced among the number of participants. There were more core team members that participated than the other ancillary team members.

While the participation was from participants willing to volunteer, the sampling was limited to a set number of teams within the health care organization. In addition, there was no control of the selection of participants; for this study, the greater majority of participants were female. Limitation to the responses is that the responses come from the perception of the female population. However, the benefit in using these teams were that they were familiar with participation in research projects since they were customarily used for other grant studies within the healthcare organization. Perhaps a benefit to this limitation was that the participants were not sensitized to the research environment and were more comfortable in answering questions honestly since this was not the first time for participation.

Last of all, not all service areas within a health care organization were represented in participant sampling. Not all health care environments were reviewed; efforts concentrated on the outpatient health care environment. The sample population came from the transitional interprofessional team members supporting care for patients in an ambulatory setting. There were no participants from the acute, or inpatient, side of the healthcare environment.

**Delimitations**

The research did not expand beyond the concept of clinical knowledge management. Clinical knowledge management concentrates on the processes involved in the clinical diagnosis and treatment of the patient; the direct care of the patient. The

focus of the research was to involve clinical knowledge management tools in regard to how these tools might support the clinical decision-making process between the interprofessional collaboration that takes place during the care of the patient.

The research did not include the concept of healthcare knowledge management or the processes involved in healthcare education, research, or dissemination of information beyond the direct care of a patient. Although this broader term of knowledge management within healthcare may also impact the efficiency of the healthcare system, the direct focus of the research was on the decision-making process and collaboration that was specific to the direct care of a patient.

Finally, the research did not include interprofessional team members outside the healthcare environment. Interprofessional teams could include the patient, the patient family members, and the patient care givers. However, the research outlined in the project only included the interprofessional team members from the healthcare system.

## Recommendations for Action

Current pressures from "health maintenance organizations has led hospitals and healthcare companies to reduce healthcare costs through efficiencies and be innovative, with new technologies, processes and services" (Cegarra Navarro & Cepeda-Carrion, 2013, p. 1219). According to the researchers, "public and private healthcare services organizations are looking closely at the benefits associated with knowledge management and process management" (p. 1219). The researchers noted that there are indications that healthcare leaders are exploring ways to optimize knowledge management and optimal healthcare outcomes by "developing the capacity to create, distil and distribute knowledge…implying that new management initiatives will focus on interaction,

collaboration and increased sharing of information and knowledge" (p. 1220). While the use of knowledge management is a key factor in identifying innovative ways to be more efficient, it is important not to forget to understand the climate of the organization to ensure that the organization supports collaboration, sharing, and trust among the team members that are responsible for the creation and sharing of knowledge.

Interprofessional teams are becoming more common in delivering care to patients, particularly in the process of transitioning care and with the growing elderly patient population. According to Hartgerink et al (2014), "patients with complex needs use more health services than the general population; receive care from different health professionals and in multiple settings" (p. 792). Because many different professional types contribute to the interprofessional teams, there is an opportunity to understand how to better support the teams in the decision-making process to support standardization and quality in the delivery of care. There is also opportunity to better understand how to reduce costs through efficient and effective decision making.

An important team process is collaboration (Nancarrow et al., 2013, p. 2). However, some challenges are experienced with different professionals coming together as an interprofessional team due to conflicts with individuals accustom to their scope of practice now playing a team decision-making role, and the adjustments of working outside the traditional hierarchical structure in a team-based structure (Nancarrow et al., 2013, p. 2). An opportunity exists to support collaboration and team decision making among the interdisciplinary team environment by the use of knowledge management tools. A better understanding of the team environments can play an important success

factor on the Clinical Information Technology or Clinical Informatics team when developing and offering knowledge management tools.

Based on the research conducted by McFadden, Lee, Gowen, and Sharp (2014), "quality management practices are relevant and can provide a significant contribution to the effectiveness of healthcare systems, especially when coupled with KM capabilities" (p. 53). Providing efficiencies in the support of decision making could play an important factor in improving the quality care of the patient and a potential area for cost reduction. This could provide opportunities to reduce the gap in the healthcare delivery system.

The research conducted in this project reflects many of the factors noted above. Understanding the climate of the interprofessional teams is important to identify how knowledge management tools might be implemented to help support the clinical decision-making process. The research data from this study supports the need to understand what works for the teams in order to determine areas of implementation that might become challenging when attempting to complete the implementation of tools. While further studies are required to further study the additional KM tools that might be beneficial and how technology acceptance might impact implementation, there is evidence from this study that teams have awareness for the need of an environment to support collaboration, sharing, and trust. The study also indicates that interprofessional teams have awareness on how KM tools can support patient care decision making and streamline patient care.

Overall, the healthcare environment does seem to be lagging in the use of knowledge management. This provides an opportunity to change and improve. Improving the quality of patient care and reducing costs in the healthcare delivery are

both areas for positive change; ultimately leading to positive social change if the disparities in the delivery system are in any way being reduced.

## Recommendations for Further Study

This research project has helped provide some insight to gaps in the current research. One area includes the use of metrics. Responses obtained from the TCI and CSACD instruments provided score results that could be used as preliminary metrics to understand areas to concentrate on managing before attempting to implement knowledge management tools into the environment. Understanding the environment prior to implementation could be leveraged to incorporate the appropriate management techniques as part of the project plan to optimize the success of the implementation project.

In addition, the research has provided insight to potential areas where further research might be beneficial to better understand the types of KM tools to consider for implementation. For example, how might decision support systems, dashboards, and analytic tools be designed to support the interprofessional teams? How can mobile devices be paired with the different application tools to make the applications more accessible, easy to use and convenient for the team interactions? How might virtual tools, such as secured web meetings or teleconferencing be used when direct face-to-face interactions are limited? Finally, how is "knowledge translation" - any evidence or best practices learned from the team translated and turned into action (Strauss, Tetro, & Graham, 2011, p. 7)?

Many of the responses obtained from the teams pertained to information communication and sharing. While these are important factors as part of knowledge

management, there are additional areas of further study. For instance, how can knowledge be captured and re-used with the teams with content management, lessons learned, and evidence-based medicine tools? How can knowledge be share between the different care teams for potential re-use? And lastly, how are the interprofessional team learnings from the ambulatory setting utilized to identify global methodologies for the whole healthcare organization?

**Research Questions**

The following outlines the research questions that were proposed for the study and the recommendations based upon the outcomes of the research questions.

**Research question #1: What role, if any, do KM tools play in supporting the clinical decision-making process?** Communication tools were the common responses obtained from the participants when identifying how knowledge management tools supported the clinical decision-making process. Additional research is recommended to further identify the tools that might be beneficial beyond communication during the decision-making process. Additional research is also suggested to determine if the type of tools supporting the decision-making process is determined upon the process phase of the decision-making process.

**Research question #2: How does the type of knowledge tool available support decision making among the interprofessional clinical team involved in the patient care?** Future research studies might be helpful to explore how the communication tools are used to capture knowledge and re-use in the interprofessional team environment. While the teams provided insight on communication tools used for immediate patient care within their respective interprofessional team, the responses did

not indicate how each team identified new best practices to incorporate and re-use. Additionally, the teams did not indicate how knowledge was shared among the different interprofessional teams or how re-use of knowledge was incorporated into organizational processes.

**Research question #3: How does the team climate influence the implementation and use of KM tools?** As noted in Chapter 4, many of the teams responded to indicate that they believed their team environment to supported attributes of trust, willingness to share, try new ideas, and collaborate among the team members. These team environments would be good candidates for implementing knowledge management tools.

For the teams that did not have high scores on both instruments, the organization may want to consider interventional team building training for these teams prior to any implementation that requires team collaboration, trust, willingness to share – all attributes required for knowledge management initiatives to be successful.

**Research question #4: How does the level of satisfaction in the interprofessional care decision-making process impact the use of KM tools?** Based on the responses obtained from the participants, there appeared to be a gap in the satisfaction responses from members from the peripheral team compared to the responses from the core team members. This may be an area of opportunity to creatively define how knowledge management tools might be able to assist in bridging the two team environments together.

