DISSERTATION

CHARACTERIZING MEDICAL AND NURSING STUDENT COMMUNICATION USING VERBAL LISTENING BEHAVIORS AND CLOSED LOOPS IN SIMULATED HEALTH CARE DELIVERY

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ABSTRACT

CHARACTERIZING MEDICAL AND NURSING STUDENT COMMUNICATION USING VERBAL LISTENING BEHAVIORS AND CLOSED LOOPS IN SIMULATED HEALTH CARE DELIVERY

Few issues are more unsettling than the persistent threats to patient safety from medical errors; communication failure among providers is among the leading causes for medical errors (The Joint Commission, 2012). Significant reduction of medical errors is constrained by a lack of understanding for the causes of communication failure; the bulk of knowledge about communication failure is known after such failures result in medical errors. The problem addressed in this dissertation is the lack of tools to study provider-provider communication in progress. The study included here aims to demonstrate one means by which provider-provider communication can be successfully characterized.

Few studies of provider-provider communication during care delivery have been conducted. Some understanding of information exchanges has been provided from studies by communication and listening scholars in health care and in other fields where precise communication is essential. However researchers lack the ability to recognize the specific components in an information exchange between two or more providers that indicate communication has succeeded or failed. These conditions leave new studies without testable theories and offer no reasonable basis for hypotheses about communication failure.

This study employed an exploratory inquiry strategy and leveraged verbal listening behaviors in closed loop communication (CLC) to identify characteristics of communciation. Observations were conducted of medical (MD) and nursing (RN) student teams managing Emergency

Medicine (EM) simulations. Observers accessed the videotaped EM encounters at the Center for Advancing Professional Excellenec (CAPE) at the University of Colorado Denver's Anschutz Medical Campus (UC/AMC). Students' verbal listening behaviors were used to characterize their exchanges of information; CLC provided a framework to identify and position the listening behaviors in exchanges of information.

This study had three goals, which were revised based on learning gained from the study.

1. To identify specific steps in provider-provider exchanges of information where communication succeeds and fails--is revised to--To characterize the exchanges of information among the MD and RN student teams during simulated care delivery
2. To describe the characteristics of communication sufficiently to assess outcomes of communication loops not being closed--is deleted as data gathered did not support this goal and the goal was determined to exceed the scope of the study.
3. To recommend hypotheses to study to inform providers' communication curriculum, professional development, and subsequent research--The exploration and data supported this goal and it was retained. Hypotheses for future studies are detailed.

Competencies and decision-making: Hypothesis One. There is a negative correlation between students' demonstration of specific communication competencies and specific clinical decision-making competencies in the same simulation of care delivery. Researchers should consider study participants' level of communication education and/or practice experience when deciding the type and number of competencies to be evaluated in the study.

Level of communication skill and competencies: Hypothesis Two. There is no relationship between IP teams whose members are closely matched with respect to their level of acquired communication skill and their ability to demonstrate communication competencies. The data

suggests that researchers should minimize disparities among study participants' education and/or practice experience.

Nonverbal behaviors: Hypothesis Three. There is no relationship between nonverbal behaviors and the ability to more thoroughly identify the contributing factors for successful and unsuccessful communication. This study and the literature make a case for nonverbal behaviors to supplement, expand, and give clues to underlying issues in the associated verbal behaviors.

Hypothesis Four. There is no relationship between increasing acuity of the care delivery encounter and the number of information exchanges that end in closed loops. Provider-provider observational studies demonstrate as acuity of the condition being treated increases participants' listening behaviors increase and, in some cases, communication competency declines.

Educators and providers need precise understandings of communication failure to confidently advise changes to curriculum and practice and produce the health professions work force to deliver that care.

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Gwyn Barley inspired the entire dissertation, from introducing me to patient safety issues in 2005 and to interprofessional education (IPE) in 2011 and for opening the way to the CAPE as my research site. I sometimes "blamed her" as well when sleep deprivation and momentary lapses in clarity stalled my work!

My advisor, Carole Makela, orchestrated the entire process: she guided, cajoled, affirmed, informed, and somehow knew exactly when to contribute and when to leave me to make my own discoveries. Carole provided an irresistible standard for thinking, researching, and writing that is the reason I have arrived at completion.

Friends, at Regis University and in my personal life, supported me and warmly, humorously urged me along; my family tolerated my absences from or short stays at gatherings. My observers, Shimaa Basha and Malia Crouse, deserve a special thanks for attention to our work every bit as committed and vigilant as mine. The "support group" of Ph.D. candidates at CSU regularly supported, critiqued, and inspired my work.

I hope you all know how very deeply I appreciate your support and many contributions.

DEDICATION

Two people held unique, inspiring roles through the entire Ph.D. process, my father, Ralph Rosser and my wife, Mary Cook, and to them I dedicate this work.

My father gave me curiosity and the intellectual strength to pursue and complete the Ph.D. Dad would have drawn genuine pleasure from my rambling verbal explorations of new concepts, vexing questions, and occasional dead ends; he would have happily given it right back, with his own propensity for the same behaviors. I regularly stopped to imagine how he would have aided my progress, from his powerful intellect, enthusiasm for learning, and his faith. I missed him terribly, then and now.

Mary made innumerable sacrifices so I had time for the work. Her gifts were a steady outlook, endless patience with the Ph.D. process and how I experienced it, and unconditional love and support for me. She listened to me, comforted me, made me accountable for my words and actions, and, when the time was right, would just leave me alone.

Mary now gets as much of the time I will have from completing the Ph.D. as I can possibly give her.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE: INTRODUCTION

> I don't think that crashing a 727 jet every day and killing everybody aboard is a good standard of care in U.S. hospitals. If that happened in aviation, they would shut the airlines down (Sternberg, 2012, para. 4).

Few issues in health care delivery are more unsettling than the persistent threats to patient safety from medical errors. Care delivery remains burdened by providers' errors that lead to inadequate or incorrect care, temporary or permanent injury, and death (Hannawa, Beckman, Mazor, Paul, & Ramsey, 2013; Sternberg, 2012). The Joint Commission (TJC) (2012, 2014) has formalized unexpected occurrences as *sentinel events* to focus attention on and track conditions that lead to injury or death (The Joint Commission, 2012, 2014). However, "The terms 'sentinel event' and 'error' are not synonymous; not all sentinel events occur because of an error, and not all errors result in sentinel events (Comprehensive Accreditation Manual for Hospital, January, 2013).

This acknowledgement from the TJC is cause for ongoing concern: "Data Limitations: The reporting of most sentinel events to The Joint Commission is voluntary and represents only a small proportion of actual events" (The Joint Commission, 2015, p. 1). Information on the number of injuries, reported and unreported, remains uncertain. Recent studies of the root causes for sentinel events in health care show communication failure is no less than the fourth-ranked cause (The Joint Commission, 2012, 2014; Singh et al., 2008). In 21 types of tracked sentinel events, communication failure was the third or higher cause in 15 of the events (Commission, 2012). "Poor communication is the leading cause of preventable adverse events in hospitals, as well as a major root cause of sentinel events" (Manojlovich et al., 2014).

Health care professionals and the general public can be perplexed by the facts about errors caused by communication failure when weighed against Shipley's (2010) assertion that,

"Listening is likely the most ancient of health care skills. It is a critical component of all aspects of…care and is necessary for meaningful interactions with patients" (p. 126). Nevertheless researchers "…have yet to identify particular communication behaviors or competencies that reduce patient safety and lead to medical errors" (Parker-Raley, 2012, p. 103). Significant advances in research, technology, and knowledge bases fall short of consistently transcending the human tendency to misspeak or misinterpret spoken words.

The Problem

The problem addressed in this dissertation is the lack of tools to study provider-provider communication in progress. The study included here aims to demonstrate one means by which provider-provider communication can be successfully characterized.

Numerous studies have been conducted to identify the type and etiology of medical errors; error rates have fallen substantially since 2012 from research and numerous government and provider error-reduction initiatives, but the number of errors remains at troubling levels (Singh et al., 2008; Singh, 2014; Sternberg, 2012). The health care communication literature is substantial in volume, dominated by studies of patient-physicians encounters and studies that inform government- and provider-driven initiatives on rationalizing care delivery processes and re-training personnel who contribute to errors (Arford, 2005; Interprofessional Education Collaborative, 2011b; Lingard et al., 2004). Additional studies are needed to describe specific communication contexts to examine components of provider-provider communication during care delivery (Bavelas & Gerwing, 2011; Bodie, 2013).

The focus of new efforts to reduce medical errors is primarily on providers' communication with each other (Singh et al., 2008). Research into provider-provider communication is sparse

and new studies are enthusiastically welcomed (A. Blue, Ph.D., personal communication, July 26, 2013). There are four challenges studies of provider-provider communication must address.

The first challenge is to assure accessibility of a suitable population for a study of communication. Practicing providers are a problematic research population for several reasons:

1. Practice locations are distributed over wide geographic areas
2. Resolution of provider confidentiality issues is time-intensive
3. Few single practice sites aggregate a sufficiently large number of providers.

Providers' education and practice experiences have been single discipline/profession or siloed, which constrains the design and conduct of quality studies (Interprofessional Education Collaborative, 2011b; Stange et al., 2010). These conditions appear to be improving as provider training programs continue to adopt a new model called interprofesional education (IPE). Students from multiple disciplines take portions of their training together, including classroom instruction and working as teams in simulated care delivery settings. This study meets the suitable population challenge by gathering data from team care delivery simulations at the Center for Advancing Professional Excellence (CAPE) at the University of Colorado Denver's Anschutz Medical Campus (UC/AMC).

The second challenge is a lack of research tools to examine listening in specific contexts (Bodie, 2011b, 2013; Janusik, 2004; Shipley, 2010). Research to identify causes for communication failures is extensive (Institute of Medicine, 1999; Singh et al., 2008), but research into components of communication is limited (Alvarez & Coeira, 2006; Brindley & Reynolds, 2011; Hargestam, Lindkvist, Brulin, Jacobsson, & Hultin, 2013). This study design leverages over 25 years of research in and training of aviation cockpit crews and a small number of studies in care delivery settings that focus on successfully closing communication loops.

During observations of student teams delivering care verbal listening behaviors were recorded to characterize their exchanges of information (loops).

Third, health care communication is dominated by research in physician-patient contexts. The language used and content in the exchanges of information between the provider and patient are not the same as the exchanges of information among two or more providers (K. Kirshbaum, Ph.D., personal communication, July 13, 2013). Researchers of provider-provider exchanges of information can leverage findings from several sources to hypothesize about listening among team members in care delivery but must acknowledge the limits of this knowledge to inform new studies. Sources include studies of provider-patient communication (Hickey et al., 2012; Kilpatrick, 2012; Levinson, Lesser, & Epstein, 2010), communication studies in analogous professions Burke, Salas, Wilson-Donnelly, & Priest, 2004; Singh, Peterson, & Thomas, 2006**),** and a limited number of listening behavior studies (Bavelas & Gerwing, 2011; Hargestam et al., 2013; Roter & Larson, 2001; Simonoff & Step, 2011).

The final challenge is named in studies by Hargestam et al., (2013), Lyndon, Zlatnick, and Wachter, (2011), Manojlovich et al. (2014), and Parker-Raley et al. (2012) who affirm the need for research in provider-provider encounters and, in doing so, name a finer point of error etiology--and study design. "Many medical errors are due to frequent miscommunication among teams instead of the individual medical performance of health care providers" (Parker-Raley et al., 2012, p. 103). The culture of care delivery has long focused on identifying the person(s) whose performance caused the error and on their remediation (Liang, 2002). The shift away from a culture of shame and blame is underway (Hagopian, Singer, Curry-Smith, Nottingham, & Hickner, 2010), but more evidence is needed to confirm Parker-Raley et al.'s (2012) belief that

research needs to focus on teams of providers delivering care. This study responds to that need by choosing teams of medical and nursing students as the population of interest.

The preceding challenges may appear to outweigh the worth of the issue as a study problem, but the challenges provide study boundaries and helpful cautions in the design of studies. These boundaries had a decisive impact on the choice of inquiry strategies.

The Study

The study employs an exploratory inquiry strategy to conduct observations of simulated emergency medicine (EM) encounters and to describe the characteristics of medical and nursing students' communication that may contribute to successful and failed exchanges of information. CLC provides the framework for the study and the observations of students' verbal listening behaviors are the data to characterize their communication.

Communication among practicing providers has improved though years of hierarchical relationships across and within any one health profession assures progress will be slow (Kirschbaum & Fortner, 2012; Powell & Davies, 2012). A growing consensus among researchers, educators, and practitioners is that waiting on improved communication to evolve among established providers is insufficient, significant reform to health professions' education holds the most promise to catalyze improvements (Chen, Williams, & Gardner, 2013; Interprofessional Education Collaborative, 2011b). Martin (2011) anticipates and advocates for education reform, noting

> When I refer to a "social turn," I am emphasizing that the relationship between professional formation and the broader social context within which health care is delivered indicates a growing conception of medical practice and education that is relational, culturally aware, and collaborative (p. 1566).

Site. Given the state of providers' practice, the optimum setting for studies will be academic medical centers where IPE curricula bring students from multiple health professions together in

didactic classrooms and in simulated and actual care delivery encounters. These settings teach students to *merge* their discipline-specific skills and become acquainted with each other's skills, language, and roles. These populations are accessible and shielded from the challenges of studies with practicing providers.

The study takes place at the CAPE, an 18,000 square foot simulation facility that employs High Fidelity Patient Simulators (HPS) and standardized patients to create a wide range of care delivery settings and patient conditions for the education of multi-disciplinary teams.

Encounters. The study uses simulated emergency medicine (EM) encounters. EM teams use the same three encounters and are composed of only medical and nursing students. EM encounters are more suitable than the multidisciplinary team encounters in the Clinical Transformations (CT) portion of the CU IPE training that were also considered. The multidisciplinary CT encounters include several different encounters and 2-3 additional provider types: teams include students in medicine, nursing, physical therapy, pharmacy, and dentistry or physician assistant.

Videotaped encounters are chosen over live encounters. Videotape is more accessible and can be reviewed multiple times. Kilpatrick's (2012) study affirmed the choice of videotape with her descriptions of the complicating effects of rising acuity and an increased number of encounter participants on observers' ability to capture targeted behaviors during live encounters.

Design. The exchanges of information among students during an encounter are the unit of analysis. Six (6) verbal listening behaviors were coded to identify the communication characteristics of the exchanges of information. Bodie (2013) cautions those who would utilize listening behaviors as research data,

> Of the research on listening conducted to date, most tends to focus on the individual listener and the cognitive and affective components of the process. Behaviors that constitute ‘‘good listening’’ and their connection to important outcomes. (p. 81).

Listening scholars have produced a notable body of literature on definitions and models for listening without advancing those understandings to an equivalent body of theory. Listening is an accepted component of communication but leading scholars including Bodie (2013), Bostrum (2011), Janusik (2007), and Wolvin (2013) continue to advocate that context-specific understandings of listening are needed to establish full credibility of research on listening and causes of successful and failed communication.

Notwithstanding the cautions of researchers there is acceptance that observations of listening behaviors offer promise as research tools worthy of considering (Bavelas & Gerwing, 2011; Bodie, 2013; Bostrom, 2011). The students' verbal listening behaviors are part of communication loops, a concept drawn from numerous studies in aviation cockpit communication (Bowers & Jentsch, 1998; Burke et al., 2004; Denham, Sullenberger, Quaid, & Nance, 2012; Salas, Burke, Bowers, & Wilson, 2001; Sexton & Helmreich, 2000; Singh et al., 2006). Each loop includes an initiating behavior, a varying number of additional behaviors as the participants discuss the issue and, if the exchange is to be successful, a concluding verbal listening behavior (Hargestam et al., 2013). Failed exchanges occur when a loop is not closed, closes too slowly, or is closed but the incorrect or no action is taken. The assumption is made that the correct action was taken and executed appropriately when communication loops close with a verbal listening behavior.