**Research question #5: What metrics might be used to predict the success of implementing KM tools among interprofessional teams?** The overall results from the

instruments might be able to assist in providing an overall team score rating so that managers involved in determining implementation strategies may use the metrics to determine any pre-requisite steps that might need to be included in the implementation project plan. Further research is recommended to identify if a KM assessment tool would also be useful to identify areas of deficit that might benefit having KM tools implemented.

In general, further research would be suggested to use the same instruments with participants in the acute care side of the health care environment. It would be interesting to understand if there is a difference in the interprofessional team environments based if treating in the ambulatory or inpatient environment. It would be interesting to see if there would be a different set of knowledge management tools identified to support the decision-making process. This might be helpful when attempting to define the framework for system implementations to understand the optimal tool sets requirements depending on the interprofessional team environments involved.

Further research would be recommended to determine the influence of the team's ability to use and accept technology toward the tools supporting knowledge management. While the TCI instrument measured responses from the participants on how well the team was open to innovative procedures and tools, the instrument did not capture specifically the acceptance of the team members to trying and using new technology tools. Based on the responses from the physicians, the response was that the teams were not always open to new innovative suggestions. It would be interesting to follow up to learn more.

Additional research might be conducted to understand how a KM assessment might be leveraged to understand an organization's KM readiness & KM innovative

opportunities**.** This would be helpful to understand when implementing KM solutions. Further research would be recommended to identify how the assessment for KM aligns with the responses obtained from the CSACD and TCI instruments.

The last recommendation would be to suggest further research to obtain responses from more teams and team members to obtain a larger sampling for generalization of responses. The majority of the responses obtained in this study were from female participants. Further research should also incorporate more male respondents. Many of the participants were from the nursing profession. Further research would be recommended to include more responses from interprofessional team members such as Pharmacists and Therapists. Last of all, patients, patient family members, and patient care givers should be considered as part of the interprofessional team and their responses incorporated into the research model.

## Concluding Remarks

The outcomes of the research project help identify how knowledge management tools can be utilized to support interprofessional teams in the clinical decision-making process to help fill the gap in the current research. In addition, the research outcomes illustrate the importance to understand the team climate environment prior to making final design and implementation plans for KM tools. While further research is required to further understand the different KM tools that can be applied, the research provides initial data that pertains to interprofessional teams and the use of KM tools in supporting the clinical decision making process. Limited literature could be found that addressed interprofessional teams, the decision-making process, and knowledge management; the results from this study help fill this gap. Hopefully, further research can be built from the

findings from this research project to continue to understand KM and decision making among the interprofessional healthcare teams.

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## Appendix A: Collaboration and Satisfaction about Care Decisions (CSACD)[1]

Please respond to the following questions by circling your response. These questions are related to interprofessional team collaboration during patient care decision making. Please circle the number that best represents your judgment about the decisions. All surveys are confidential.

1.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Strongly disagree | | | | | | Strongly agree |

2.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Strongly disagree | | | | | | Strongly agree |

3.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Strongly disagree | | | | | | Strongly agree |

4.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Strongly disagree | | | | | | Strongly agree |

5.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Strongly disagree | | | | | | Strongly agree |

6.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Strongly disagree | | | | | | Strongly agree |

7.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| No Collaboration | | | | | | Complete Collaboration |

8.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Not Satisfied | | | | | | Very Satisfied |

9.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Not Satisfied | | | | | | Very Satisfied |

Adapted, with permission, for the UBC HCTC (2006)

# Appendix B: The Team Climate Inventory

**PART 1: PARTICIPATION IN THE TEAM**

This part concerns how much participation there is in your team. Please circle the most appropriate response to you for each question.

| | | **Strongly disagree** | **Disagree** | **Neither agree nor disagree** | **Agree** | **Strongly agree** |
|---|---|---|---|---|---|---|
| 1. | We share information generally in the team rather than keeping it to ourselves | 1 | 2 | 3 | 4 | 5 |
| 2. | We have a `we are in it together' attitude | 1 | 2 | 3 | 4 | 5 |
| 3. | We all influence each other | 1 | 2 | 3 | 4 | 5 |
| 4. | People keep each other informed about work-related issues in the team | 1 | 2 | 3 | 4 | 5 |
| 5. | People feel understood and accepted by each other | 1 | 2 | 3 | 4 | 5 |
| 6. | Everyone's view is listened to even if it is in a minority | 1 | 2 | 3 | 4 | 5 |
| 7. | There are real attempts to share information throughout the team | 1 | 2 | 3 | 4 | 5 |
| 8. | We keep in regular contact with each other | 1 | 2 | 3 | 4 | 5 |
| 9. | We interact frequently | 1 | 2 | 3 | 4 | 5 |
| 10. | There is a lot of give and take | 1 | 2 | 3 | 4 | 5 |
| 11. | We keep in touch with each other as a team | 1 | 2 | 3 | 4 | 5 |
| 12. | Members of the team meet frequently to talk both formally and informally | 1 | 2 | 3 | 4 | 5 |

**PART 2: SUPPORT FOR NEW IDEAS**

This part deals with attitudes towards change in your team. Please indicate how strongly you agree or disagree with each of the following statements as a description of your team by circling the appropriate number.

| | | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree |
|---|---|---|---|---|---|---|
| 1. | This team is always moving toward the development of new answers | 1 | 2 | 3 | 4 | 5 |
| 2. | Assistance in developing new ideas is readily available | 1 | 2 | 3 | 4 | 5 |
| 3. | This team is open and responsive to change | 1 | 2 | 3 | 4 | 5 |
| 4. | People in this team are always searching for fresh, new ways of looking at problems | 1 | 2 | 3 | 4 | 5 |
| 5. | In this team we take the time needed to develop new ideas | 1 | 2 | 3 | 4 | 5 |
| 6. | People in the team co-operate in order to help develop and apply new ideas | 1 | 2 | 3 | 4 | 5 |
| 7. | Members of the team provide and share resources to help in the application of new ideas | 1 | 2 | 3 | 4 | 5 |
| 8. | Team members provide practical support for new ideas and their application | 1 | 2 | 3 | 4 | 5 |

**PART 3: TEAM OBJECTIVES**

This part of the questionnaire is concerned with the objectives of your team. The following statements concern your understanding of your team's objectives. Circle the appropriate number to indicate how far each statement describes your team.

| | | Not at all | | | Somewhat | | | Comple-tely |
|---|---|---|---|---|---|---|---|---|
| 1. | How clear are you about what your team's objectives are? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. | To what extent do you think they are useful and appropriate objectives? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | Not at all | | | Somewhat | | | Comple-tely |
|---|---|---|---|---|---|---|---|---|
| 3. | How far are you in agreement with these objectives? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. | To what extent do you think other team members agree with these objectives? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5. | To what extent do you think your team's objectives are clearly understood by other members of the team? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6. | To what extent do you think your team's objectives can actually be achieved? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 7. | How worthwhile do you think these objectives are to you? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8. | How worthwhile do you think these objectives are to the team? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 9. | How worthwhile do you think these objectives are to the wider society? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 10. | To what extent do you think these objectives are realistic and can be attained? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 11. | To what extent do you think members of your team are committed to these objectives? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

**PART 4: TASK ORIENTATION**

This part is about how you feel the team monitors and appraises the work it does. Consider to what extent each of the following questions describes your team. Please circle the response which you think best describes your team.

| | | To a very little extent | | | To some extent | | | To a very great extent |
|---|---|---|---|---|---|---|---|---|
| 1. | Do your team colleagues provide useful ideas and practical help to enable you to do the job to the best of your ability? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. | Do you and your colleagues monitor each other so as to maintain a higher standard of work? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. | Are team members prepared to question the basis of what the team is doing? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | To a very little extent | | | To some extent | | | To a very great extent |
|---|---|---|---|---|---|---|---|---|
| 4. | Does the team critically appraise potential weaknesses in what it is doing in order to achieve the best possible outcome? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5. | Do members of the team build on each other's ideas in order to achieve the best possible outcome? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6. | Is there a real concern among team members that the team should achieve the highest standards of performance? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 7. | Does the team have clear criteria which members try to meet in order to achieve excellence as a team? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

***Primary Health Care Questionnaire***

# Appendix C: Demographic Questionnaire

## Demographic Data

1. Team Code: _____
2. Clinical Role? _____
3. Sex: □ Male □ Female
4. Years in Healthcare? _____ years
5. Years at Organization? _____ years
6. Length of time on current team/unit? _____

# Appendix D: Open-Ended Questions

## Questions

1. **Describe or list the tools you and your team use to manage information you work with on a day-to-day basis.** (*Examples might include the Lync system, EMRs, huddles, decision support systems, content development tools, and secure messaging*.)

2. **Do you think these tools help in the clinical decision making process? If so, how?**

3. **What are the top 3 tools used by your team the most.** *(#1 being the most used.)*

4. **Why do you think these are the top 3 used?**

5. **How is information shared or communicated between the core and peripheral teams** *(Psych, Social Work, Pharmacy, etc.)***?**

6. **What tool do you think is the best for sharing information** *(could be the one you use the most or* not) **- or - any ideas for something else that would be more useful?**

# Appendix E: Use of Copyright – Dr. Baggs

Subject : Re: Copyright Inquiry
Date : Mon, Sep 30, 2013 02:57 PM CDT
From : Judith Baggs
To : Lisa Simon

1.This looks fine. It resembles the team version I sent you. I would ask if you really want to say "decision" or "decisions." Unless you identify a specific decision you are interested in, the latter seems better.
2.Yes, you may put it in an application and IRB application, but please mark it copyright by Judith Baggs, not for distribution.

Best wishes,
Judith

Sent from my iPad

On Sep 30, 2013, at 10:51 AM, "Lisa Simon" wrote:

> Hi Dr. Baggs,
>
> I had a few questions for you in regard to our email conversation back in April:
>
> 1. In reviewing the different versions of the instrument, I was wondering if I might obtain permission to adjust the CSACD9team version with instructions to reflect interprofessional team collaboration during patient care instead of the team decision in transferring the patient. I have attached a draft copy of the suggested changes for your review/approval.
>
> 2. You indicated that I should not publish the instrument used. Would I be permitted to include the instrument in my initial proposal appendix (not published) and IRB application? I would not include the instrument in my dissertation that would be published. Please let me know if this is acceptable.
>
> Regards,
> Lisa
>
> Original E-mail
> From : Judith Baggs
> Date : 01/30/2013 09:13 AM
> To : Lisa Simon
> Subject : RE: Copyright Inquiry
>
> Dear Lisa,
> You are welcome to use my instrument. I have attached four versions of it, the original psychometric article, and a list of related references. I do have four requests:
> 1. If you want to make any revisions to one of these versions before using it, send your proposed revisions to me for approval before you use it.
> 2. Let me know what you find out.

3. If you publish, cite my work appropriately.
4. If you publish, do not publish the instrument so that I may maintain copyright and continue to share.

Best wishes,
Judith Baggs

# Appendix F: Use of Copyright – Dr. Neil Anderson

Subject : RE: Team Climate Inventory instrument
Date : Mon, Jun 24, 2013 07:43 AM CDT
From : Neil Anderson
To : Lisa Simon

Dear Lisa,

You are welcome to use the TCI for your study. Please see our downloadable papers below.

Best Regards,

***Neil Anderson, PhD***

From: Lisa Simon
Sent: 24 June 2013 12:43
To: Neil Anderson
Subject: Team Climate Inventory instrument

Hello Dr. Anderson,

I am in the initial process of requesting copyright permission to use the 44-item short-form version of the Team Climate Inventory instrument as part of my research for my dissertation at Walden University. I was provided your contact information from SHL.

I am currently working on my proposal. Once I identify the appropriate contacts to obtain permission and learn if it will be possible to use the instrument as part of my research, I will follow up with a formal letter of request for permission.

I thank you in advance for your input.

Best Regards,
Lisa

# Appendix G: Data Use Agreement

**DATA USE AGREEMENT**

This Data Use Agreement ("Agreement"), effective as of November 17, 2014 ("Effective Date"), is entered into by and between Lisa [redacted] ("Data Recipient") and Dr. [redacted] ("Data Provider"). The purpose of this Agreement is to provide Data Recipient with access to a Limited Data Set ("LDS") for use in research **in accord with laws and regulations of the governing bodies associated with the Data Provider, Data Recipient, and Data Recipient's educational program.** In the case of a discrepancy among laws, the agreement shall follow whichever law is more strict.

1. Definitions. Due to the study's affiliation with Laureate, a USA-based company, unless otherwise specified in this Agreement, all capitalized terms used in this Agreement not otherwise defined have the meaning established for purposes of the USA "HIPAA Regulations" and/or "FERPA Regulations" codified in the United States Code of Federal Regulations, as amended from time to time.

2. Preparation of the LDS. Data Provider shall prepare and furnish to Data Recipient a LDS in accord with any applicable laws and regulations of the governing bodies associated with the Data Provider, Data Recipient, and Data Recipient's educational program.

3. Data Fields in the LDS. **No direct identifiers such as names may be included in the Limited Data Set (LDS).** In preparing the LDS, Data Provider shall include the **data fields specified as follows,** which are the minimum necessary to accomplish the research:
   - Clinical Role
   - Years in Healthcare
   - Years at the Organization
   - Length of time on current team/unit
   - Team ID
   - Likert-scale results from Collaboration and Satisfaction about Care Decisions (CSACD) and Team Climate Inventory (TCI) survey tools
   - Responses to Open-Ended Questions

4. Responsibilities of Data Recipient. Data Recipient agrees to:

   a. Use or disclose the LDS only as permitted by this Agreement or as required by law;

   b. Use appropriate safeguards to prevent use or disclosure of the LDS other than as permitted by this Agreement or required by law;

   c. Report to Data Provider any use or disclosure of the LDS of which it becomes aware that is not permitted by this Agreement or required by law;

d. Require any of its subcontractors or agents that receive or have access to the LDS to agree to the same restrictions and conditions on the use and/or disclosure of the LDS that apply to Data Recipient under this Agreement; and

e. Not use the information in the LDS to identify or contact the individuals who are data subjects.

5. Permitted Uses and Disclosures of the LDS. Data Recipient may use and/or disclose the LDS **for its Research activities only.**

6. Term and Termination.

a. Term. The term of this Agreement shall commence as of the Effective Date and shall continue for so long as Data Recipient retains the LDS, unless sooner terminated as set forth in this Agreement.

b. Termination by Data Recipient. Data Recipient may terminate this agreement at any time by notifying the Data Provider and returning or destroying the LDS.

c. Termination by Data Provider. Data Provider may terminate this agreement at any time by providing thirty (30) days prior written notice to Data Recipient.

d. For Breach. Data Provider shall provide written notice to Data Recipient within ten (10) days of any determination that Data Recipient has breached a material term of this Agreement. Data Provider shall afford Data Recipient an opportunity to cure said alleged material breach upon mutually agreeable terms. Failure to agree on mutually agreeable terms for cure within thirty (30) days shall be grounds for the immediate termination of this Agreement by Data Provider.

e. Effect of Termination. Sections 1, 4, 5, 6(e) and 7 of this Agreement shall survive any termination of this Agreement under subsections c or d.