Descriptive and analytical statistics were applied to characterize the observed verbal listening behaviors as indicative of successful and failed communication in each encounter. The study concludes with implications and recommended hypotheses for use in subsequent studies to

inform patient safety initiatives and providers' communication curriculum and professional development.

Students' exchanges of information. The study departs from many studies that focused on providers' performance as the cause of errors and focuses on students' communication. Bodie (2013) provides a precise *direction* for the study noting "What we are most interested in is what listeners do when interacting with others and whether the enactment of specific behaviors impacts important outcomes" (p. 79). Other listening scholars support Bodie and point out the untapped potential for listening behaviors to expand the understanding of successful and failed communication (Bavelas & Gerwing, 2011; Bostrum, 2011; Imhoff, 1998; Wolvin, 2013**)**

This researcher acknowledges the constraints of limited theory and a lack of guidance from previous studies in provider-provider care delivery communication. The process of addressing this study's goals for provider-provider communication is informed by an interdisciplinary approach, research in listening, communication in health care and in closely-related fields, provider education and practice, and patient safety to explore listening in a previously undefined context.

Purpose statement. The purpose of this dissertation is to show how verbal listening behaviors and CLC can be used as tools to characterize the exchanges of information in medical and nursing student encounters. The findings from this dissertation's study may provide a foundation for more definitive studies to examine successful and failed provider-provider communication and identify causes/factors in each during health care delivery.

This study has three goals:

1. To identify specific steps in provider-provider exchanges of information where communication succeeds and fails

2. To describe the characteristics of communication sufficiently to assess outcomes of communication loops not being closed.
3. To recommend hypotheses to study to inform providers' communication curriculum, professional development, and subsequent research.

Rationale for an Exploratory Inquiry Strategy

The process to confirm the study's inquiry strategy proceeded from literature. Alvarez and Coiera's (2006) literature review of studies of provider-provider communication point out "Regrettably, there is neither an adequate definition of good communication nor an attempt to quantify communication as meeting minimal criteria for effectiveness. Indeed, very limited research on what type of communication actually occurs between health professionals exists" (p. 236). Studies by Brindley and Reynolds (2011), Hargestam et al. 2013, Lingard et al. (2004), Lingard et al. (2005), and Lingard et al. (2010) use CLC to observe provider-provider communication in high acuity encounters. Among the conclusions reached is the need for more studies before researchers can confidently hypothesize about and confirm causes for communication failure. Manojlovich et al. (2104) observe

> In summary, we know little about how to conduct research into what constitutes effective (and ineffective) communication on medical–surgical units. The wide variation in care delivery caused by multiple specialties and increasingly complex patients makes communication an intricate process not easily captured by a single method (p. 2).

Hall and Schmid Mast (2009) provide support for an exploratory inquiry strategy:

> Though grounding one's research on a previously developed theory provides it with a respectable ancestry, in fact an investigator could validly ground his or her research on an original or previously unpublished and untested theory, or even just a novel point of view from which justifiable hypotheses can be developed. (p. 283).

Hulsman (2009) advocates for all health care communication behavioral researchers to recognize they are working in goal-oriented and problem-solving processes that include

considerable more complexity than might be recognized by counting expected verbal responses. Studies in patient safety note the difficulties in finding theories, data collection instruments, and care delivery settings for research that are generalizable (Hagopian et al., 2010).

Reiter's (2013) argument for the confident use of exploratory research in the social sciences provides decisive support to the choice of an inquiry strategy for this study. He offers a thoughtful, balanced justification for exploratory research from which the following two points are taken:

> Proceeding in such a way allows for a clearly defined starting position in the process of knowledge building and gaining understanding and familiarity with a subject or problem. It also allows for a delimitation of the empirical field that is relevant to a given research question – as purely exploratory research would otherwise be endless and lead into the traps of infinite regression (Reiter, 2013, pp. 10-11).

Reiter (2013) affirms the validity of acknowledging from the outset of a study that its findings may be tentative. "Instead of advancing arguments that make exclusive truths claims, exploratory research provides more or less plausible and hence fruitful ways to examine and explain reality that can be shared, if successful and plausible, after a critical evaluation" (Reiter, 2013, p. 4). Reiter (2013) also examines, critiques, and affirms deductive, confirmatory research and offers a credible basis for employing either inquiry strategy.

Reiter (2013) admonishes social science researchers to be wary of hard and fast rules about phenomena and to "…content ourselves with detecting new and fruitful ways to look at and analyze reality – none of which should lay claims to be exclusive, or true – at least not truer than another, equally fruitful way to analyze reality" (p. 8). Nevertheless he notes the need for linkages and mechanisms to connect variables in an exploratory study (Reiter, 2013).

The necessary mechanism for this study is found in CLC drawn primarily from over 25 years of communication studies in aviation and a modest number of observational health care

communications studies that utilize CLC. Aviators' training, required competencies, team-based decision-making, and the risks of passenger injury or death from pilots' cockpit communication errors align sufficiently with similar characteristics of health care providers' education and practice (Bowers & Jentsch, 1998; Burke et al., 2004; Hargestam et al., 2013; Singh et al., 2006). Adoption of CLC for this study also considered the cautions from Ricci, Panos, Lincoln, Salerno, and Warshauer (2012) who delineate the differences between cockpits and care delivery situations. CLC is the framework into which the characteristics of communication among study participants, as described by observed verbal listening behaviors, are examined for their potential to improve understandings of successful and failed communication.

Studies to examine the components of communication during care delivery are welcomed by providers and educators (Interprofessional Education Collaborative, 2011b), but researchers' ability to design substantive studies are constrained by the four challenges described in the Problem section. These challenges significantly influenced the decision for an exploratory inquiry strategy.

Significance of the Study

The Joint Commission (TJC) includes this caveat with any data it releases:

> The reporting of most sentinel events to The Joint Commission is voluntary and represents only a small proportion of actual events. Therefore, these data are not an epidemiologic data set and no conclusions should be drawn about the actual relative frequency of events or trends in events over time (The Joint Commission, 2013b, p. 4).

Recent reports of sentinel event data show that by the end of 2012 all categories of events had peaked and were declining. Nevertheless, researchers, providers, and educators note error levels remain high and affirm the need for strategies to further reduce medical errors (Hagopian et al., 2012; The Joint commission, 2013a).

Research in communication failure in care delivery. Prior to the 1990s health industry acknowledgement and public awareness of medical errors were limited. Leape's (1994) defining work, *Error in Medicine*, startled the health care community, the public, and the federal government with its assertion that at least 44,000 people, and possibly twice that number, die yearly in hospitals as a result of medical errors (Institute of Medicine, 1999). Skeptics for Leape's findings were numerous but extensive evidence for the type and causes of errors followed in key Institute of Medicine (IOM) reports (Institute of Medicine, 1999, 2001). The IOM asserted that at least 98,000 people die every year as a result of medical errors, and while that figure remains accepted among facility and individual providers, other sources cite the number of deaths as high as 400,000 per year (McCann, 2014).

Studies identified persistent communication failures between health care providers among the most frequent causes for diagnostic errors and for compromises to other indicators of quality care (The Joint Commission, 2014; Singh et al., 2008). Despite centuries of health care practice, a culture of accurate and accessible communication had not been established (Leape, 1994; Liang, 2002; Sternberg, 2012). The IOM reports lent weight and, ultimately, the threat of federal and state government intervention in care delivery to the work of the National Committee for Quality Assurance (NCQA) (National Committee for Quality Assurance, 2013).

Recent studies still note a disappointing error reduction rate despite numerous error-reduction initiatives and a higher level of public awareness that care delivery is an error-prone environment (Leape, 1994; Lingard et al., 2004; Sternberg, 2012). The decline in number of sentinel events and the impact of knowledge about the causes, likely locations, economic impact, and roles of providers in medical error are not yet cause for celebration (Agarwal, Sands, & Schneider, 2010; Liang, 2002; Singh et al., 2008; Sternberg, 2012).

Communication researchers' work with listening fidelity (accuracy) needs to build on earlier research by Mulanax and Powers (2001) and Powers and Bodie (2003) to offer health care communication researchers additional perspectives on assessing listening in care delivery (G. Brodie, Ph.D., personal communication, January 11, 2013). The study by Kirschbaum and Fortner (2012) is among the first to propose cultures within physician specialties warrant recognition for precise listening by all health professions' disciplines in education and practice. In a subsequent study Kirschbaum (2012) surveyed surgeons and anesthesiologists about their communication during surgical procedures and found significant differences of expectations about communication style, based largely on role perceptions between the two specialties.

The first decade of the 21st century produced a mixture of NCQA quality designations, government oversight and enforcement, and private sector scrutiny forcing health care providers into practice patterns and care delivery models for which they have little training. Judging from the assessment of health care communication research, limited tools with which to diagnose communication failure and improve providers' communication skills for these new models are available. Health care professionals are understandably wary of further government intrusion, but without marked reductions in errors, the health care industry must consider strategies from other industries (Morey et al., 2002; Singh et al., 2008; Spath, 2011). The health care industry efforts to address visible, intractable issues like medical errors should include activists who bring unique energy and perspective from industries such as commercial aviation, nuclear power, and aerospace (Denham et al., 2012).

Summary of listening studies. Listening scholarship has its roots in Ralph Nichols' 1948 doctoral thesis (Purdy, 2006). A number of scholars have built on his work into the 21st century, but neither specific research agendas nor studies have catalyzed a pragmatic, coherent pursuit of

listening research (Bodie, 2009; Bodie, Janusik, & Valikoski, 2008; Bostrom, 2011; Witkin & Trochin, 1997; Wolvin, 2013). Listening scholarship offers "…a fragmented and seemingly dizzying array of definitions, methodological approaches, and theoretical frameworks" (Bodie, Worthington, Imhof, & Cooper, 2008, p. 104).

The community of interpersonal communication scholars has chastened each other for being busy advancing their individual definitions for listening rather than prioritizing theory-based research (Bodie, 2009; Bodie, Janusik, & Välikoski, 2008; Bodie, Worthington, et al., 2008; Witkin, 1990). Even if scholars set aside individual pursuits to "…establish and measure a global construct for listening…" (Wolvin, 1989, p. 526), they may still be misdirecting their efforts when their best work may be to "…develop models to illustrate listening in different contexts for different purposes." (p. 527). Witkin (1990), Janusik (2008), Bodie (2013), and Wolvin (2013) have sustained an unanswered call for context-specific listening research for over 20 years.

The validity of verbal listening behaviors as factors in CLC and the availability of context-specific listening research remain a partially confirmed, incomplete situation. The use of listening behaviors as tools to identify the characteristics of communication has limitations but is sound and rooted in the literature. An understanding of the evolution of listening studies is necessary.

Definitions of listening. The earliest writing to define listening is from interpersonal communication scholars focused primarily on the cognitive processes (Barker, 1971; Edwards & McDonald, 1993; Imhof & Janusik, 2006; Janusik, 2004; Lewis, 1958; Nichols, 1957; Rogers, 1994; Witkin & Trochin, 1997; Wolvin & Coakley, 1993a). The terms used for cognitive processes are varied but essentially the same: "…attending to [hearing], understanding, receiving, and interpreting content and relational messages" (Bodie, 2013, p. 77; Janusik, 2004).

Affective processes indicate a willingness to listen, a state shaped by the listener's attitude and individual belief systems (Bodie, 2013; Rhodes, 1993; Wolvin & Cohen, 2012). Measures of affective processes have failed to demonstrate consistent validity so only modest attention has been given to perceived listening competence, attitude, tendency, and predisposition (Bodie, 2013).

Scholars' and educators' interest in behavioral processes has grown apace of the increasing scrutiny of communication failures (Agarwal et al., 2010; Bentley, 1997; Brue, 1988), as the focus of research turns to identifying what listeners do rather than what listening is (Bostrom, 2011; Wolvin, 2013). Verbal behaviors are important to confirming the cognitive processes that precede responses (Bavelas & Gerwing, 2011), but closing the listening loop with behavioral studies presents researchers with considerable logistical and design challenges (Bavelas & Gerwing, 2011; Bodie, 2013; Bodie, St. Cyr, Pence, Rold, & Honeycutt, 2012; Bowman & Targowski, 1987). Bodie notes that far less time and labor are needed when a series of self-report instruments is applied to gather data, but he acknowledges the limits of self-report reliability:

> What we are most interested in is what listeners do when interacting with others and whether the enactment of specific behaviors impacts important outcomes. If so, relying too heavily on self-report measurement for the advancement of knowledge about listening seems counterproductive" (2013, p. 79).

Bodie's observation describes the current state of listening definitions: agreement on cognitive and affective components but little progress on closing the loop with equal understanding of the behavioral component.

Bodie et al. (2012) examine three studies in depth to delineate between what listening is (attributes) and what listeners do (behavior). Bodie (2013) notes the significant research in listening behaviors comes from Bavelas and her colleagues at Victoria Microanalysis Associates (Department of Psychology, University of Victoria, Victoria, BC) who have spent several

decades "…exploring the listener as addressee, or 'the person the speaker is addressing 'directly and who can respond to and interact with the speaker in a dialogue'" (as cited in Bavelas & Gerwing, 2011, p. 180). Bavelas and Gerwing name "…the addressee as a 'full partner in creating the dialogue'" (2011, p. 180) and provide subsequent research a useful overlap with patients' increasing expectations for an equal role in their care decisions (Beach & Inui, 2006; Epstein et al., 2005). Bavelas and her colleagues' work provides one leverage point for this study's design.

Models of listening. The roots of the current lack of theory and specific contexts for listening are found in scholars' focus on attributes of listening, or what listening is, rather than what listeners do (Bentley, 1997, 2000; Bodie et al., 2012). Scholars persisted in supporting their individual understandings of listening by advancing models to further establish definitions (Bodie et al., 2008; Bodie, Worthington et al., 2008).

The first listening scholar to examine listening from a model's perspective was Karl Deutsch in 1952 who described four uses for models as expressions of how listening occurs (Wolvin, 1989). A series of scholars spent the next 60 years exploring how models depict cognitive, affective, and behavioral processes, verbal and nonverbal inputs and responses, and a number of environmental variables (Wolvin, 1989). Despite the degree to which components of listening have been explored, no one model integrates all that has been learned; no significant integration of concepts has been achieved (Brownell, 2010b; Janusik, 2004; Wolvin, 1989).

Toward the end of his career Bostrum (2011) noted,

> Two very important questions in communication research are: How do people process information received from others? How can this processing be improved? Common sense tells us that to claim that something has been improved, we must be able to demonstrate that individuals are different in some fashion as a "result" of something that they perceived. If we believe something can be improved, the most logical way to demonstrate

> this is to measure its level prior to the improvement procedure hypothesized and then measure it after the procedure has been applied (p. 22).

Wolvin celebrates "Bostrom's work provides us with a solid foundation on which to build models that more realistically explain how listeners function differently in different communication contexts and how speakers can facilitate successful listening in these contexts (Wolvin, 2013, p. 105). The model included in Chapter Two is built upon and incorporates much of the information on the roots, definitions, and models of listening. The model does not propose alternative concepts to the accepted cognitive, affective, and behavioral elements described by scholars. The model introduces health care-specific variables that depict the distinct characteristics of communication in care delivery, integrating contributions from health care educators, providers, and communication researchers to produce a credible basis for observing, thinking about, and characterizing listening in care delivery.

Definitions and models for listening fall short of providing the ideal basis for claiming listening behaviors are tools for communication research, but do provide sufficient support for this study's assumption that listening behaviors can be used to more precisely characterize components of communication.

Evolving provider practice and education conditions. This section describes changing conditions in the health care system, which emphasize the need for better understandings of provider-provider communication. These conditions are:

1. Patients' expectations for equal participation in their care decisions are increasing as their share of delivery costs increases.
2. Care delivery models are evolving from pressures to deliver care more efficiently, effectively, and safely.

3. Fundamental changes to improve providers' communication skills will occur during their education even as strategies to reduce provider errors continue to develop (G. Barley, Ph.D., personal communication, September 15, 2005).

***Changing patient expectations*.** Errors in care delivery resulting from communication failures among providers are more than sufficient cause to seriously examine communication processes and provider skills and roles. Now patients and their families are restive about current conditions in the health care delivery system. This constituency is increasingly knowledgeable about the care delivery system and has begun to openly challenge their past role as bystanders.

Patients are alarmed by persistent reports of medical errors (Fox, 2013; Sternberg, 2012), confused by evolving health insurance options, and irritated by limited choice (Manchikanti, Caraway, Parr, Fellows, & Hirsch, 2011; Sommers & Rosenbaum, 2011). Their expectations for a shared role in decisions about their health are confusing, irritating, and even alarming to providers (J. Rumbyrt, M.D., personal communication, July 23, 2013). Regulators and payors, whose perspectives on and interactions with patients and providers are customarily different, find their self-interest converging as greater oversight and intrusion into provider practice (Devers & Berenson, 2009; Goldsmith, 2010a)

Patient expectations of the health care system are an expanding, affirming trend that increases their role in accounting for their health; for providers the trend is toward expectations that are constraining and fraught with uncertainty as care delivery becomes less physician-centric and all providers must become better collaborators, communicators, and teammates (Goldsmith, 2010a; Powell & Davies, 2012; Press, Michelow, & MacPhail, 2012; Suter et al., 2009). Government regulations have been promulgated to assure patient safety (Agency for Healthcare Research and Quality, 2012; The Joint Commission, 2013a) to protect personal health

information (Manchikanti et al., 2011) and to enhance efficiency and quality of care (Centers for Medicare & Medicaid Services, 2013; National Committee for Quality Assurance, 2013).

The government and commercial payors are escalating their efforts to manage care delivery costs (Goldsmith, 2010a). "There will be a growing need for new, carefully executed research studies that reflect the new…practice environment, as well as the reality of more aggressive, activated patient participants in the physician–patient encounter" (Christianson, Warrick, Finch, & Jonas, 2012, as cited in Chesser, 2013, p. 4). The pressure on care delivery models from regulators, government and commercial reimbursement sources is *joined* by evolving expectations of patients for their role in care delivery.

Changing care delivery models. The rationale for changes to care delivery models is summarized in the following four conditions excerpted from the proceedings of the Macy Foundation's 2011 conference on team-based education and practice (Ensuring an Effective Physician Workforce for the United States, 2011):

- Changing population demographics and disease burden
- Transformation of the health care system, extending the delivery of care away from hospitals to other facilities, community settings, and homes
- Explosive growth in health care technology and requirements for its efficient and safe use
- Unsustainable growth in the cost of the health care system

These conditions appear poised to diminish the weight of tradition in practice and education, which has limited the imperative for reform for many years.

Government and commercial payors' responses to these conditions are provider reimbursement models that force increasing amounts of team care delivery. Providers' ability to adapt to these care delivery models is inhibited by a 100 year old legacy: the Flexner Report

(Flexner, 1910). Abraham Flexner's work both informs today's emerging changes and must be held accountable for the silos of education that have been immutable for so long. In the formative years the education models segregated health professionals from each other and defined and justified the segregation of professions in practice as well (Carraccio, Wolfsthal, Englander, Ferentz, & Martin, 2002). Now, as changes begin to impact current providers, the forces reveal how inadequate the practice (and education) experiences of many current health professionals are for work in the evolving health care industry (Garman, Leach, & Spector, 2006; Interprofessional Education Collaborative, 2011a; Interprofessional Education Collaborative, 2011b). Years of practice in the traditional hierarchy of roles steepens providers' learning curve as they attempt to adapt to roles in team-based care delivery. The vertical arrangement of health professions, that places physicians at the top, and arrays other professions in various descending orders, is already flattening, for at least three reasons:

- Other health professions' scope of care is being validated
- Disease complexity is moving diagnosis and management away from individual providers to groups or teams of professions treating a patient.
- Government and commercial payors increasingly choose bundled provider reimbursement plans and experiment with Pay for Performance programs. (Devers & Berenson, 2009)

The pressure from changes in consumer expectations and in care delivery models is gradually spreading to health professions' education process.

Changing education models. Education model reform that responds to evolving practice realities is catalyzed by more than the imperative to reduce errors; the demands of practice realities underscore the need for improved communication. The Institute of Medicine's (IOM)

report, *Educating for the Health Team* (Institute of Medicine, 1972), defined the need for reform as clearly in 1972 as it is defined today.

However, the historic model for health professions' education described in 1910 in the Carnegie Foundation report, *Medical Education in the United States and Canada*, (Flexner, 1910) has withstood most reform efforts and established separation of the professions in education that persists into practice (Blue, Zoller, Stratton, Elam, & Gilbert, 2010; Starr, 1983). These conditions perpetuate a limited appreciation among the professions for each other's scope of practice and inhibit efforts to collaboratively address critical issues such as care delivery errors (Leape, 1994).

The decisive impetus for curriculum change comes from initiatives in the last 5-8 years such as the Kalamazoo II Report (Duffy, Gordon, Whelan, Cole-Kelly, & Frankel, 2004) and the Interprofessional Education Collaborative, as well as significant support from foundations (Josiah Macy Jr. Foundation, 2011). The most definitive study to date on health professions' competencies in the United States is the 2011 IPEC Report (Interprofessional Education Collaborative, 2011b), assembled by an ambitious first-time collaboration of six major professional educational organizations:

- American Association of Colleges of Nursing (AACN)
- American Association of Colleges of Osteopathic Medicine (AACOM)
- American Association of Colleges of Pharmacy (AACP)
- American Dental Education Association (ADEA)
- Association of American Medical Colleges (AAMC)
- Association of Schools and Programs of Public Health (ASPPH)

The report describes interprofessional competencies and the issues that support and inhibit their use in practice and in education. The panel is as definitive in naming issues as they are with the report's assertions about education reform (Interprofessional Education Collaborative, 2011b).

Refinements to interprofessional collaborative practice continue, notwithstanding provider ambivalence, to inform the evolution of competencies that all health professionals should acquire during their education to practice effectively and safely (Interprofessional Education Collaborative, 2011b). The 2011 Interprofessional Education Collaborative Expert Panel report describes four competencies to prepare health professions students. One competency is communication and within that competency domain, listening skills are prominently featured (Interprofessional Education Collaborative, 2011b).

The following two excerpts from the report's closing paragraphs support this exploratory study, to improve understandings of provider-provider communication:

> This report focuses on the charge the panel was given to identify individual-level interprofessional competencies for future health professionals in training. We wrote competency statements and identified learning activities relevant for the pre-licensure/pre-credentialing student. However, we hope that the competencies identified are general enough…to spur needed educational research and evaluation (Interprofessional Education Collaborative, 2011b, p. 42).

> We recognize the dynamic nature of this evolving knowledge base in a climate that increasingly values interdisciplinary/interprofessional translational research, and the ways this type of research will help close the gaps between research and practice going forward (Interprofessional Education Collaborative, 2011b, p. 43).

Competency-based interprofessional education (IPE) is further affirmed as provider licensure and specialty boards change the content of exams to require providers demonstrate knowledge of the emerging competencies (J. Williams, Ph.D., personal communication, April 30, 2012). Notwithstanding the acceptance of IPE, educators have their own challenges to design and execute curriculum that deliver the competencies to transition from siloed education and practice to interprofessional collaborative practice (M. Earnest, M.D., Ph.D., personal communication, October 29, 2013).

Assumptions

Three assumptions are made consistent with this exploratory inquiry:

1. CLC is an acceptable framework to characterize provider-provider communication during care delivery as adapted from communication studies in the aviation sector.

The development of CLC as a tool in exploring and improving communication came in the aviation sector over the past 25 years (Bowers & Jentsch, 1998; Hargestam et al., 2012). The training, required competencies, team-based decision-making, and the risks of passenger injury or death from pilots' cockpit communication errors align, albeit not uniformly, with similar characteristics of health care providers' education and practice. Ricci et al. (2012) provide a realistic assessment of the utility and limitations of cockpit communication as the definitive tool for examining provider-provider communication. Nevertheless, the decision to use CLC in this study is influenced by reviewing several observational studies of cockpit crews and the viability of CLC that emerges from those studies (Bowers & Jentsch, 1998; Burke et al., 2004; Cocksedge & May, 2005; Kanki, Folk, & Irwin, 1991; Kanki & Foushee, 1989; Neville, 2006, 2007; Prince & Jentsch, 2001; Salas et al., 2001; Sexton & Helmreich, 2000; Weiner, Kanki, & Helmreich, 1993).

2. Verbal listening behaviors are components of CLC and are valid tools in observations to identify/describe provider-provider exchanges of information during care delivery.

The limited number of observational studies that characterize the role of verbal listening behaviors in communication, the literature includes sufficient studies in care delivery settings and in settings that closely align with care delivery to employ verbal listening behaviors to explore loops that are not closed (Alvarez & Coiera, 2006; Hargestam et al., 2013; Lingard et

al., 2005; Lingard et al., 2004; Lingard et al., 2008; Siassakos, Draycott, Montague, & Harris, 2009; Siassakos et al., 2011; Singh et al., 2006)

3. The limited amount of provider-provider communication research is offset by related studies of other participants in care delivery and of professionals in analogous fields. The sum of available studies was sufficient to guide design of this exploratory inquiry study.

The body of health communication research is primarily on patient-physician communication, and the language, roles, and relationships in provider-provider communication differ from those in physician-patient communication (K. Kirschbaum, Ph.D., personal communication, July 8, 2013). Nevertheless, the physician-patient dyad and the limited research in provider-provider communication offers sufficient guidance for this study's exploratory inquiry strategy (Burke, Boal, & Mitchell, 2005; Brindley & Reynolds, 2011; Chesser, 2012; Coiera & Tombs, 1998; Conn, Reeves, Dainty, Kenaszchuk, & Zwarenstein, 2012; Kilpatrick, 2012; Kirschbaum, 2012; Kirschbaum & Fortner, 2012; Mann & Pratt, 2008).

Delimitations

This study is conducted with teams of medical and nursing students at the UC/AMC CAPE using HPS to simulate patient encounters in an emergency room setting.

Teams of students from the UC/AMC School of Medicine and from nursing programs at the Regis University Rueckert Hartman College of Health Professions' (RHCHP) and Arapahoe Community College (ACC) are assembled on a random basis for the CAPE encounters. Teams are assembled two weeks prior to the students' CAPE sessions. Teams include no less than two MD and two RN students; team size ranged from 4-7 students and averaged five members.

Each team is matched randomly with two of three patient conditions included in the EM encounters. The simulations of EM encounters include two settings and three patient conditions:

- a young adult with an aspirin overdose (Intensive Care)
- a nine-month baby in septic shock (Emergency Room)
- a nine-month old in hemorrhagic shock (Emergency Room)

Closed loops and open loops will represent successful communication and failed communication, respectively. However the encounters observed for this study do not include consistent visible confirmation that the expected action was taken and carried out successfully.

Key Points from the Introduction

Leape asserted in 1994 that at least 44,000 people, and possibly twice that number, died yearly in hospitals as a result of medical errors (Institute of Medicine, 1999). In subsequent years studies identified persistent communication failures among health care providers as one of the most frequent causes for diagnostic errors and for compromises to other indicators of quality care (The Joint Commission, 2012, 2014; Singh et al., 2008). Initial strategies to reduce errors were concentrated in care delivery processes, with an increasing focus on the role of human error (Agency for Healthcare Research and Quality, 2012; Institute of Medicine, 1999; National Committee for Quality Assurance, 2013). These strategies have produced mixed results in reducing medical errors (Spath, 2011; Sternberg, 2012).

The consensus among policymakers, educators, and many providers is the skill set needed to prevent errors can be developed in students and practicing providers (Skochelak, 2010; Thibault, 2012). Competency-based IPE curriculum that emphasizes effective communication skills, the ability to work in formal teams, and role clarity is becoming a second *front* for strategies to reduce errors (Interprofessional Education Collaborative, 2011a, 2011b).

One challenge for researchers and educators to develop interprofessional curriculum is the limited guidance from health care communication and education reform studies because the

preponderance of studies is on patient-physician encounters and medical (physician) education, respectively (Interprofessional Education Collaborative, 2011a, 2011b). This study of characteristics of communication was initially constrained by the preceding, by the limited understanding for the components of communication in health care (Alvarez & Coiera, 2006; Cameron, de Haes, & Visser, 2009), and by overly-broad definitions of listening (Bodie, 2013). These conditions affirm a statement by Reiter (2013) about the utility of an exploratory inquiry strategy acknowledging from the outset of a study that its findings may at best be provisional.

The aforementioned limitations are more appropriately adopted as study design boundaries and acceptable *stepping-off* points toward an understanding of listening in care delivery for which little precedent is available (A. Blue, Ph.D. personal communication, July 28, 2013). Much can be learned and applied to further research in health care communication from the literature on communication and listening studies (Bavelas & Gerwing, 2011; Bodie, 2011, 2013; Cameron et al., 2009; Cocksedge & May, 2005; de Haes & Bensing, 2008; and on health care professions education and practice (A. Blue, Ph.D. personal communication, July 28, 2013; Gilbert, 2005; Interprofessional Education Collaborative, 2011b).

CHAPTER TWO: REVIEW OF LITERATURE

"If only someone would listen" (Nichols & Stevens, 1958).

The opening quote is over 55 years old and is emblematic of the issue examined in the review of literature--and the study. As I pursue this study, I now suggest that Nichols and Stevens' *lament* is more precisely put as 'If only we understood what listening is.'; or, 'What does successful communication look like?'

This review includes four sections: first, a description of the problem of medical errors and communication failure; second, the impact on providers' practice environment from evolving care delivery and education models and changing stakeholder expectations; and third, the rationale for using verbal listening behaviors to examine provider-provider exchanges of information. The third section also substantiates the use of closed loop communication (CLC) as the framework for the study and describes a model for examining communication during health care delivery. The final section introduces the study to characterize communication among teams of MD and RN students.

The review of literature has two goals, to establish a knowledge base of the changing conditions in care delivery that require significant changes to health care providers' skillsets; and knowledge of communication and verbal listening behaviors sufficient to develop the tools and framework for the study.

Communication Failure in Health Care Delivery

Leape (1994) persuasively described the issue of medical errors and the need for a culture and processes that promote safety and error reduction. Three Institute of Medicine studies (1999, 2001, 2003) followed to frame the strategies that government and the health care system continue to refine. This section focuses on provider-provider communication failure as one of the

leading causes of medical errors. A case is made for research into causes for communication failure beyond the event and the participants involved to the participants' verbal listening behaviors of "what was said", "who said it", and "how it was said." The number of error has begun to fall since the middle of 2012 (The Joint Commission, 2013b) but the number and consequences of errors remain of concern and the tools to enable more insightful research into provider-provider communication failure remain very limited.

The Institute of Medicine (IOM) report, *To Err is Human*: *Building a Safer Health Care System*, added alarming detail to Leape's (1994) findings with scenes of medical errors that caused significant numbers of patient injuries and deaths (Institute of Medicine, 1999). A second report from the IOM two years later described a philosophy and blueprint for *locating* medical errors in definitions of quality care. Health care education and delivery system professionals had little room to equivocate about the need to examine their respective processes to train health care professionals and deliver quality care (Institute of Medicine, 2001). The third report, *Health Professions Education: A Bridge to Quality*, brought additional scrutiny to the human element of care delivery and the need to re-consider health professions' education models (Institute of Medicine, 2003).

Error reduction initiatives from governmental agencies and the health care industry have been implemented (Agency for Healthcare Research and Quality, 2012; Institute of Medicine, 2001; The Joint Commission, 2013a; Sternberg, 2012). TeamSTEPPS is among the most visible and widely-used error reduction strategies in health care education and practice, in government, and private sector organizations (Agency for Healthcare Research and Quality, 2012).

The NCQA offers extensive resources to care delivery facilities and providers to achieve and maintain quality standards that were, in turn, adopted by government and commercial payors to

justify provider in/exclusion from insurance plans and to design the reimbursement levels providers receive (National Committee for Quality Assurance, 2013). The Joint Commission (TJC) develops quality standards, grants accreditation to facility providers, and offers quality certifications to individual providers (The Joint Commission, 2013a). TJC applied the term sentinel events to unexpected incidents that result in death or permanent loss of function, named 21 types of errors, and tracked their occurrence rates and causes since the mid-1990s (The Joint Commission, 2012, 2014; Singh et al., 2008).