7. Miscellaneous.

a. Change in Law. The parties agree to negotiate in good faith to amend this Agreement to comport with changes in federal law that materially alter either or both parties' obligations under this Agreement. Provided however, that if the parties are unable to agree to mutually acceptable amendment(s) by the compliance date of the change in applicable law or regulations, either Party may terminate this Agreement as provided in section 6.

b. Construction of Terms. The terms of this Agreement shall be construed to give effect to applicable federal interpretative guidance regarding the HIPAA Regulations.

c. No Third Party Beneficiaries. Nothing in this Agreement shall confer upon any person other than the parties and their respective successors or assigns, any rights, remedies, obligations, or liabilities whatsoever.

d. Counterparts. This Agreement may be executed in one or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

e. Headings. The headings and other captions in this Agreement are for convenience and reference only and shall not be used in interpreting, construing or enforcing any of the provisions of this Agreement.

IN WITNESS WHEREOF, each of the undersigned has caused this Agreement to be duly executed in its name and on its behalf.

| **DATA PROVIDER** | **DATA RECIPIENT** |
|---|---|
| Signed | Signed: [redacted] |
| Print Name: [redacted] MD | Print Name: [redacted] |
| Print Title: VA Quality Scholar | Print Title: [redacted] |

# Appendix H: CSACD & TCI Demographical Statistics.

## CSACD Demographical Statistics

| | *CSACD5* |
|---|---|
| count | 29 |
| mean | 5.45 |
| sample variance | 3.54 |
| sample standard deviation | 1.88 |
| minimum | 1 |
| maximum | 7 |
| range | 6 |

| | *CSACD6* |
|---|---|
| count | 29 |
| mean | 5.28 |
| sample variance | 3.56 |
| sample standard deviation | 1.89 |
| minimum | 1 |
| maximum | 7 |
| range | 6 |

| | *CSACD7* |
|---|---|
| count | 29 |
| mean | 5.14 |
| sample variance | 3.34 |
| sample standard deviation | 1.83 |
| minimum | 1 |
| maximum | 7 |
| range | 6 |

| | *CSACD8* |
|---|---|
| count | 29 |
| mean | 5.31 |
| sample variance | 2.29 |
| sample standard deviation | 1.51 |
| minimum | 2 |
| maximum | 7 |
| range | 5 |

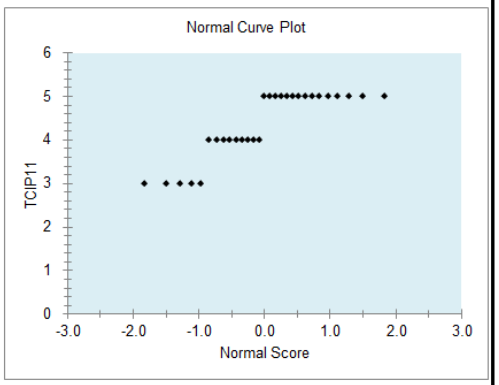
| | *CSACD9* |
|---|---|
| count | 28 |
| mean | 5.57 |
| sample variance | 2.77 |
| sample standard deviation | 1.67 |
| minimum | 2 |
| maximum | 7 |
| range | 5 |

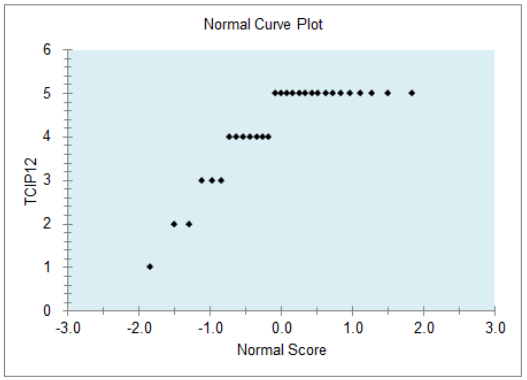
# TCI Part I Demographical Statistics

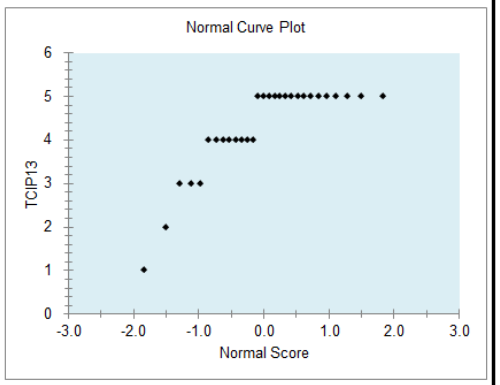
**Descriptive statistics**

**Part 1**

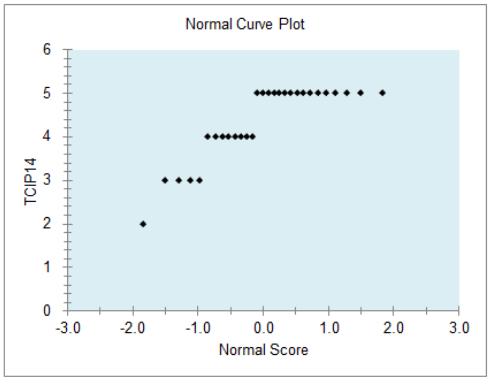
| | TCIP11 | TCIP12 | TCIP13 |
|---|---|---|---|
| count | 29 | 29 | 29 |
| mean | 4.34 | 4.21 | 4.28 |
| sample variance | 0.59 | 1.24 | 1.06 |
| sample standard deviation | 0.77 | 1.11 | 1.03 |
| minimum | 3 | 1 | 1 |
| maximum | 5 | 5 | 5 |
| range | 2 | 4 | 4 |
| skewness | -0.70 | -1.44 | -1.65 |
| kurtosis | -0.91 | 1.41 | 2.69 |
| coefficient of variation (CV) | 17.70% | 26.48% | 24.12% |
| 1st quartile | 4.00 | 4.00 | 4.00 |
| median | 5.00 | 5.00 | 5.00 |
| 3rd quartile | 5.00 | 5.00 | 5.00 |
| interquartile range | 1.00 | 1.00 | 1.00 |
| mode | 5.00 | 5.00 | 5.00 |
| low extremes | 0 | 0 | 0 |
| low outliers | 0 | 3 | 2 |
| high outliers | 0 | 0 | 0 |
| high extremes | 0 | 0 | 0 |



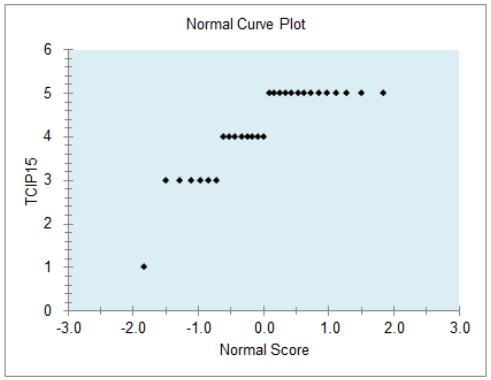



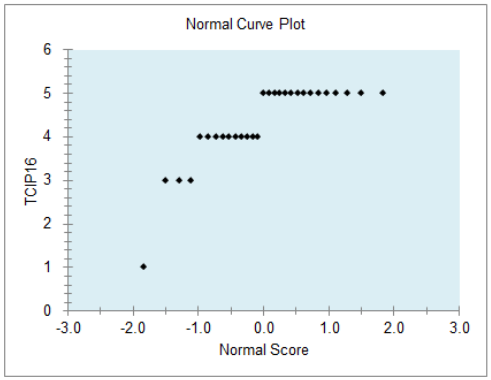
| | TCIP14 |
|---|---|
| count | 29 |
| mean | 4.34 |
| sample variance | 0.73 |
| sample standard deviation | 0.86 |
| minimum | 2 |
| maximum | 5 |
| range | 3 |
| | |
| skewness | -1.13 |
| kurtosis | 0.46 |
| coefficient of variation (CV) | 19.72% |
| | |
| 1st quartile | 4.00 |
| median | 5.00 |
| 3rd quartile | 5.00 |
| interquartile range | 1.00 |
| mode | 5.00 |
| | |
| low extremes | 0 |
| low outliers | 1 |
| high outliers | 0 |
| high extremes | 0 |