Notwithstanding the preceding initiatives Sternberg (2012) reports the following information: a 2010 government analysis found that 134,000 Medicare beneficiaries were suffering adverse events every month, many of which were "clearly or likely preventable." A separate five-year study of North Carolina hospitals, published in the *New England Journal of Medicine* in November 2010, states in 25% of all admissions, the medical care harmed patients (Sternberg, 2012). A study published in *Health Affairs* in April 2011 revealed that the standard methods hospitals use to detect medical errors fail over 90% of the time (Sternberg, 2012). Singh (2014) notes that 95% of physicians' diagnoses are correct; but evidence across the entire U.S. adult population shows a 5% error rate equates to 12 million adults misdiagnosed a year.

Early strategies in response to errors reporting focused on the individual who last had contact with the patient, "…namely, shame and blame of individuals with accusations of incompetence, unprofessionalism, and unworthiness to treat patients" (Liang, 2002, p. 64). Sharpe (2000) examined the history of accountability in health care and noted the roots of the focus on individual error are found in "…the 'gentlemanly honour' model of medicine, [where] individual error is deemed a moral failure on the part of the practitioner" (as cited in Liang, 2002, p. 64). Sharpe's assessment offers a partial explanation for the slow acceptance by the health care

system for broader consideration of causes for errors. Liang (2002), Parker-Raley et al., (2012). and Rudolph, Simon, Dufresne, and Raemer (2006) assert that focus on the individual, in practice and in education, delayed and then diluted more comprehensive, successful approaches by decades. As error rates persisted, researchers, health care system facilities, and individual professionals advocated for more resources to reduce error rates and for broader consideration of factors that could cause errors (Denham et al., 2012; Lingard et al., 2004; Virginia Mason Medical Center, 2013). Facilities were tasked to commit to cultures of safety, error disclosure, and overall error reduction (Gillotti, Thompson, & McNeilis, 2002; Liang, 2002; Sharpe, 2000; Singh et al., 2008).

Government and health care system error-reduction strategists have resources, event data, and an expanding group of stakeholders to leverage: "Many consumers, savvier and armed with more digital information than ever before, are forming advocacy and support groups, such as the Society for Participatory Medicine, to push for better access to their own records and a bigger role in decision-making" (Sternberg, 2012, para. 19). Liang's (2002) study described a unique approach to error reduction:

> Systems concepts, the patient-provider partnership, and overall quality of care can be enhanced using a system of disclosure that provides for education about the systems nature of error, fulfils the delivery system philosophy of mutual respect, and integrates the patient and his/her family as a partner in the error reduction enterprise (p. 1).

The convergence of demanding constituents, slowed error reduction rates, impressive safety records from other industries, and systems thinking tools from management researchers and practitioners has broadened the scope of strategies (Powell & Davies, 2012; Sternberg, 2012).

The health care industry has looked within itself for successful models of patient safety (Dentzer, 2011) and initiatives such as Intermountain Healthcare's (Utah) partnership with the Mayo Clinic (Minnesota), Dartmouth-Hitchcock Health (New Hampshire), and Denver Health

Medical (Colorado) provide examples of possible successes (Sternberg, 2012). In 2011 the administration at Nationwide Children's Hospital in Columbus, Ohio, set aside the 1994 observation by Leape that errors are inevitable and committed to achieving a state of zero errors by 2013 (Sternberg, 2012). Nationwide's "Zero heroes" have cut errors in half, short of their bold goal, but a significant achievement. Beth Israel Deaconess Medical Center in Boston reduced incidences of preventable harm from 300 in 2008 to 160 in 2009 (Sternberg, 2012).

Virginia Mason Medical Center (Seattle, WA) looked to another industry for safety management processes, adopting Toyota's highly regarded process that allows anyone to stop a production line if any problem emerges (Virginia Mason Medical Center, 2013). Unique voices offering critiques and solutions are coming from the aviation industry, among them former US Airways Capt. Chesley B. "Sully" Sullenberger III, famous for landing Flight 1549 in the Hudson River in 2009 without loss of life. Sullenberger and like-minded aviation industry colleagues call for an entity such as the National Transportation Safety Board (NTSB) to address medical errors (Denham et al., 2012).

Brent James, chief quality officer at Intermountain Health care in Salt Lake City (UT) observes "Few hospitals can count on the sort of top-to-bottom buy-in they need to model themselves after Toyota" (Sternberg, 2012, para. 17) or NASA, or to create an NTSB-equivalent for care delivery organizations. Hospitals are unique organizations, operated by a combination of employed staff and contracted providers, such as emergency room physicians, anesthesiologists, and radiologists. Hospitals are heavily influenced by and dependent on private practice providers whose patients utilize hospitals' inpatient and outpatient services. These groups have shared disparate perspectives on collaboration, and hospital administrators must regularly navigate shifting alliances (Garman et al., 2006). Recent researchers are turning to the numerous

relationships among professions and conducting studies that push beyond process and actions taken to explore the communication components and human elements of adverse events (Hulsman, 2009; Kirschbaum & Fortner, 2012; Kirschbaum et al., 2015; Liang, 2002).

Care delivery facilities now employ a dual focus on care delivery process improvement and re-training when human error is a factor (Virginia Mason Medical Center, 2013). Hagopian et al. (2012) welcome a balance between process and people:

> Health care is experiencing a paradigm shift, away from a culture of blaming individuals for errors to a just culture of viewing errors as system failures and opportunities for shared learning and improvement in patient safety with appropriate individual responsibility. Some experts argue that an improvement in safety culture is a prerequisite to improving patient safety (p. 15).

However, sobering voices point to the difficulty with establishing a safety culture. Garman et al. (2006) note "Each of the major disciplines--physicians, nurses, allied health providers, and health administrators--represent qualitatively distinct sets of goals and professional values, influencing not only current behavior but also who chooses these roles in the first place" (p. 1). Hagopian et al. (2012) note the disparate clinical and administrative constituencies in care delivery organizations that may hinder the process of institutionalizing safety. They express doubt about current tools to measure a safety culture and advocate for studies that demonstrate improved patient outcomes as a direct result of safety cultures (Hagopian et al., 2012). They speculate that a disproportionate focus on safety may take time and focus away from quality care delivery, and the pursuit of a safety culture may be a process so far removed from care delivery that the two processes cannot be related (Hagopian et al., 2012). Hagopian and his colleagues make a good case that current strategies fall short of providing the decisive insights to error etiology and reduction. Current advocates call for more granular approaches to error etiology and

for consideration of other industries' safety initiatives (Denham et al., 2012; Hargestam et al., 2013; Pronovost el., 2009; Ricci, Panos et al., 2012; Singh et al., 2006).

Studies to characterize communication success and failure during care delivery are one example of a more granular approach. In 21 types of tracked sentinel events, communication failure was the third or higher cause in 15 of the events (The Joint Commission, 2012; 2014). Miscommunication among care delivery providers is described as a more frequent cause for errors than is a lack of providers' clinical skill or knowledge, in large part because a high percentage of patient encounters include more than one provider (Kirschbaum & Fortner, 2012; Kirschbaum et al., 2015; Parker-Raley et al., 2012; Singh et al., 2008). These findings suggest a more equitable place for communication skills (and ability to work in teams) among the competencies expected of health professions' students and providers (Hulsman & Visser, 2013; Interprofessional Education Collaborative, 2011b; Smith, Dollase, & Boss, 2003). Kirschbaum and Fortner (2012) offer the possibility that "…correlation of [communication] variables also provides insight on cultural communication factors that may contribute to miscommunication" (p. 187).

These studies reveal the complex cognitive, behavioral, and environmental factors present in any care delivery encounter, and how those factors become particularly decisive as acuity of the condition being treated increases (L. Yancey, M.D., personal communication, October 29, 2012). Parker-Raley et al. (2012), Rabøl, McPhail, Østergaard, Andersen, and Mogensen (2012), and Singh et al. (2008) focus on the human elements in health care communication and express valid concerns:

> Improving both electronic and verbal team communication are methods suggested to improve the quality of patient care. However, so far the results have been limited and adverse events related to information exchange remain common, with little evidence of widespread improvement. Further studies of the details of the link between

> interprofessional communication and medical error have been called for in order to develop appropriate interventions Rabøl et al., 2012, p. 129).

Rabøl et al. (2012) explain why "Communication is particularly vulnerable during handover of patient information between shifts or units, when a team has to establish skills and roles during teamwork" (p. 129). Handoff communication occurs when providers exchange information about a patient within a single department during shift change (intershift) and when a patient is being moved from one department to another (intrahospital transfers). Riesenberg, Leitzsch, and Cunningham (2010) and Ong and Coiera (2011), respectively, as well as Abraham, Kannampallil, Almoosa, Patel, and Patel (2011, 2014), have brought considerable attention to this area. Siassakos et al. (2011) conducted a secondary analysis of data from a large observational study of emergency obstetrical care and found "…a paucity of high-quality studies linking the use of handover mnemonics to clinical behaviour or outcome" (p. 604). Abraham et al. (2011) note that handoffs "…have been recognized as a major healthcare challenge primarily due to the breakdowns in communication that occur during transitions in care. Consequently, they are characterized as being 'remarkably haphazard'" (p. 28). Handoff communication is a very frequent event, includes a variety of provider types and acuity levels, and occurs successfully when participants follow an understood number and type of exchanges. These encounters are ideal opportunities to record, observe, and analyze data to pinpoint successful and failed communication.

Inayatullah (2014) writes in an article for *The Futurist* about the use of Causal Layered Analysis (CLA) as a research tool to probe deeply into complex issues and cites medical errors as an example.

> If we do not go deeper in understanding causation, almost always the business-as-usual strategy is to focus on the individual: more training for particular doctors. By going deeper, however, we discover that safety issues lie not just with particular doctors making

> mistakes, but rather with the medical and hospital system as a whole. Long working hours, hospitals poorly designed for a maturing society, and lack of communication among different parts of the health system are among other key issues (para. 5).

Inayatullah's (2014) assessment is not an inclusive approach to health care professions but his warning aligns with studies already described here. The need is for more efforts directed at the less public work of successful institution-wide initiatives to find the more fundamental elements of communication behavior, which researchers and educators postulate can be incorporated into curriculum and practice (M. Earnest, M.D., Ph.D., personal communication, October, 29, 2012). Studies are needed to probe into the exchanges of information among participants in care delivery episodes to identify their successful and unsuccessful components as a means to inform education curriculum and institution-wide initiatives.

Concerns from government, providers, and the public about patient safety as well as cost, equitable access, and overall quality of care are catalyzing changes to care delivery models in an effort to address these issues (Devers & Berenson, 2009; Interprofessional Education Collaborative, 2011b; Stange et al., 2010). Government and commercial payors already require providers to collaborate in the treatment of certain chronic diseases and are increasingly bundling payment to the group delivering care. This trend will spread and apply more pressure for improved communication and effective teamwork (Devers & Berenson, 2009; Goldsmith, 2010a). This dissertation study's goals are aligned with the need for research to provide tools to characterize provider-provider communication and, with these tools, to potentially inform the process of altering health professions' education and practice to evolve a safety culture that can be monitored and managed.

Evolving Provider Education and Practice Conditions

"It is clear that *how* care is delivered is as important as *what* care is delivered. Developing effective teams and redesigned systems is critical to achieving care that is patient-centered, safer, timelier, and more effective, efficient, and equitable" (Institute of Medicine, 2001, p. 4).The expectations by all constituents of the health care system and the evolving conditions in care delivery and education models affirm the need for this study. Team-based care is becoming the preferred care delivery model by federal and commercial payors, especially to manage chronic diseases. Silos of practice must give way to more collaboration over providers' roles and responsibilities; providers must improve accuracy of their communication. These conditions make the case for current health care education reforms to prominently include interdisciplinary skill training in communication as requisite to effective collaboration among providers as well as with patients.

Patients' expectations for care delivery. Patients are impatient and dissatisfied with providers and opaque, impersonal processes. (Beach & Inui, 2006; Davis, Foley, Crigger, & Brannigan, 2008). Patients increasingly understand their financial, emotional, and physical stakes in their health. The new *intersection* of patient expectation, provider skill, and clinical outcomes is evident in noting "Effective communication and listening in health care between the practitioner and patient can bear directly on the quality of care and the therapeutic benefits of the medical encounter" (Davis, Foley et al., 2008, p. 171).

Patients' share of health care costs is increasing and their access to information about their health and about the health care system is alerting them to the need to be more involved in their care decisions (Beach & Inui, 2006; Chesser, 2013; Davis, 2010). Patients expect that the providers who deliver care can communicate well with them and with any other providers

needed in their episode of care. The ubiquitous nature of information on health and disease both enables and impairs consumers to be viable influencers on reform. But this ambiguity does not dissuade them from expecting to play a more prominent role in their care decisions, especially as changes to insurance coverage shift more of the cost to them (Beach & Inui, 2006; Holmes, 2007; Ok, Marks, & Allegrante, 2008; Wanzer, Booth-Butterfield, & Gruber, 2004).

Internet-enabled health care information and patient choice allows patients to by-pass their primary care physician and has opened direct contact by patients with other providers (Fox, 2013). A Pew Internet & American Life Project (Fox, 2013) "…found 85% of U.S. adults use the Internet" (para. 2) and "72% of Internet users say they looked online for health information in the last 12 months" (para. 4). Information on website Healthfinder.gov (2013) ranges from authoritative and researched to opportunistic and unregulated hyperbole about diagnoses, products and procedures, and cures; patients' ability to discern fact from fiction varies widely (CAPHIS, 2013, March 7). Providers are increasingly required to help patients decipher myriad amounts of unfamiliar and complex processes and information. More accessible information is not uniformly beneficial, however. People receiving health insurance from government or commercial plans must navigate through more complex plan descriptions, decipher varying coverages, and deal with impersonal and automated customer service (Davis, 2010; Meldrum, 2011).

Patients' expectations and exasperations add complexity to provider practices already stressed by new care delivery models, evolving reimbursement plans, and pressure from the government, payors, and the public to define and adhere to best practice benchmarks (Garman et al., 2006; Goldsmith, 2010a). Patients' experiences of the health care system are by no means wholly positive, but patients' expanding *presence* is a healthy balancing force for a system that has

operated in a narrow, top-down model (Deledda, Moretti, Rimondini, & Zimmermann, 2013; Kagan, 2008a). With diminishing autonomy, shrinking incomes, and increasing oversight from government, payors, and patients, providers may feel expectations of them are in a negative trend (Powell & Davies, 2012; Suter et al., 2009; Swanson, Norman, & Linn, 1995).

Increasing intrusion into provider practices by patients seeking information and equality, by regulators, and by payors is diminishing provider autonomy and holding providers accountable for communication (and management) competence well beyond their clinically-based training. There is comfort and caution in the knowledge that, to date, linking specific attributes and behaviors to provider-provider communication competence has been highly speculative and largely extrapolated from research on the physician-patient relationship (Bodie et al., 2012). New communication studies may proceed with limited grounding in validated theory and concepts and their usefulness will be evaluated within a tumultuous and evolving environment. Well-conceived studies will be welcomed responses to the need for tools to evaluate communication in practice and education (A. Blue, personal communication, July 26, 2013).

Provider practice. The Pulitzer Prize winning book by Starr (1983), *The Social Transformation of American Medicine*, provides a detailed, authoritative description of how providers and facilities evolved into silos of practice and care delivery, especially the medical profession, as indicated by the book's subtitle, *The Rise of a Sovereign Profession and the Making of a Vast Industry*. Despite evolving conditions, individual and facility providers remain prone to viewing the health care system from siloes and to supporting intense lobbying efforts to protect their scope of practice and income (Garman et al., 2006). Nevertheless **t**he will to preserve the status quo has begun to wane among the leadership of health professionals' licensing, accreditation, and advocacy bodies, such as the American Medical Association (AMA)

and professional societies for nurses, and allied health professions (M. Earnest, M.D., Ph.D., personal communication, October 29, 2012).