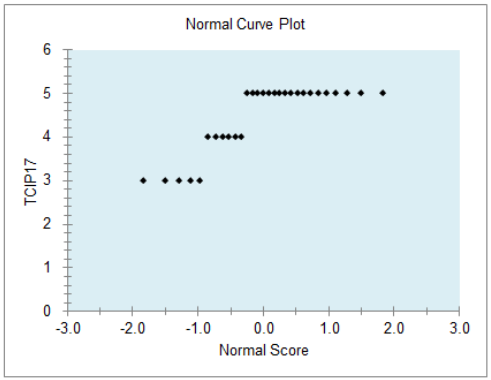

| | TCIP15 |
|---|---|
| count | 29 |
| mean | 4.17 |
| sample variance | 1.00 |
| sample standard deviation | 1.00 |
| minimum | 1 |
| maximum | 5 |
| range | 4 |
| | |
| skewness | -1.28 |
| kurtosis | 1.87 |
| coefficient of variation (CV) | 24.03% |
| | |
| 1st quartile | 4.00 |
| median | 4.00 |
| 3rd quartile | 5.00 |
| interquartile range | 1.00 |
| mode | 5.00 |
| | |
| low extremes | 0 |
| low outliers | 1 |
| high outliers | 0 |
| high extremes | 0 |



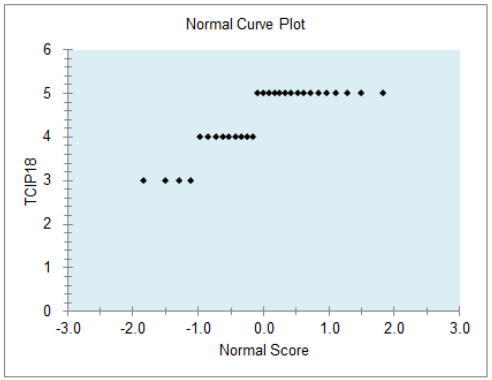

| | TCIP16 |
|---|---|
| count | 29 |
| mean | 4.31 |
| sample variance | 0.86 |
| sample standard deviation | 0.93 |
| minimum | 1 |
| maximum | 5 |
| range | 4 |
| | |
| skewness | -1.83 |
| kurtosis | 4.49 |
| coefficient of variation (CV) | 21.57% |
| | |
| 1st quartile | 4.00 |
| median | 5.00 |
| 3rd quartile | 5.00 |
| interquartile range | 1.00 |
| mode | 5.00 |
| | |
| low extremes | 0 |
| low outliers | 1 |
| high outliers | 0 |
| high extremes | 0 |



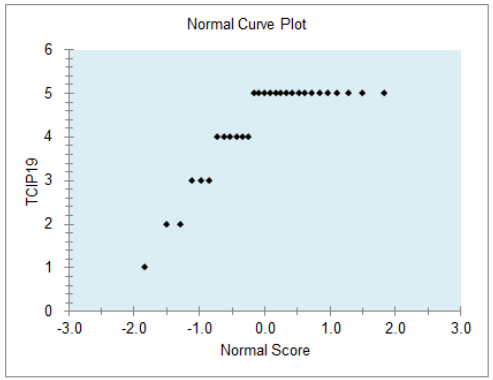
| | TCIP17 |
|---|---|
| count | 29 |
| mean | 4.45 |
| sample variance | 0.61 |
| sample standard deviation | 0.78 |
| minimum | 3 |
| maximum | 5 |
| range | 2 |
| skewness | -1.01 |
| kurtosis | -0.54 |
| coefficient of variation (CV) | 17.61% |
| 1st quartile | 4.00 |
| median | 5.00 |
| 3rd quartile | 5.00 |
| interquartile range | 1.00 |
| mode | 5.00 |
| low extremes | 0 |
| low outliers | 0 |
| high outliers | 0 |
| high extremes | 0 |



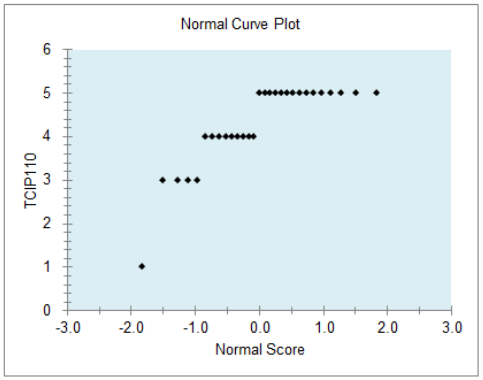

| | TCIP18 |
|---|---|
| count | 29 |
| mean | 4.41 |
| sample variance | 0.54 |
| sample standard deviation | 0.73 |
| minimum | 3 |
| maximum | 5 |
| range | 2 |
| skewness | -0.85 |
| kurtosis | -0.57 |
| coefficient of variation (CV) | 16.60% |
| 1st quartile | 4.00 |
| median | 5.00 |
| 3rd quartile | 5.00 |
| interquartile range | 1.00 |
| mode | 5.00 |
| low extremes | 0 |
| low outliers | 0 |
| high outliers | 0 |
| high extremes | 0 |



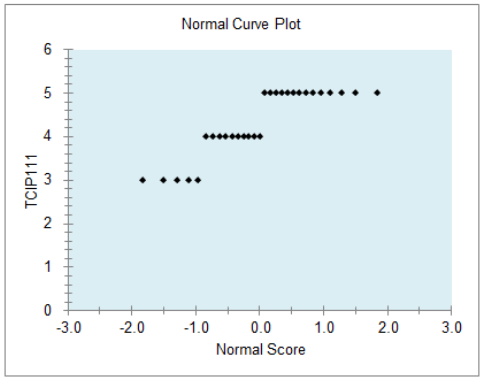

| | TCIP19 |
|---|---|
| count | 29 |
| mean | 4.24 |
| sample variance | 1.26 |
| sample standard deviation | 1.12 |
| minimum | 1 |
| maximum | 5 |
| range | 4 |
| skewness | -1.49 |
| kurtosis | 1.48 |
| coefficient of variation (CV) | 26.48% |
| 1st quartile | 4.00 |
| median | 5.00 |
| 3rd quartile | 5.00 |
| interquartile range | 1.00 |
| mode | 5.00 |
| low extremes | 0 |
| low outliers | 3 |
| high outliers | 0 |
| high extremes | 0 |



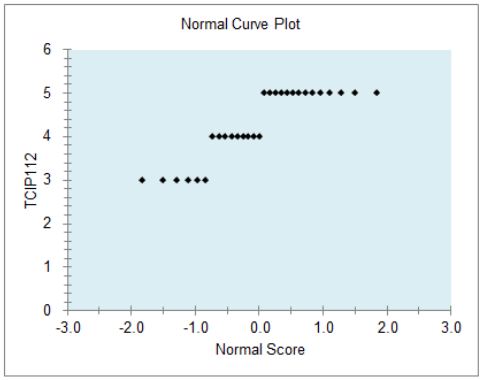
| | TCIP110 |
|---|---|
| count | 29 |
| mean | 4.28 |
| sample variance | 0.92 |
| sample standard deviation | 0.96 |
| minimum | 1 |
| maximum | 5 |
| range | 4 |
| | |
| skewness | -1.65 |
| kurtosis | 3.43 |
| coefficient of variation (CV) | 22.45% |
| | |
| 1st quartile | 4.00 |
| median | 5.00 |
| 3rd quartile | 5.00 |
| interquartile range | 1.00 |
| mode | 5.00 |
| | |
| low extremes | 0 |
| low outliers | 1 |
| high outliers | 0 |
| high extremes | 0 |




| | TCIP111 |
|---|---|
| count | 29 |
| mean | 4.31 |
| sample variance | 0.58 |
| sample standard deviation | 0.76 |
| minimum | 3 |
| maximum | 5 |
| range | 2 |
| | |
| skewness | -0.61 |
| kurtosis | -0.97 |
| coefficient of variation (CV) | 17.65% |
| | |
| 1st quartile | 4.00 |
| median | 4.00 |
| 3rd quartile | 5.00 |
| interquartile range | 1.00 |
| mode | 5.00 |
| | |
| low extremes | 0 |
| low outliers | 0 |
| high outliers | 0 |
| high extremes | 0 |




| | TCIP112 |
|---|---|
| count | 29 |
| mean | 4.28 |
| sample variance | 0.64 |
| sample standard deviation | 0.80 |
| minimum | 3 |
| maximum | 5 |
| range | 2 |
| | |
| skewness | -0.56 |
| kurtosis | -1.18 |
| coefficient of variation (CV) | 18.64% |
| | |
| 1st quartile | 4.00 |
| median | 4.00 |
| 3rd quartile | 5.00 |
| interquartile range | 1.00 |
| mode | 5.00 |
| | |
| low extremes | 0 |
| low outliers | 0 |
| high outliers | 0 |
| high extremes | 0 |



# TCI Part II Demographical Statistics

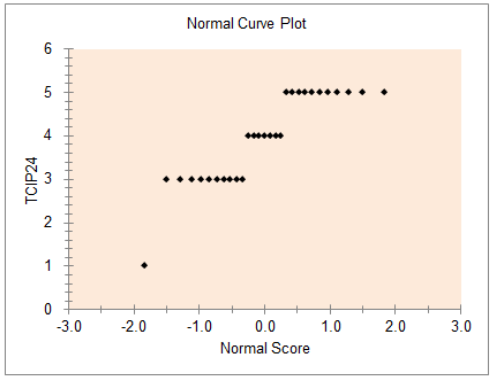
**Descriptive statistics**

**Part 2**

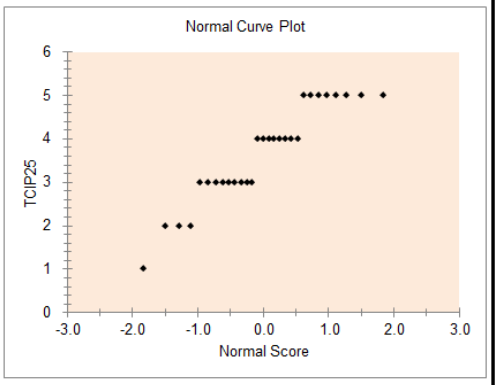
| | TCIP21 | TCIP22 | TCIP23 |
|---|---|---|---|
| count | 29 | 29 | 29 |
| mean | 4.14 | 4.00 | 3.97 |
| sample variance | 0.69 | 1.14 | 1.03 |
| sample standard deviation | 0.83 | 1.07 | 1.02 |
| minimum | 2 | 1 | 1 |
| maximum | 5 | 5 | 5 |
| range | 3 | 4 | 4 |
| skewness | -0.67 | -1.13 | -1.02 |
| kurtosis | -0.11 | 0.99 | 1.15 |
| coefficient of variation (CV) | 20.14% | 26.73% | 25.65% |
| 1st quartile | 4.00 | 4.00 | 3.00 |
| median | 4.00 | 4.00 | 4.00 |
| 3rd quartile | 5.00 | 5.00 | 5.00 |
| interquartile range | 1.00 | 1.00 | 2.00 |
| mode | 4.00 | 4.00 | 4.00 |
| low extremes | 0 | 0 | 0 |
| low outliers | 1 | 3 | 0 |
| high outliers | 0 | 0 | 0 |
| high extremes | 0 | 0 | 0 |



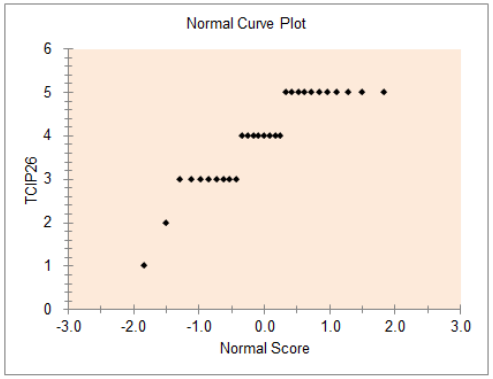
| | TCIP24 |
|---|---|
| count | 29 |
| mean | 3.93 |
| sample variance | 1.07 |
| sample standard deviation | 1.03 |
| minimum | 1 |
| maximum | 5 |
| range | 4 |
| skewness | -0.69 |
| kurtosis | 0.37 |
| coefficient of variation (CV) | 26.27% |
| 1st quartile | 3.00 |
| median | 4.00 |
| 3rd quartile | 5.00 |
| interquartile range | 2.00 |
| mode | 5.00 |
| low extremes | 0 |
| low outliers | 0 |
| high outliers | 0 |
| high extremes | 0 |



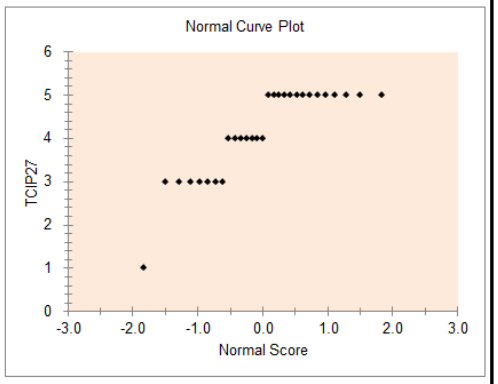

| | TCIP25 |
|---|---|
| count | 29 |
| mean | 3.66 |
| sample variance | 1.23 |
| sample standard deviation | 1.11 |
| minimum | 1 |
| maximum | 5 |
| range | 4 |
| skewness | -0.42 |
| kurtosis | -0.44 |
| coefficient of variation (CV) | 30.39% |
| 1st quartile | 3.00 |
| median | 4.00 |
| 3rd quartile | 5.00 |
| interquartile range | 2.00 |
| mode | 3.00 |
| low extremes | 0 |
| low outliers | 0 |
| high outliers | 0 |
| high extremes | 0 |




| | TCIP26 |
|---|---|
| count | 29 |
| mean | 3.93 |
| sample variance | 1.14 |
| sample standard deviation | 1.07 |
| minimum | 1 |
| maximum | 5 |
| range | 4 |
| skewness | -0.80 |
| kurtosis | 0.34 |
| coefficient of variation (CV) | 27.14% |
| 1st quartile | 3.00 |
| median | 4.00 |
| 3rd quartile | 5.00 |
| interquartile range | 2.00 |
| mode | 5.00 |
| low extremes | 0 |
| low outliers | 0 |
| high outliers | 0 |
| high extremes | 0 |



| | TCIP27 |
|---|---|
| count | 29 |
| mean | 4.14 |
| sample variance | 1.05 |
| sample standard deviation | 1.03 |
| minimum | 1 |
| maximum | 5 |
| range | 4 |
| | |
| skewness | -1.15 |
| kurtosis | 1.31 |
| coefficient of variation (CV) | 24.78% |
| | |
| 1st quartile | 3.00 |
| median | 4.00 |
| 3rd quartile | 5.00 |
| interquartile range | 2.00 |
| mode | 5.00 |
| | |
| low extremes | 0 |
| low outliers | 0 |
| high outliers | 0 |
| high extremes | 0 |



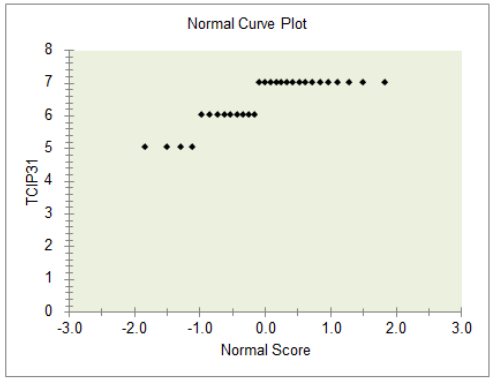

| | TCIP28 |
|---|---|
| count | 29 |
| mean | 4.03 |
| sample variance | 1.03 |
| sample standard deviation | 1.02 |
| minimum | 1 |
| maximum | 5 |
| range | 4 |
| | |
| skewness | -0.95 |
| kurtosis | 0.97 |
| coefficient of variation (CV) | 25.21% |
| | |
| 1st quartile | 3.00 |
| median | 4.00 |
| 3rd quartile | 5.00 |
| interquartile range | 2.00 |
| mode | 5.00 |
| | |
| low extremes | 0 |
| low outliers | 0 |
| high outliers | 0 |
| high extremes | 0 |