As the healthcare system reacted and adapted to changing economic, social, scientific, and technological conditions, the provider community responded: business realities have consistently catalyzed practitioners to change and adapt. (Devers & Berenson, 2009). Through the last 30 years of the 20th century, facility and individual providers aggressively initiated and were swept along unwillingly by various configurations of payors, care delivery models, employers, and investor-owned entrepreneurial ventures (Goldsmith, 2010a; Kleinke, 1998). Providers have experienced significant impacts from legislation and strategies that affect how they practice and how they are paid, including Medicare and Medicaid, various forms of managed care (Health Maintenance Organizations, Preferred Provider Organizations), consolidation of hospitals into mega-systems, and the spread of free-standing out-patient diagnostic, surgery, and emergency service centers (Kleinke, 1998). Providers can be forgiven for believing they had adapted to, or at least survived, the various government and private sector interventions over the past generation. "Many of the threats that motivated herdlike behavior--health reform, Columbia/HCA, the physician practice management firms, managed care plans--either collapsed under their own weight or were defeated by the dogged, rear-guard actions of hospitals and systems" (Goldsmith, 2002, p. 1).

Providers are discovering status quo is not warranted (Goldsmith, 2002). The current and future health care system terrain appears no less prone to interventions involving the provider, payer, and patient triad working with traditional themes of care delivery, provider reimbursement, health insurance coverage, and government oversight (Goldsmith, 2013). Two initiatives are and will have especially intrusive and disruptive impact on the form and style of

provider practice. The first, the imperative for physicians to adopt Electronic Health Records (EHR) is well underway. The second is another iteration of reimbursement plan reform, part of the Patient Protection and Affordable Care Act (ACA) that poses new, uncertain, and risky scenarios for providers (Manchikanti et al., 2011).These reforms include various forms of formal, multi-profession practice, the most prominent of which are patient-centered medical homes (PCMH) (Ferrante, Balasubramanian, Hudson, & Crabtree, 2010; Stange et al., 2010) and Accountable Care Organizations (ACO) (Berwick, 2011; Devers & Berenson, 2009).

EHRs pose an especially disruptive potential for provider practice. Policymakers and researchers believe EHRs can connect all parties in a patient's care process to transcend geography, enable efficient, cost-effective care, and provide accurate information for the parties to apply in discussing care decisions (Goldsmith, 2013, May 21). Patient safety advocates believe this access and standardization significantly reduces care delivery errors.

However, providers who adopt EHRs commit to a complex *bargain*. For the first four years after adopting EHRs, providers can get significant federal government financial incentives for using EHRs. But federal and commercial payors are using EHRs to increase and standardize the measures of providers' quality of practice (Goldsmith, 2010b) and increrase pressure on providers to collaborate (and communicate) more closely. Providers find EHRs compromise practice efficiency and complicate the provider-patient relationship with the implication that the same ubiquitous connectivity and communication patients have via their many devices are afforded by EHRs (J. Rumbyrt, M.D., personal communication, May 23, 2013). Goldsmith (2010b) quotes a senior official at the UCSF Medical Center in San Francisco who refers to clinical IT as "a bunch of 'newfangled electronic silos.'" (p. 32).

The ACA poses possibly the biggest challenge yet for Medicare, providers, employers, and the public:

> …to test and develop payment systems that encourage both disciplined spending and the right level of care for patients. So which parties bear the economic risk, and how much of it, are important questions to consider as new payment schemes are designed and tested under health reform (Goldsmith, 2010a, p. 2)

Medicare has taken the lead role in balancing cost and amount of care for its beneficiaries and commercial payors have usually adopted some form of the strategies Medicare implements (Goldsmith, 2010a; Manchikanti et al., 2011). Numerous health industry and federal government demonstration projects and experiments with PCMH and ACOs have begun to redefine the skill set required of health professionals, emphasizing collaborative practice and formal team-delivered care (Interprofessional Education Collaborative, 2011b).

Flexner would almost certainly recognize "…the changing public interest…" (Berwick & Finkelstein, 2010, p. S56) inherent in the forces that are changing care delivery models and would know why these models are potentially important responses, just as he named this need in his response to the flawed medical education models of the early 20th century (Berwick & Finkelstein, 2010). He might even have applauded how health professionals must re-configure their practice to work in the PCMH or ACO model (Press et al., 2012).

Further evolution of care delivery models is certain (Goldsmith, 2009, August 17). The traditional private practice model that places providers in the role of solo or group clinician and business owner with others in their same discipline increasingly yields to models that require health professions to have the knowledge and skills to collaborate around patient care plans, especially in the treatment of chronic diseases (Press et al., 2012; Schadewaldt, McInnes, Hiller, & Gardner, 2013). Studies are needed to inform education models for future providers and improve current provider skill sets (A. Blue, personal communication, July 28, 2013).

The competency-based models such as interprofessional education (IPE) have the most promise for training providers in the skill sets now widely acknowledged as requisite for practice in the emerging health care system (Interprofessional Education Collaborative, 2011a, 2011b). Educators have overcome considerable resistance from their colleagues and from the 100 year old education model to achieve reforms thus far (Dow, Blue, Konrad, Earnest, & Reeves, 2013). Growing consensus among educators and providers around the competencies needed to practice safely and effectively holds promise to accelerate further reform, but the favorable conditions will not completely mitigate challenges educators face (Dow et al., 2013). Newly-minted providers move into practice in an environment that was changing when they began training and remains in flux; institutional leaders in IPE acknowledge their programs must already adapt to emerging practice imperatives (Dow et al., 2013; Earnest & Brandt, 2014).

Provider education. Emerging IPE curricula mix students from multiple health professions in training to apply their discipline-specific skills collaboratively and acquaint students with the skills, language, and roles of each other and their disciplines. Buring et al. (2009) note

> Most notably, the Institute of Medicine (IOM) declared that 'health professionals should be educated to deliver patient-centered care as members of an interdisciplinary team...'. The IOM has clearly stated that patients received safer, high quality care when health care professionals worked effectively in a team, communicated productively, and understood each other's roles (p. 1).

The pace at which IPE programs are proliferating can suggest to someone unfamiliar with the history of provider education that educators readily embrace change. Many educators are arriving at this current tipping point reluctantly (Carraccio et al., 2002; Skochelak, 2010).

Calls for reform to the 100 year old model for health professions' education first appeared in the IOM report, *Educating for the Health Team* (Institute of Medicine, 1972). Changes to education models over the next 30 years were incremental and did not aggregate consequentially

in any one location or program (Berwick & Finkelstein, 2010). The alarming and defining article on medical errors from Leape (1994) did not immediately galvanize changes to education models, unlike efforts in the government, health care industry, and private sector whose reactions catalyzed strategies to address the incidences of medical errors (Institute of Medicine, 1999/2001; Liang, 2002; Singh et al., 2008). The early initiatives led to closer scrutiny of provider training and the beginnings of the safety and quality movement in health care, first in practice and now in education (G. Barley, Ph.D., personal communication, September 15, 2005).

During the years after *Educating for the Health Team* was published, reports appeared that sharpened the call for education reform, from the IOM (Institute of Medicine, 2001, 2003), the Accreditation Council for Graduate Medical Education (Brasel, Bragg, Simpson, & Weigelt, 2004), and the Canadian Interprofessional Health Collaborative (Canadian Interprofessional Health Collaborative, 2007). Those reports were affirmed by highly credible observers and participants in reform efforts, including Gilbert (2005) and key figures at the Carnegie Foundation for the Advancement of Teaching and Josiah Macy, Jr. Foundations (Josiah Macy Jr. Foundation, 2010, 2011), and the Robert Wood Johnson Foundation (Interprofessional Education Collaborative, 2011a). Progress was modest and scrutiny of education models was more from observers and critics on the outside than from any significant educator-initiated efforts (Skochelak, 2010).

The "health care duality" of education and practice remains a barrier to clear (Interprofessional Education Collaborative, 2011b). Education and practice are closely related and dependent on each other, and both are burdened and segregated by tensions around roles and responsibilities for the delivery of health care (Interprofessional Education Collaborative, 2011a). Current educators were trained in siloed models and even those committed to IPE are

just beginning to impact students' development of interprofessional (IP) competencies. The practice community begins to supplant the faculty role and *subconsciously* shape students' expectations and mental models for practice beginning in students' second or third year of training, as students spend less time in classrooms and begin patient encounters with provider preceptors (J. Williams, Ph.D., personal communication, April 30, 2012). Students beginning their preceptorship have between two and four more years of education, but are being simultaneously prepared for practice by IPE faculty and practitioners whose influence and goals are not aligned. The effect of the tension in such relationships inhibits the speed of education reform.

During the past 10-12 years some hope comes from an unprecedented consensus among educators, policymakers, and researchers on the competencies providers should gain to deliver timely, efficient, equitable, affordable, and safe care (Canadian Interprofessional Health Collaborative, 2007; Carraccio et al., 2002; Skochelak, 2010; Smith & Dollase, 1999). Reports supported by major foundations and the health professions' education and professional organizations have begun to acknowledge the validity of specific competencies in provider education (Interprofessional Education Collaborative, 2011a, 2011b; Josiah Macy Jr. Foundation, 2010, 2011). The desired outcome is for delivery of health care increasingly by a competency-based, interprofessional adept team community (Interprofessional Education Collaborative, 2011b).

Competency-based IPE models have the potential to accommodate a current version of what Flexner referred to as society's need for medical care and the paramount public interest (Berwick & Finkelstein, 2010). Programs that have committed to competency-based IPE models have

chosen variations on the four competencies advanced in the report from the Interprofessional Education Collaborative (2011b):

- Values/Ethics for Interprofessional Practice
- Roles/Responsibilities
- Interprofessional Communication
- Teams and Teamwork

Examples of health professional education centers that have committed to competency-based, IPE models provide considerable consequential evidence of what the future of health professions' education may be. A list of the notable sites for various forms of IPE with some of the distinct offering is provided in Appendix B.

Numerous studies affirm the competencies providers need to practice in the evolving care environment; but few studies effectively characterize the detailed components of successfully executed competencies, especially in the case of provider-provider communication. New communication studies are being designed amidst a mixture of perspectives about communication type and methods that invite innovators to look beyond current trends to explore a [r]evolution of relationships among providers, their patients, and care delivery decisions (M. Fisher, DBA, personal communication, October 12, 2012). Mobile Electronic Devices (MEDs) are taking a significant role in the shift of health monitoring, diagnosis, and treatment from the traditional provider office to the home and from the provider to the patient. Castells (2010) and Nunberg (1996) describe information exchange scenarios that de-emphasize the speaker-listener paradigm in favor of stronger abilities to understand and respond to digitized information and speech. Notwithstanding these scholars' speculation, communication and listening literature provides much validity and necessity for personal and professional exchanges of information.

Few exchanges are more compelling than those among health care professionals, and among those professionals and their patients in the delivery of health care (Interprofessional Education Collaborative, 2011b).

The digitization of health care that began in the 1960s, and the type, amount, and sophistication of clinical information available for exchange among providers in various locations has followed the available technology (Boulos, Wheeler, Tavares, & Jones, 2011; Singh et al., 2008). The statement that the most decisive encounters in health care will continue to be provider-provider and provider-patient has long been embraced by the care delivery sector. The digitization of health care may well dilute the literal meaning of that statement but the requirement for accurate, comprehensive communication adds further impetus to professionals' embrace of new education and practice models (Interprofessional Education Collaborative, 2011b).

The degree of consensus among health professions' educators for the requisite competencies is an impressive achievement (Thibault, 2012). Its current potential lies in educators' ability to adopt some degree of entrepreneurial and technological tactics, to refine their model even as requirements for provider skill sets remain unsettled (Dow et al., 2013; Earnest & Brandt, 2014). In the meantime educators (and providers) must adapt to the initiatives and expectations from numerous *constituents* whose concerns with present conditions in care delivery are not limited to errors but to issues that add further pressure on providers' communication skills and exchanges of information.

The preceding environmental conditions are a backdrop for efforts to address medical errors and a description of the dynamic conditions in care delivery that affirm the need for this study.

Communication and Listening Studies

This section describes the roots of and modern day uses for listening behaviors as tools to enhance general communication research and specifically provider-provider communication during care delivery. The challenges posed by the limited tools researchers can access from current health care communication and general listening studies are examined. A model for examining communication during care delivery is proposed and studies from aviation cockpit conversations and application of CLC are introduced as sources for the framework of the study.

> An attending physician on rounds strides into a hospital room with an entourage of medical students and asks his patient this question: "How can we do a better job of caring for you?" The patient, a 15-year-old boy named Kevin, has been in and out of the hospital 30 or 40 times for treatment of short bowel syndrome…commonly caused by the need for surgical removal of the small intestine. This veteran of the health care system says he's been very happy with the care he has received over the years, but, when pressed, says this: "I have great doctors and nurses here - but can you please talk to each other?" Interprofessional Education Collaborative (2011a, p. 2).

This section supports two premises upon which this dissertation is built: there is a unique compelling need to understand communication among health care professions more precisely than is currently the case (Krautscheid, 2008; Lyndon et al., 2011; Ok et al., 2008; Wanzer et al., 2004) and listening behaviors can be useful tools in studies seeking to characterize communication in specific contexts to achieve more precise understandings of provider-provider communications (Bavelas & Gerwing, 2011; Hargestam et al., 2013; Janusik, 2008; Singh et al., 2008).

Findings in communication and listening studies are aggregated in three areas:

- Origins of communication, including the practitioners, scholars and seminal theories that defined the field, pre-20th century-1945
- Post World War II communication research from which listening studies emerged
- Origins of listening and current state of research in listening

Communication: origins, scholars, and theories. The American Communication Association (ACA) agreed upon the following definition of communication in 1995:

> The field of communication focuses on how people use messages to generate meanings within and across various contexts, cultures, channels, and media. The field promotes the effective and ethical practice of human communication. (Korn, Morreale, & Boileau, 2000, p. 1).

This definition was from a survey of the ACA membership to ascertain the utility of that definition (Korn et al., 2000). In a field with arguably over 2,000 years of information, for scholars to reach even modest agreement on a definition of communication is problematic. So a disparate collection of understandings about what constitutes communication remains, though not without some discernable continuity (Fiske, 2011).

An understanding of how communication studies evolved was reached after examining the spoken and written contributions of scholars in the following three periods: pre-20th century where the earliest root of communication are found; 1900-1945 when the preeminent scholars from multiple disciplines laid the foundations for modern communication studies; and post-World War II when communication became a legitimate academic pursuit.

Pre-20th century. The literature is replete with perspectives, researched and well-reasoned opinion that [only] agree on perhaps 2-3 broad points about the roots of today's studies in communication (Peters, 1999; Pooley, 2008; Rogers, 1997). First, the roots of the discipline can be *located* among the greatest classic Greek thinkers and philosophers including, successively, Socrates, Plato, Aristotle, Cicero, and some of the Sophists. Second, scholars accept little was written or studied that significantly shaped the discipline again until the 20th century. Third, despite significant advances in communication practice and education, Wahl-Jorgensen (2003) observes the efforts by scholars to define the field's core, boundaries, unified and identifiable

projects, and myths of origin have simultaneously succeeded and fallen short. In the process the efforts may have stymied further breakthroughs.

The Classic Greek period was the birthplace of oratory, rhetoric, and dialogue (Brickhouse & Smith, 2005; Clayton, 2005; Kemmerling, 1997). The encounters between speaker and audience appear as basic one-way, speaker-to-audience form, and the more inclusive dialogues between leading thinkers and their pupils, personified by the "…Aristotelian 'friendship' between unequals…" (Beach & Inui, 2006, p. S4). Providers and patients alike cannot help noting that these *models* persist today as the prevalent form of communication between both parties. This period is arguably the origin of all the hierarchies that array "those who know" and "those who should learn from them" in sharp contrast. Aristotle advanced this limiting image of communication only slightly by naming humans the speaking animals (Peters, 1999).

A highly influential mix of philosophers, teachers, scholars, priests, and statesmen made substantive contributions to knowledge and its dissemination after the Classics, a group that includes Jesus (in the Synoptic Gospels), St. Augustine, St. Thomas Aquinas, Sir Francis Bacon, John Locke, and Soren Kierkegard (Peters, 1999; Rogers, 1997). Nevertheless no consequential link to present day communication studies can be discerned among these very significant people.

Peters' well-regarded text, and its equal by Everett Rogers, only briefly acknowledge the time between the Classic Greek era and the 20th century. Neither scholar finds much noteworthy contributions to defining and studying communication as a field in the 19 centuries that followed Socrates (Peters, 1999; Rogers, 1997). Only Kierkegard attempts to credibly bring forward communication traditions from Classic Greece and Christianity to develop more relevant approaches (McPherson, 2001). McPherson (2001) notes Kierkegard was considered awkward by admirers in his attempts to explore communication more deeply than any major writer or

intellectual before, but his were the most impactful efforts to position language and communication for the critical discoveries of the 20th century.

1900-1945. The National Communication Association formed in 1914, but prior to the 1950s little of the thought and writing on communication appears to have been sufficiently compelling to catalyze the formation of communication as a distinct academic discipline that sought to develop theory and inform practice (Rogers, 1997). Peters (1999) and Rogers (1997) provide sound evidence for their similar beliefs that modest scholarship and research in communication emerged after World War I as shell-shocked soldiers with speech impairments and waves of immigrants in need of English-language training presented challenges to existing resources. Another surge of research in and application of communication techniques came during and after World War II as the major combatants tried to rally public support for their causes--and, in some cases, horrific strategies (Peters, 1999; Rogers, 1997).

Communication studies ultimately evolved in the first half of the 20th century from speech, journalism, and theater departments, from social science and humanities, and from the singular efforts of a handful of forerunners (Peters, 1999; Rogers, 1997). The scholars who examined this period name many of the same group of events and people as instrumental in establishing modern communication studies.

The first half of the 20th century was noteworthy for the aggregation of and contributions of leading intellectuals at two well-established universities--University of Chicago (IL) and at the University of Frankfurt (Germany). The Chicago scholars, among them George Herbert Mead, Harold Lasswell, and Douglas Waples, were the first to apply empirical research to communication, albeit narrowly on mass communication, just as major world political events began to call attention to the role of communication in society (Wahl-Jorgenson, 2003). The

early Frankfurt School scholars included Max Horkheimer, Theodor Adorno, Eric Fromm, and Herbert Marcuse. This group of scholars formed initially at Frankfort University, but did most of their major work in social research, critical theory, and dialectics in the United States where the school was re-established after being disbanded by the Nazis (Pooley & Park, 2012). The work of that first generation of scholars significantly informed communication studies into the second half of the 20th century, primarily in the person of Jurgen Habermas (Niemi, 2005).

Paul Lazarsfeld was another prominent émigré, although not part of the Frankfurt group who had a seminal influence over the techniques and the organization of social research (Peters, 1999). Lazarsfeld, Adorno, and Lasswell, with Carl Hovland and Kurt Lewin, were drawn to the massive U.S. propaganda effort during World War II and they laid the foundation for modern communication studies (Rogers, 1997).

Post World War II. The Committee on Communication and Public Opinion (1942-1945) at the University of Chicago was the birthplace for the study of mass communication, spurred on by the U.S. government's World War II (WWII) psychological warfare strategy (Berelson, 1959). The institutional support for this committee died after three years, but the *opening* was created for the several men who advanced the study of communication into academic legitimacy (Berelson, 1959; Rogers, 1997). Wilber Schramm's role in this period is debated among communication scholars but his achievements are signal, even if he is "…viewed as [a] shrewd politician of the academy and less a founding father" (Rogers, 1997; Wahl-Jorgensen, 2003). Schramm's vision for communication study was shaped by his years in war-time Washington, DC.

Schramm left Washington and parlayed the divergent influences from Lazarsfeld, Lasswell, and Lewin and an opportunistic attitude into establishing the initial Ph.D. programs in

communications at the University of Iowa (Iowa City, IA) and then at the University of Illinois Urbana-Champaign, IL) and at Stanford (Stanford, CA) (Rogers, 1997; Wahl-Jorgensen, 2003). Schramm's pattern of fortuitous developments, curricular clarity, and tireless promotion was born at Iowa, as he found himself heading the School of Journalism. There the first Ph.D. in Mass Communication was established in 1947 with its first two Ph.D. degrees awarded in 1948 (Rogers, 1997; Wahl-Jorgensen, 2003). He also created the unusual and potentially divisive situation of having two different academic units on the same university campus awarding Ph.D. degrees in communication. The Department of Speech and Dramatic Arts (now the Department of Communication Studies) had been awarding Ph.D. degrees since 1930 that were unique in their focus on interpersonal communication (Rogers, 1997).

Scholars debate Schramm's founding role in communication studies, as there were already scholars exploring communication and Ph.D. degrees were being awarded. Many consider him no more than a peer to preeminent scholars of his time (Berelson, 1959; Rogers, 1997). Few scholars dispute Schramm was influential, and Schramm is arguably the first to name himself and conduct his activities and research as a communications scholar (Pooley, 2008). The men usually named as forerunners in the field – Lazarsfeld, Lasswell, Hovland, and Lewin – maintained identity with their respective fields (Berelson, 1959; Pooley, 2008). Schramm did more to aggregate the seminal work of other scholars noted here into formal study than anyone previous (Pooley, 2008).

Schramm and other of the WWII scientists and scholars moved into the second half of the 20th century widening inquiry from mass communication (message transmission) to interpersonal communication (message meaning) (Rogers, 1997). Hypotheses and models began to emerge in close *proximity* to each other. In *The Structure and Function of Communication in Society*,

Lasswell (1948) proposed a Five Question Model (Lasswell's Model, 2010) in Figure 1, which argued that beyond shaping and delivering the message, there was value in knowing the impact of the message. Lasswell was the first to establish a place for the active listener who, at least at a rudimentary level, responded with some indication of the message's effect.

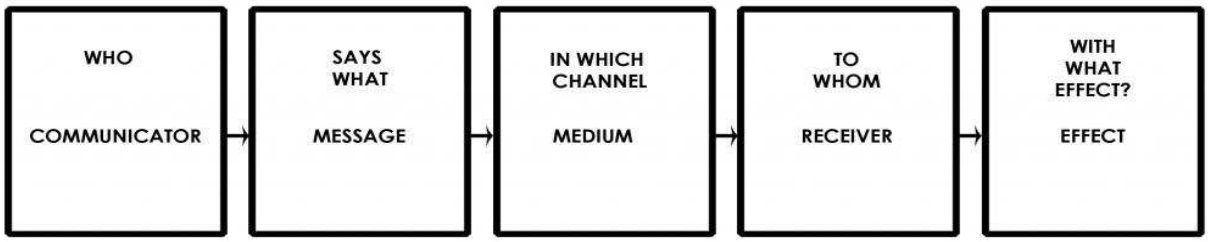

Figure 1. Lasswell's Five Question Model (Lasswell's Model. 2015, February 8)

Bell Laboratory engineers Claude Shannon and Warren Weaver did not intend to address communication or listening studies but, while trying to depict how radio waves move through cables transmitting a message, they extended Lasswell's argument for message impact (Chandler, 2008, August 7; McKlin, 2004). They developed the engineering model (Source-Message-Channel-Receiver) in 1949 that placed the message receiver more prominently than had been the case previously, in Figure 2.

Shannon and Weaver's transmission model is the best-known example of the informational approach to communication. Although no serious communication theorist would still accept it, it has been the most influential model of communication yet developed, and it reflects a common sense (if misleading) understanding of what communication is (Chandler, 2008, August 7; Lewbel, 2001). Lasswell's verbal version of this model, "*Who* says *what* in *which* channel to *whom* with *what effect*?" was reflected in subsequent research in human communication which was closely allied to the behavioral components of listening that this dissertation utilizes.

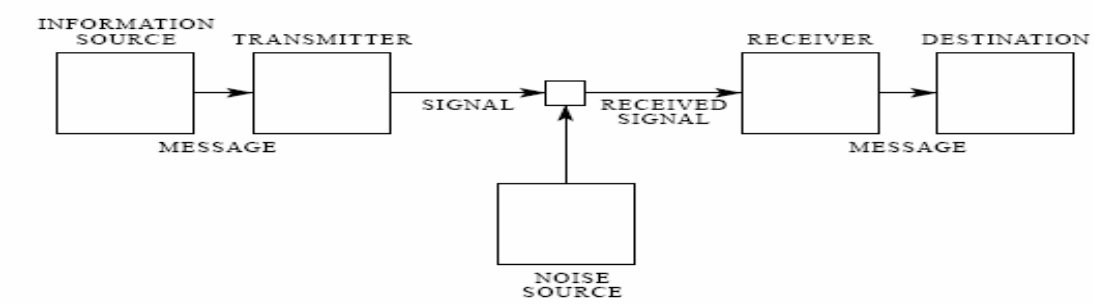

Figure 2. Shannon-Weaver Engineering Model (Chandler, 2008, August 7)

More sophisticated models for communication emerged in the 20 years after the Shannon-Weaver Model in 1949 as scholars defined and explored beyond message transmission to the meaning of messages. Bar-Hillel and Carnap included a semantic component to communication (Bowman & Targowski, 1987); Osgood's work with semantic differential led him to postulate "…that meaning is contained in the social context as well as in the message and that communication 'units' contain both nonverbal and verbal components" (Bowman & Targowski, 1987, p. 25). Osgood's mention of "context" as a component of communication foreshadows a topic that remains problematic in communication research. His concept of verbal and nonverbal components made its way into definitions and models of listening though few listening scholars include both components in their contributions.

Schramm's 1954 model was the first to move away from the prevailing linear models of Lasswell and Shannon-Weaver, explicitly defining communication as closed loop events, as shown in Figure 3 and he assigned active roles for both speaker and receiver (Bowman & Targowski, 1987). An emerging scholar Ralph Nichols was laying the foundations for listening studies and had begun to refer to the receiver as "listener" (Purdy, 2006).

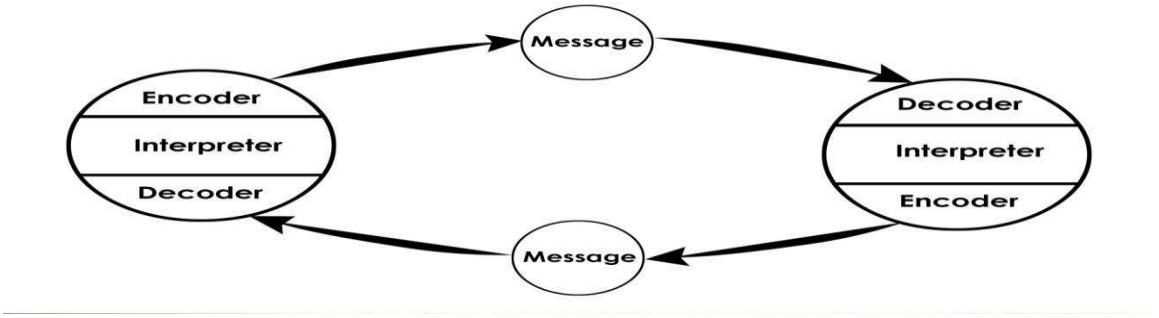

Figure 3. Schramm Communication Model (Bowman, & Targowski, 1987).

Many subsequent communication and listening models show the communication processes as closed loops (Bowman & Targowski, 1987; Wolvin & Coakley, 1993b). Researchers in aviation and health care communication cite listening loops as models for displaying and improving information exchange in care delivery (Bowers & Jentsch, 1998; Cocksedge & May, 2005; Hargestam et al., 2013; Helmreich, 2000; Ricci et al., 2012). Schramm's model and a model from one of his more distinguished pupils David Berlo, in Figure 4, add further refinements to understanding communication as continuous interaction, asserting how people take turns being speaker and receiver.

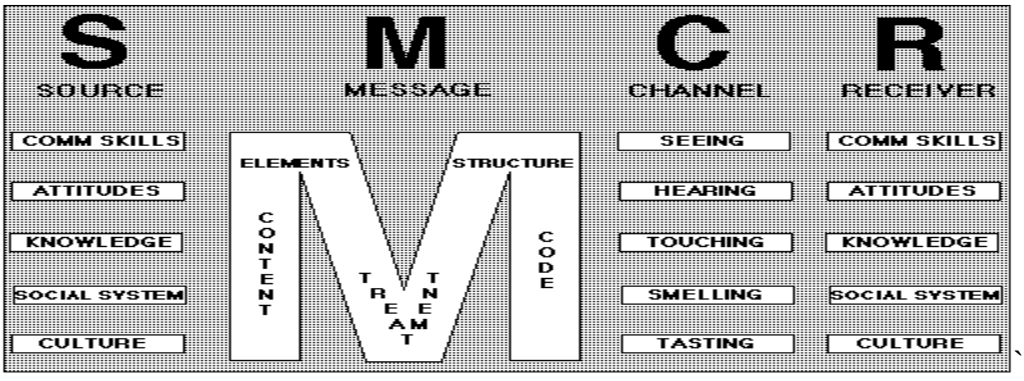

Figure 4. Berlo's SMCR Model of Communication (Berlo, 1960)

Berlo's (1960) model added depth to the Shannon-Weaver Model and opened the way for closer examination of the communication process. Bowman and Targowski (1987) point out how Berlo's 1960 Communication Process "…provides some useful vocabulary for discussing the

process and encourages an examination of the nature of the central components of the communication process" (p. 27). Berlo's model is essentially linear but, to the extent he did not advance Schramm's closed loops concept, he more than compensated with his observation that messages, not meanings are transmitted. His assertion that the receiver assigns meaning broke ground to more fully consider cognitive, affective, and behavioral process in listening (Bowman & Targowski, 1987). Into the 1960s, other communication researchers were questioning the definition of communication as simply transmitting data or text; questions emerged about what impact or meaning the transmission had on sender and receiver (Bowman & Targowski, 1987).

Bowman and Targowski (1987) make the point

> Language and communication occupy the central role in human activity and make possible the analysis and synthesis leading to knowledge and wisdom, but after thousands of years of recorded history, we still do not fully understand what happens when two people communicate [exchange information] (p. 22).

The evolution of communication studies since WWII and into the present day has been driven by a number of factors, including rapid social changes in the 1950s, cultural movements and political activism in the 1960s and 1970s, and the multiple impacts on society and science as the Digital Age becomes the Knowledge Age (Rogers, 1997).

Forty years before Bowman and Targowski's (1987) observation about communication (above) the hypotheses from Lasswell, Shannon and Weaver, Schramm, and Berlo were already being acknowledged by scholars as they searched for more clarity about messages, parties to the information exchange, and for a better understanding of successful and unsuccessful communication. Their quests are the origins of listening scholarship.

Listening studies. It is coincidence that Ralph Nichol's Ph.D. dissertation was completed in 1948 in the University of Iowa communication program Schramm had founded (Rogers, 1994), but given the unavoidable influence Schramm had on those early scholars, it is not coincidence

that Nichols quickly assimilated the available communication scholarship and set the direction for the field of listening (Purdy, 2006). References are made in the literature to the work of P.T. Rankin in the 1920s that may have been the first scholarly effort to examine listening (Purdy, 2006; Witkin & Trochin, 1997), but Purdy (2006) wryly observes, "…the study was descriptive/quantitative, limited, and no one was especially listening" (p. 20). Unlike some in communication research who debate Schramm's role in communication studies, the earliest roots for listening studies are seldom disputed: scholars come to unusually common ground that the founding father of the field is Ralph Nichols (Purdy, 2006).