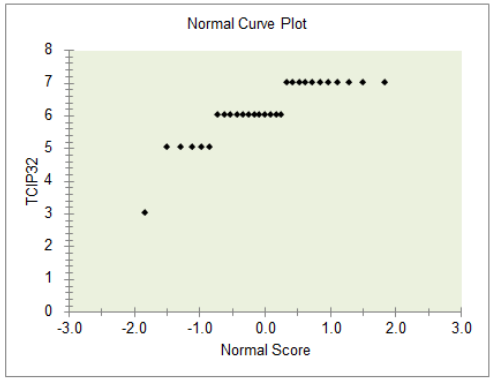
# TCI Part III Demographical Statistics

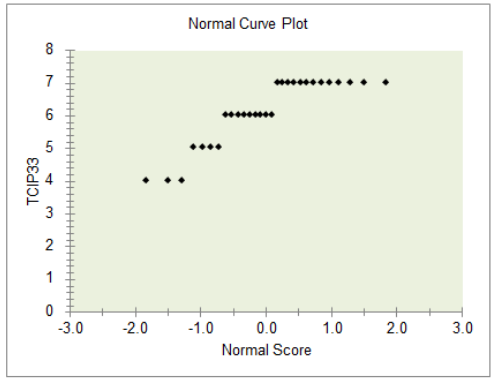
**Descriptive statistics**

**Part 3**

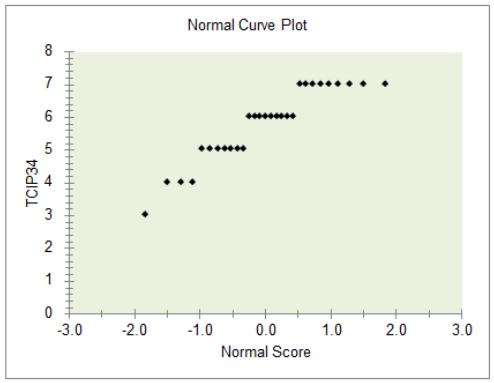
| | TCIP31 | TCIP32 | TCIP33 |
|---|---|---|---|
| count | 29 | 29 | 29 |
| mean | 6.41 | 6.10 | 6.10 |
| sample variance | 0.54 | 0.88 | 1.02 |
| sample standard deviation | 0.73 | 0.94 | 1.01 |
| minimum | 5 | 3 | 4 |
| maximum | 7 | 7 | 7 |
| range | 2 | 4 | 3 |
| skewness | -0.85 | -1.33 | -0.89 |
| kurtosis | -0.57 | 2.76 | -0.27 |
| coefficient of variation (CV) | 11.42% | 15.39% | 16.58% |
| 1st quartile | 6.00 | 6.00 | 6.00 |
| median | 7.00 | 6.00 | 6.00 |
| 3rd quartile | 7.00 | 7.00 | 7.00 |
| interquartile range | 1.00 | 1.00 | 1.00 |
| mode | 7.00 | 6.00 | 7.00 |
| low extremes | 0 | 0 | 0 |
| low outliers | 0 | 1 | 3 |
| high outliers | 0 | 0 | 0 |
| high extremes | 0 | 0 | 0 |



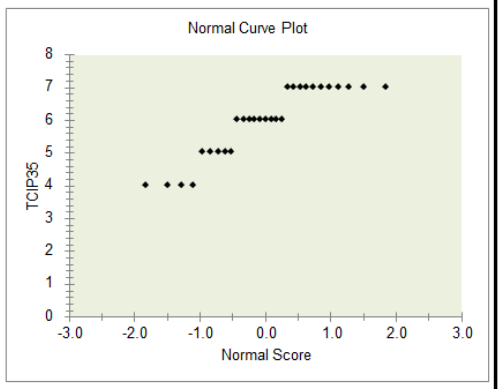



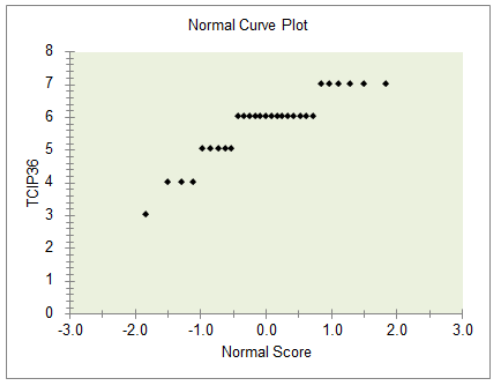
| | TCIP34 |
|---|---|
| count | 29 |
| mean | 5.76 |
| sample variance | 1.26 |
| sample standard deviation | 1.12 |
| minimum | 3 |
| maximum | 7 |
| range | 4 |
| | |
| skewness | -0.62 |
| kurtosis | -0.28 |
| coefficient of variation (CV) | 19.50% |
| | |
| 1st quartile | 5.00 |
| median | 6.00 |
| 3rd quartile | 7.00 |
| interquartile range | 2.00 |
| mode | 6.00 |
| | |
| low extremes | 0 |
| low outliers | 0 |
| high outliers | 0 |
| high extremes | 0 |



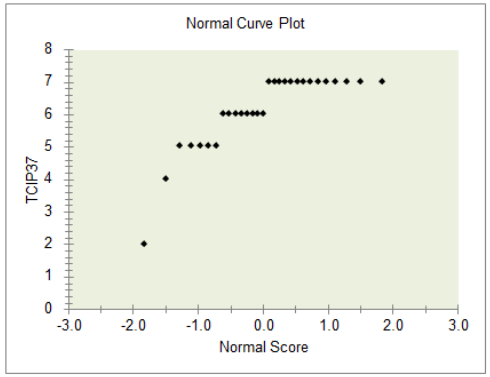

| | TCIP35 |
|---|---|
| count | 29 |
| mean | 5.93 |
| sample variance | 1.14 |
| sample standard deviation | 1.07 |
| minimum | 4 |
| maximum | 7 |
| range | 3 |
| | |
| skewness | -0.61 |
| kurtosis | -0.83 |
| coefficient of variation (CV) | 17.99% |
| | |
| 1st quartile | 5.00 |
| median | 6.00 |
| 3rd quartile | 7.00 |
| interquartile range | 2.00 |
| mode | 7.00 |
| | |
| low extremes | 0 |
| low outliers | 0 |
| high outliers | 0 |
| high extremes | 0 |



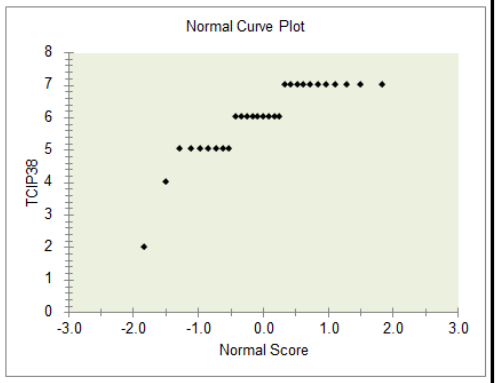

| | TCIP36 |
|---|---|
| count | 29 |
| mean | 5.72 |
| sample variance | 1.06 |
| sample standard deviation | 1.03 |
| minimum | 3 |
| maximum | 7 |
| range | 4 |
| | |
| skewness | -0.86 |
| kurtosis | 0.52 |
| coefficient of variation (CV) | 18.02% |
| | |
| 1st quartile | 5.00 |
| median | 6.00 |
| 3rd quartile | 6.00 |
| interquartile range | 1.00 |
| mode | 6.00 |
| | |
| low extremes | 0 |
| low outliers | 1 |
| high outliers | 0 |
| high extremes | 0 |