Nichols immediately demonstrated his own emerging thoughts about listening by critiquing how the Shannon-Weaver model positioned the receiving of communication as the end point and portrayed communication as simply transmitting information (Chandler, 2008, August 7; Lewbel, 2001; Purdy, 2006). Nichols made an important decision to initiate listening studies more for practitioners than for researchers of practice. "His characteristics of listening were descriptors of what listening was--not conceptualizations or abstractions--what people actually did that was effective or ineffective in the process of listening" (Purdy, 2006, p. 20). Nichols was already acknowledging what has become a key concept in this study, that "What we are most interested in is what listeners do when interacting with others…" (Bodie, 2013, p. 79).

Listening studies were taking shape on the basis that communication included more than an aggregation of the bits of information passed among people (Campbell & Level, 1985). A broadening field created opportunities and Nichols' colleagues affirm he separated listening from communication and moved the listening field into its own (Purdy, 2006). An argument can be made that Nichols' applied approach was, in part, accountable for the current paucity of theory in listening studies as well. His focus on practitioners inhibited equal attention to listening research

which remains problematic even now for studies that attempt to characterize communication. His opportunistic outlook on defining listening as a discipline itself catalyzed a number of listening scholars to propose definitions for listening and bolster them with models that generated a variety of thoughts about listening, but little coherence (Bodie, 2009; Bodie, Janusik, & Välikoski, 2008; Bodie, Worthington et al., 2008). Nevertheless one or more of Nichols' published works frequently appears in the articles in this review of literature (Bodie et al., 2008; Janusik, 2004; Purdy, 2006; Rhodes, 1993; Wolvin & Coakley, 1993a).

The International Listening Association formed in 1979 and scholars organized around the belief that effective listening behaviors were an integral part of effective communication in "…learning, teaching, counseling, culture, and the business world" (International Listening Association, 2000). Listening was defined in 1996 as: "The process of attending, receiving, constructing meaning from, and responding to spoken and/or non-verbal messages" (International Listening Association, 2000, para. 1). That definition belies the complexity that listening is proving to include, but its simplicity signals the need for in-depth listening studies (Bodie, 2013; Bostrom, 2011; Purdy, 2000; Wolvin, 2013)

Roots in communication studies. The third edition of John Fiske's highly-regarded text, *Introduction to Communication Studies*, makes some useful contributions to transition from the preceding sections to the literature on listening. He notes in the Preface that communication is too often taken at face value when it should be taken apart (Fiske, 2011). He advocates for the utility of a less than unified field in communication and cautions against the seduction of media technology (Fiske, 2011); both thoughts are helpful links to similar perspectives now being posed by listening scholars (Bodie et al., 2008; Bodie, Worthington et al., 2008; Wolvin, 2013).

Fiske describes two schools of communication. The first is the semiotic school whose advocates focus on the study of signs and meaning. Their interest is in the interactions among people as members of a particular culture or society; a misunderstood message is not so much indicative of communication failure as it is a difference in signs and meaning (Fiske, 2011).

The second school is based around process or the successful transmission of messages. These [communication] scholars choose the word *episode* to include the series of communication steps that end when "…one person affects the behavior or state of mind of another" (Fiske, 2011, p. 55). [NOTE: Most listening scholars and all health care communication researchers use the word "exchange." The word exchange is used in this study as it aligns with the focus on unsuccessful communication in health care delivery.] Unsuccessful communication results when the desired effect is different from or less than expected; these scholars examine the process for the point(s) of failure (Fiske, 2011), not unlike the process of diagnosing communication failure in care delivery.

The process school focus emphasizes successful message exchanges. Peters (1999) notes, "Humans are hardwired by the privacy of their experiences to have communication problem" (p. 9). Speakers and listeners in casual conversation can choose how crucial the success of their exchanges [of information] are to them; as the exchanges occur in increasingly complex, high stakes fields like delivery of health care, the success rate must be essentially 100%. Richard Brilli, chief medical officer at Nationwide Children's Hospital in Columbus, Ohio says facilities, staff, and providers need to "Commit to eliminating medical errors and harmful practices altogether. 'I couldn't look a family in the eye and say we aspire to be 50 percent better,' Brilli says. 'There is no higher goal than zero harm events'" (Sternberg, 2012, para. 7).

Even the most serious-minded scholars cannot help but recall with a smile the iconic assessment by Strother Martin, as the Captain, in the 1967 movie, *Cool Hand Luke* over the situation Paul Newman's character catalyzes: "What we got here is failure to communicate" (Rosenberg, 1967). The bulk of knowledge about unsuccessful communication that leads to medical errors is realized after the error, essentially another version of the Captain's words. Scholars and researchers must search deeper than a statement or the evidence of unsuccessful communication into the *fragmented* state their differences create to reach across discipline lines to search for the more precise understandings of all types of communication that complex processes and ideas need (Bostrom, 2011; Janusik, 2004; L. Janusik, Ph.D, personal communication, Novermber 8, 2013; Sternberg, 2012). The field of listening stands to benefit most from the pursuit of a unifying definition for listening, which has long hindered the development of theory and specific listening contexts (Kirschbaum & Fortner, 2012; Witkin & Trochin, 1997; Wolvin, 2013).

Listening definitions and models. Listening definitions and models in a chronology make a case for this study to characterize provider-provider communication. This section includes the researcher's proposed model for examining communication in care delivery.

The earliest work to define listening behavior began with Nichol's Ph.D. dissertation (Wolvin, 2006). His was the first significant attempt to study the process of listening and to ask what basis existed to determine the components of good listening (Wolvin, 2006). Nichol's research is a remarkable forerunner of how listening scholarship progressed from that point, as he identified aural and visual factors in the listening process, as well as environmental variables that are debated to the present day by scholars (Bavelas & Gerwing, 2011; Bodie, 2013; Bostrom, 2011;

Edwards, 2011; Janusik, 2008; Roter & Larson, 2001; Simonoff & Step, 2011; Wolvin, 2006, 2013).

The process by which listening was examined going forward from Nichols' work is best described as scholarship, rather than research. Graham Bodie notes that scholars advanced and defended models for listening behavior at the expense of research that firmly defined theory (G. Bodie, Ph.D., personal communication, December 12, 2011). Janusik (2004; L. Janusik, Ph.D., personal communication, November 8, 2013) notes listening scholars have not consistently built on each other's work or shared information across disciplinary lines. The result is over 50 definitions and models for listening (Janusik, 2004). These conditions also support the choice of an exploratory inquiry strategy for the study here. Listening scholars have produced no substantive theory and have not produced bases for hypothesizing about causes for communication failures from which to build studies.

Nevertheless the definitions and models developed by these scholars are the best available expressions of the components of listening and the associated behaviors, including points of agreement and disagreement around those components.

Listening Definitions. The earliest writing from interpersonal communication scholars focused on defining what listening is, primarily on the cognitive processes (Barker, 1971; Edwards & McDonald, 1993; Imhof & Janusik, 2006; Janusik, 2004; Lewis, 1958; R. G. Nichols, 1957; Rogers, 1994; Witkin & Trochin, 1997; Wolvin & Coakley, 1993a). The terms used for cognitive processes are varied but essentially the same: "…attending to, understanding, receiving, and interpreting content and relational messages" (Bodie, 2013; Janusik, 2004). Affective processes are generally accepted to indicate a willingness to listen, a state shaped by the listener's attitude and individual belief systems (Bodie, 2013; Rhodes, 1993; Wolvin & Cohen, 2012). Affective

processes have received modest attention, yet many of the measures of perceived listening competence, attitude, tendency, and predisposition to listening have failed to demonstrate validity (Bodie, 2013).

Scholars' and educators' interest in behavioral processes has grown apace of the increasing scrutiny on communication failures (Agarwal, Sands, & Schneider, 2010; Bentley, 1997; Brue, 1988; Hargestam et al., 2013; Manojlovich et al., 2014; Siassakos et al., 2011), as the focus of research turns to trying to identify what listeners do rather than what listening is. Verbal and nonverbal responses are important to confirming the cognitive processes that precede the responses (Bavelas & Gerwing, 2011), but identifying the listening loop has closed with behavioral studies present researchers with considerable logistical and design challenges (Bavelas & Gerwing, 2011; Bodie, 2013; Bodie, St. Cyr, Pence, Rold, & Honeycutt, 2012; Bowman & Targowski, 1987). Bodie (2013) notes that far less time and labor are needed when a series of self-report instruments are applied to gather data, but he acknowledges the limits of self-report reliability.

Other approaches to defining what listening is come from Glenn (2009), Witkin and Trochin (1997), and Imhof and Janusik (2006) who sought to create consensus for the conceptualization of listening and to stimulate development of theoretical bases for research with studies that aggregate definitions of listening logically into clusters, groups, or themes. The studies advanced scholarship toward models for listening, but made little contribution to research and theory development, however (Bodie, 2009). The roots of today's lack of theory and specific contexts for listening are found in scholars' focus on attributes of listening, or what listening is, rather than what listeners do (Bentley, 1997, 2000; Bodie et al., 2012). Scholars persisted in supporting

their individual understandings of listening by advancing models to further establish their respective definitions (Bodie et al., 2008; Bodie, Worthington, et al., 2008).

Listening models. Wolvin (1989) provides a comprehensive history of listening models that begins at the time Nichols and others were describing a separate field of listening. Those scholars built on the communication models proposed by Lasswell (1948), Shannon and Weaver (Chandler, 2008), Deutsch (1952), Schramm (Bowman & Targowski, 1987), and Berlo (1960). Deutsch (1952) names four purposes served by models--to organize similar data, to discover new dimensions in an existing concept, to predict, and to measure. In a book based on Deutsch's description of model usage, McQuail and Windahl (1993) describe models as "…a consciously simplified description in graphic form of a piece of reality" (p. 2). Berlo's Source, Message, Channel, and Receiver model established a role for the message receiver and reinforced Schramm's closed loop concept, a fundamental tenet of any consequential communication (Berlo, 1960; Cocksedge & May, 2005; Wolvin, 1989).

The most frequently-cited models include some variation of the same core elements of listening: receiving, understanding, interpreting, evaluating (Barker, 1971; Brownell, 1986; Lundsteen, 1979; Maidment, 1984; Mills, 1974; Steil, Barker, & Watson, 1983; Taylor, 1964; Wolvin, 1989; Wolvin & Coakley, 1993a). The models from Taylor, Barker, Maidment, and Brownell added a final element, responding, and went beyond depicting elements to include variables, such as personal and professional characteristics, organizational roles, attitudes, values, and emotional state of the parties. The model for examining communication in care delivery proposed here takes many of its components from the work of listening scholars discussed in the following paragraphs.

Wolvin begins his comprehensive evaluation of listening models with Taylor (1964), crediting him with an early definitive model for listening (Wolvin, 1989). Taylor goes beyond the frequently-cited listening elements to suggest cognitive and affective processes, as well as variables of listening, setting, and participants' state of mind and abilities.

Mills's MASTER listening model introduces two important concepts. He considers listening an active, complex process, and he is the first to include remembering in the listening process (Mills, 1974; Wolvin, 1989). Remembering is an important element in cognitive listening processes (Janusik, 2004); and remembering is a fundamental, though potentially problematic element of listening in care delivery (G. Barley, personal communication, July 23, 2013). Health professions' training has historically emphasized rote memorization of clinical information in the belief that practitioners then apply pattern recognition (Edwards & McDonald, 1993; Janusik, 2004; Rhodes, 1993) to effectively assess and diagnose patients (Martin, 2011; Wass, Jones, & Van der Vleuten, 2001). Rote memorization has contributed to educating multiple generations of health professionals, especially physicians, to default to checklist interviews rather than successful information exchanges and relationship-building (Wanzer et al., 2004).

Barker (1971) extended Taylor's work, to define cognitive and affective processes and include verbal and nonverbal stimuli (Figure 5), and he broadly notes setting and participants' state of mind (Wolvin, 1989). He was the first to name and equally weigh a variety of verbal and nonverbal stimuli. Barker's early prominent role for verbal and nonverbal stimuli is affirmed by health professions' communication curriculum developers whose programs give equal weight to both stimuli (Bodie, 2013; Suter et al., 2009; Wanzer et al., 2004). The collective contribution to the proposed model from Taylor, Mills, and Barker defines roles for cognitive processes, for environmental and personal variables, as well as for verbal and nonverbal stimuli.

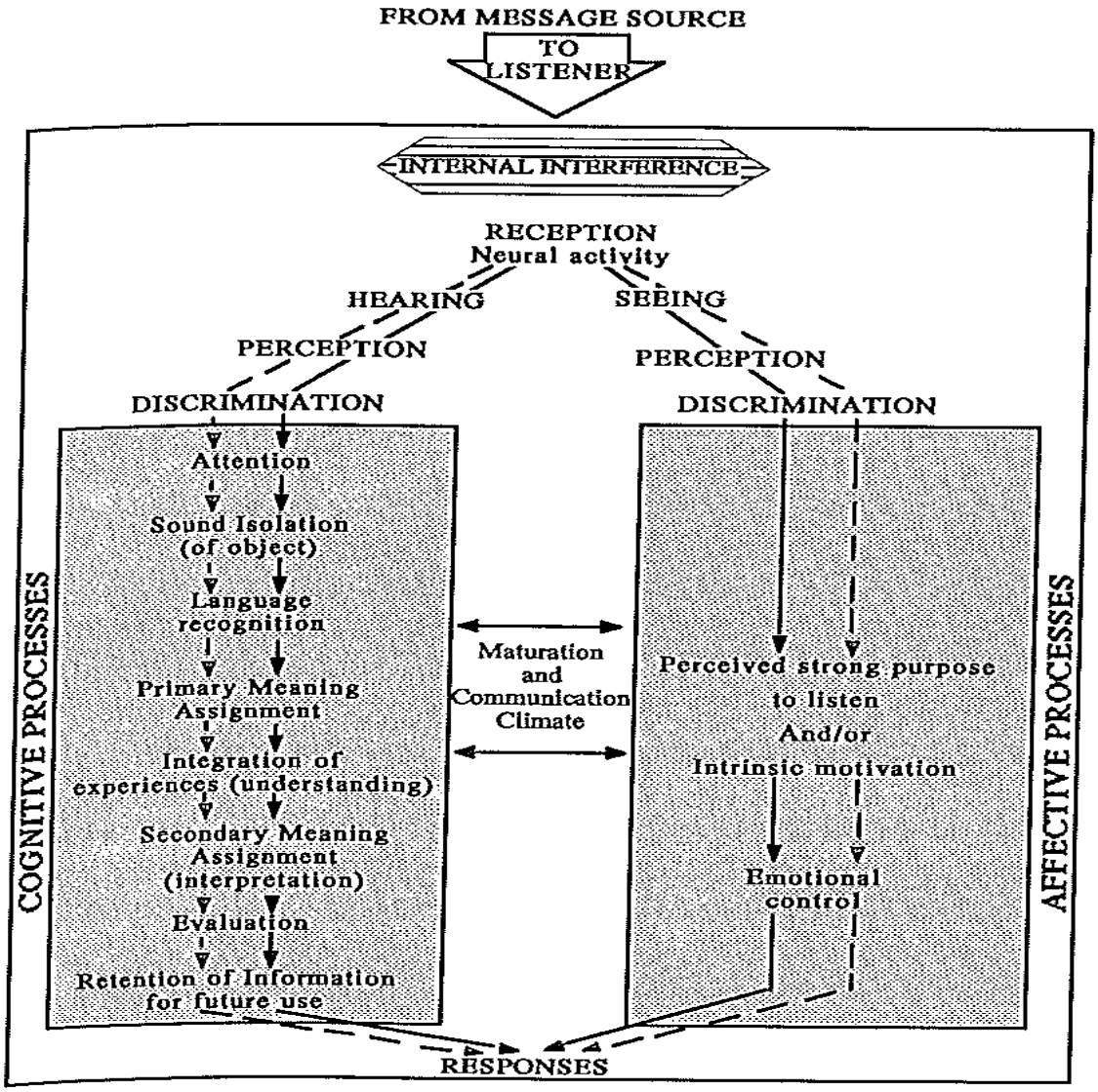

Figure 5. Barker's Listening Model (Wolvin, 1989)

Successive models from Lundsteen (1979), Goss (1982), Wolff, Marsnick, Tacey, and Nichols (1983) and (Steil et al., 1983) depict the complexity of listening by including the accepted elements as well as verbal and nonverbal stimuli and responses. None of the models effectively integrates and builds on previous findings.