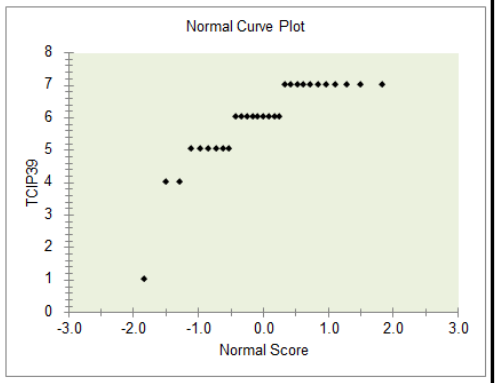
| | TCIP37 |
|---|---|
| count | 29 |
| mean | 6.10 |
| sample variance | 1.38 |
| sample standard deviation | 1.18 |
| minimum | 2 |
| maximum | 7 |
| range | 5 |
| | |
| skewness | -1.77 |
| kurtosis | 4.06 |
| coefficient of variation (CV) | 19.26% |
| | |
| 1st quartile | 6.00 |
| median | 6.00 |
| 3rd quartile | 7.00 |
| interquartile range | 1.00 |
| mode | 7.00 |
| | |
| low extremes | 1 |
| low outliers | 1 |
| high outliers | 0 |
| high extremes | 0 |



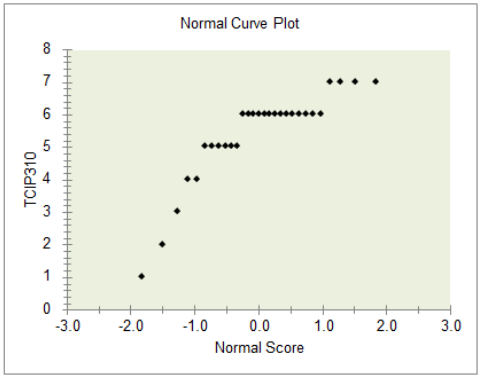

| | TCIP38 |
|---|---|
| count | 29 |
| mean | 5.93 |
| sample variance | 1.35 |
| sample standard deviation | 1.16 |
| minimum | 2 |
| maximum | 7 |
| range | 5 |
| | |
| skewness | -1.47 |
| kurtosis | 3.24 |
| coefficient of variation (CV) | 19.61% |
| | |
| 1st quartile | 5.00 |
| median | 6.00 |
| 3rd quartile | 7.00 |
| interquartile range | 2.00 |
| mode | 7.00 |
| | |
| low extremes | 0 |
| low outliers | 0 |
| high outliers | 0 |
| high extremes | 0 |



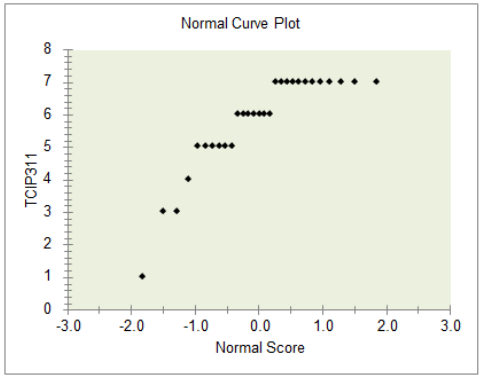

| | TCIP39 |
|---|---|
| count | 29 |
| mean | 5.86 |
| sample variance | 1.77 |
| sample standard deviation | 1.33 |
| minimum | 1 |
| maximum | 7 |
| range | 6 |
| | |
| skewness | -1.89 |
| kurtosis | 5.23 |
| coefficient of variation (CV) | 22.67% |
| | |
| 1st quartile | 5.00 |
| median | 6.00 |
| 3rd quartile | 7.00 |
| interquartile range | 2.00 |
| mode | 7.00 |
| | |
| low extremes | 0 |
| low outliers | 1 |
| high outliers | 0 |
| high extremes | 0 |



| | TCIP310 |
|---|---|
| count | 29 |
| mean | 5.38 |
| sample variance | 2.03 |
| sample standard deviation | 1.42 |
| minimum | 1 |
| maximum | 7 |
| range | 6 |
| | |
| skewness | -1.61 |
| kurtosis | 2.75 |
| coefficient of variation (CV) | 26.48% |
| | |
| 1st quartile | 5.00 |
| median | 6.00 |
| 3rd quartile | 6.00 |
| interquartile range | 1.00 |
| mode | 6.00 |
| | |
| low extremes | 1 |
| low outliers | 2 |
| high outliers | 0 |
| high extremes | 0 |




| | TCIP311 |
|---|---|
| count | 29 |
| mean | 5.76 |
| sample variance | 2.26 |
| sample standard deviation | 1.50 |
| minimum | 1 |
| maximum | 7 |
| range | 6 |
| | |
| skewness | -1.52 |
| kurtosis | 2.44 |
| coefficient of variation (CV) | 26.11% |
| | |
| 1st quartile | 5.00 |
| median | 6.00 |
| 3rd quartile | 7.00 |
| interquartile range | 2.00 |
| mode | 7.00 |
| | |
| low extremes | 0 |
| low outliers | 1 |
| high outliers | 0 |
| high extremes | 0 |



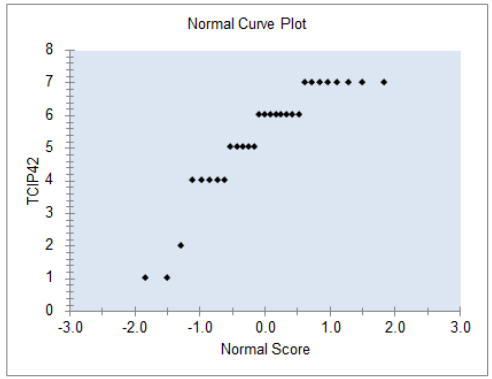
# TCI Part IV Demographical Statistics

**Descriptive statistics**

**Part 4**

| | TCIP41 |
|---|---|
| count | 29 |
| mean | 5.62 |
| sample variance | 2.74 |
| sample standard deviation | 1.66 |
| minimum | 1 |
| maximum | 7 |
| range | 6 |
| | |
| skewness | -1.52 |
| kurtosis | 2.39 |
| coefficient of variation (CV) | 29.47% |
| | |
| 1st quartile | 5.00 |
| median | 6.00 |
| 3rd quartile | 7.00 |
| interquartile range | 2.00 |
| mode | 7.00 |
| | |
| low extremes | 0 |
| low outliers | 2 |
| high outliers | 0 |
| high extremes | 0 |


| | TCIP42 |
|---|---|
| count | 29 |
| mean | 5.28 |
| sample variance | 2.99 |
| sample standard deviation | 1.73 |
| minimum | 1 |
| maximum | 7 |
| range | 6 |
| | |
| skewness | -1.17 |
| kurtosis | 0.95 |
| coefficient of variation (CV) | 32.79% |
| | |
| 1st quartile | 4.00 |
| median | 6.00 |
| 3rd quartile | 7.00 |
| interquartile range | 3.00 |
| mode | 7.00 |
| | |
| low extremes | 0 |
| low outliers | 0 |
| high outliers | 0 |
| high extremes | 0 |




| | TCIP43 |
|---|---|
| count | 29 |
| mean | 5.52 |
| sample variance | 2.33 |
| sample standard deviation | 1.53 |
| minimum | 1 |
| maximum | 7 |
| range | 6 |
| | |
| skewness | -1.04 |
| kurtosis | 1.03 |
| coefficient of variation (CV) | 27.67% |
| | |
| 1st quartile | 4.00 |
| median | 6.00 |
| 3rd quartile | 7.00 |
| interquartile range | 3.00 |
| mode | 7.00 |
| | |
| low extremes | 0 |
| low outliers | 0 |
| high outliers | 0 |
| high extremes | 0 |