Maidment (1984) provides two concepts that inform the model proposed here. Figure 6 shows the speaker and listener in a transactional, continuous process, presaging the contemporary

perspective of transactional communication (Wolvin, 1989). Maidment's filters depict some of the participant variables that are part of provider-provider exchanges of information.

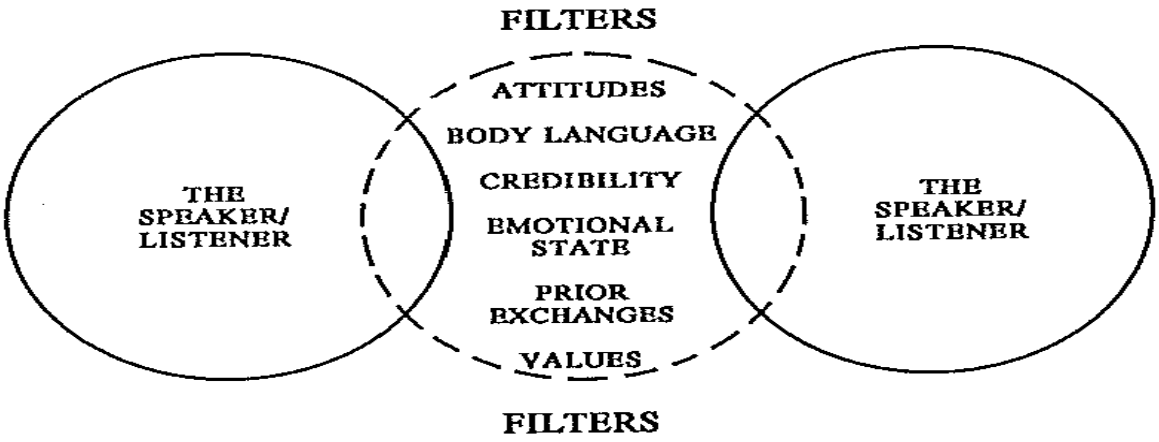

Figure 6. Maidment: Listening Model (Wolvin, 1989)

Maidment proposed a second model (Figure 7) that added detail to the activity occurring in each element of listening and proposed the transactional and relational nature of listening that scholars have widely accepted (Maidment, 1984; Rhodes, 1993; Wolvin, 1989). This second model shows a linear flow through the elements by adding depth to the cognitive, affective, and behavioral elements of listening, Maidment provides an early basis for current efforts to define listening in specific contexts. His model suggests a basis to explore how the activity in the elements may backtrack when parties fail to fully achieve the intent of any one element (Wolvin, 1989). Wolvin reminds scholars "Listeners…may not always function in a linear process" (Wolvin, 2013, p. 105).

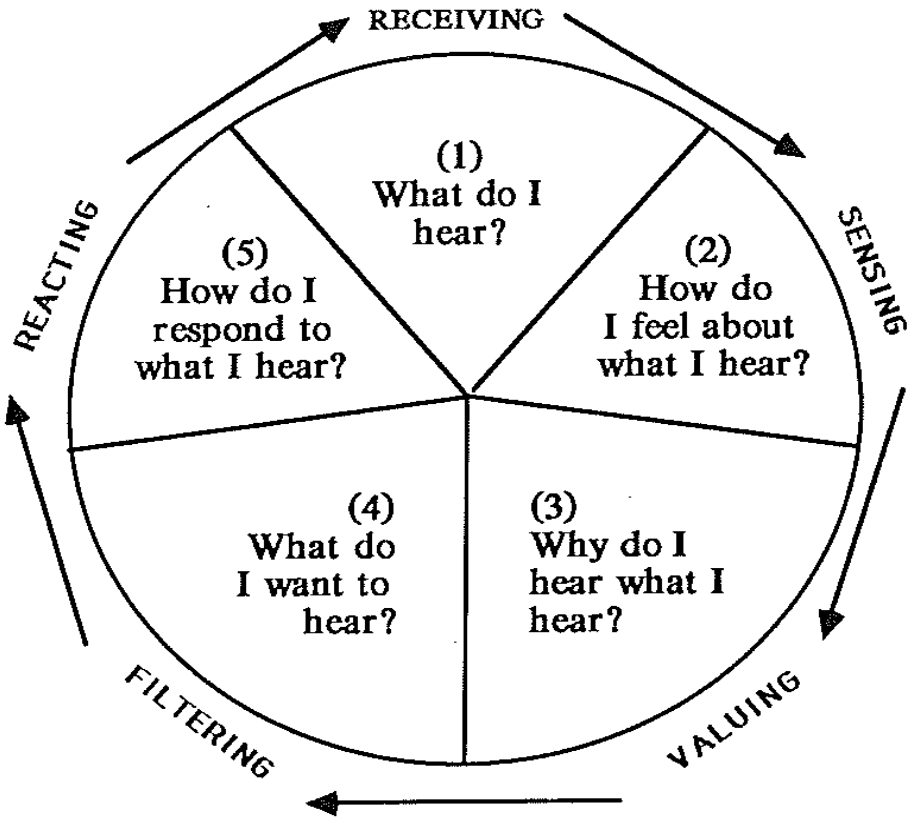

Figure 7. Maidment Model: Internal Function of Elements (Wolvin, 1989)

Brownell's (1986) HURIER model in Figure 8 offers a more complete recognition for the complexity of listening and affirms the *frailty* of advances in theory development (Wolvin, 1989). She provides the most definitive treatment of listening variables, thus lending credence to the unique factors in care delivery, including delivery location, participants' characteristics, and acuity of the medical condition. Her model integrates variables and listening elements, and centrally and equitably positions the parties to the listening episode. Brownell prominently features remembering, an element infrequently included in subsequent models (Barker, 1971).

The HURIER model is the only listening model based on empirical research, a factor analysis of listening statements generated by over 1,000 respondents to her survey (Janusik, 2004). Regrettably, Brownell omits non-verbal stimuli and, thus, does not decisively advance the process toward a more complete understanding of all elements (Brownell, 2010).

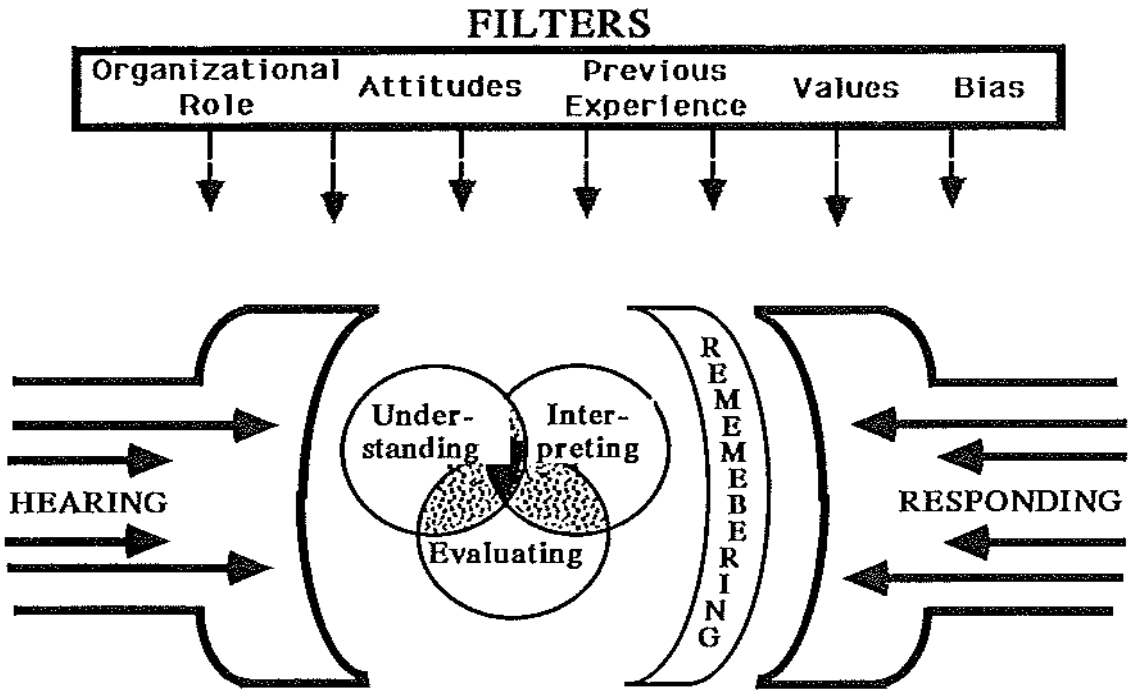

Figure 8. Brownell's HURIER Listening Model (Wolvin, 1989)

Assessments. The 1980s were an especially active period for developing assessments as scholars had produced the bulk of current listening models and turned their attention to confirming those models (Janusik, 2007; Rhodes, 1993).

Rhodes notes that in the 1980s, 25% of articles in the first four years of the *International Journal of Listening* addressed listening assessments and "…almost half of the articles on listening that appeared in Communication Education…have been concerned with assessment" (1993, p. 219). He names five other communication journals during the 1980s with 20-25% of their content on listening assessment articles (Rhodes, 1993). The website of the *International Journal of Listening* includes a database with over 30 listening assessments, many of which are noted by the unnamed compiler of the database as having acceptable reliability and validity. Other studies have attempted to validate listening tests by measuring their intended dimensions (Fitch, Hauser & Hughes, 1992). More recent studies have extended the use of established

instruments, such as the Imhof-Janusik Listening Concepts Inventory (Davis, Thompson, et al., 2008; Imhof & Janusik, 2006) and Watson, Barker and Weaver's LSP-16 instrument (Bodie & Worthington, 2010). New measures have been proposed for under-explored listening concepts, such as conceptualizations of listening (Davis, Thompson et al., 2008; Imhof & Janusik, 2006; Martin, 2011), listening fidelity (Mulanax & Powers, 2001; Powers & Bodie, 2003), and active listening (Bodie, 2011a; Fassaert, van Dulmen, Schellevis, & Bensing, 2007).

Notwithstanding the sizable number and variety of assessments, Janusik (2004) notes, "…listening research has been significantly ambiguous in the areas of measurability" (p. 2). Three scholars offer thoughts about the limitations found with assessments of listening that primarily rely on self-report instruments (Bodie, 2013; Bostrom, 2011; Wolvin, 2013) that are best described by Bodie's (2013) observation that attention should be directed more on what listeners do (behaviors) and less on what they say. These listening measures have failed to demonstrate consistent validity so only modest attention has been afforded to perceived listening competence, attitude, tendency, and predisposition to listening (Bodie, 2013). Janusik (2004) notes many of the instruments measure a product, obtained after the listening encounter is completed, not the active process that listening is as scholars have contended from the field's earliest days. The listener's recall of what was heard is not a valid measure of an active process (Bodie, 2013; Janusik, 2004). The limitations on contributions from assessments underscore gaps in listening studies previously noted that inhibit and open the way for the study presented here.

Summary of listening research. The development of listening assessments followed closely behind definitions and models in the preceding 30 years, primarily in a supporting, confirming role. Few assessments have established sustained validity and reliability and, with many definitions and models, form incomplete knowledge (Bentley, 2000; Bodie, 2011; Bostrom,

2011; Fitch Hauser & Hughes, 1992). More than one listening scholar notes, "…interpersonal communication scholars have systematically ignored theorizing about listening." (Bodie, 2011, p. 1). The field has failed to advance to more substantive research designs, despite the fact "…research shows that competence in listening leads to more productive interactions, greater relational satisfaction, heightened academic and work success, and better healthcare provision" (Bodie, 2011, p. 1).

Listening studies is a new field (at 65+ years old) compared to communication studies or the natural sciences; the listening field's research, education, and practice *constituency* has no difficulty in finding work for scholars to accomplish (Bavelas & Gerwing, 2011; Bostrom, 2011; Spunt, 2013; Wolvin, 2013). The current perception of unfulfilled potential in listening studies is useful to galvanize scholars (Bentley, 2000; Bodie, 2013; Edwards, 2011; Janusik, 2008; Wolvin, 2013), but the challenges are significant.

New researchers must explore contexts such as listening in care delivery without the guidance of theory, and by leveraging what is known from limited research to hypothesize (A. Blue, Ph.D., personal communication, July 26, 2013). The bulk of studies are of physician-patient communication. The provider community is spread across many practice settings that limit their viability as study groups of interest. The locations where multiple providers practice together are problematic to access, such as operating rooms, critical care units, emergency rooms, and multi-specialty clinics. These challenges offer opportunities because they affirm the need for more studies of communication in care delivery to identify and learn from failure points (A. Blue, Ph.D., personal communication, July 26, 2013). Listening scholars failed to unify their field as had been advocated (Bodie, Worthington et al., 2008; Witkin & Trochin, 1997), but the

fragmented state of listening theory allows researchers to more readily *locate* components of listening that aid their work than if unity of thought had been achieved.

Siloing of researchers and the subsequent lack of interdisciplinary work in listening is as lamentable as the lack of theory but is best seen as opportunity for new studies. In the face of medical error rates that resist substantive reduction, health care communication researchers are accepting the need to segment participants, actions, and information exchanges in care delivery encounters for new studies (Cameron et al., 2009; Garman et al., 2006; Hulsman & Visser, 2013). That acceptance is tacit acknowledgement of calls from listening scholars for context-specific models and studies of listening that the wider community of listening scholars has not addressed (Bodie et al., 2008; Bostrom, 2011; Janusik, 2004; Wolvin, 2013). Health care communication researchers have contributed recent findings, while not explicitly focusing on listening, which provide insights for studies such as the one described in this dissertation (Kirschbaum, 2012; Kirschbaum & Fortner, 2012). Other studies isolate the information exchange between and across provider types during care delivery and call attention to the likelihood of distinct *cultures* within each provider type than was previously thought (Davis, Thompson et al., 2008; Garman et al., 2006; Kirschbaum & Fortner, 2012).

The *International Journal of Listening* produced a special issue in 2008 devoted to listening in contexts and one of the five context groups was health care (Janusik, 2008). The groups were charged with systematically assessing the knowledge of listening in their respective contexts and separating listening from communication (Davis, Thompson et al., 2008). Other scholars are extending existing studies on listening behaviors (Bavelas & Gerwing, 2011) and adapting studies on listening fidelity (Mulanax & Powers, 2001; Powers & Bodie, 2003) to health care settings (G. Bodie, Ph.D., personal communication, January 9, 2013).

Recent efforts by listening scholars hold potential to provide tools for such research. Results from listening studies are becoming sufficiently detailed to provide tools to conceive and design studies that isolate particular participants, patient conditions, and delivery settings in education and practice. Researchers from multiple disciplines and perspectives including Bodie (2013), Bavelas and Gerwing (2011), Hall and Schmid Mast (2009), Kilpatrick, Lavoie-Tremblay, Ritchie, and Lamothe (2011), Kilpatrick (2012), Lingard et al. (2004), and Siminoff and Step (2011) name opportunities to establish conceptual if not theoretical frameworks from which studies can be conducted to examine and characterize communication.

A model is proposed here drawing extensively from and acquiring an acceptable grounding from the preceding models. The model represents the researcher's understanding of the context within which care delivery occurs and, while it displays factors beyond the scope of the study done in this dissertation, the model is an attempt to portray complexity and opportunity for research. However the model represents at best the researcher's concept. The proposed model includes no new components, but displays relationships among components that align acceptably with healthcare provider roles and the varying conditions and situations within which providers work and communicate.

A Proposed Model for Examining Communication during Health Care Delivery

The model in Figure 9 builds on the work of scholars and aligns components based on input from the work of health care communication scholars and from health care educators' and providers' experiences. The model was developed to inform the design of studies to characterize provider-provider communication. The model is believed to be unique in portraying listening behaviors in health care delivery as a tool to examine successful and failed exchanges of information. More sustainable understandings of the characteristics of successful and failed

communication in care delivery can contribute to design of additional studies of health care communication.

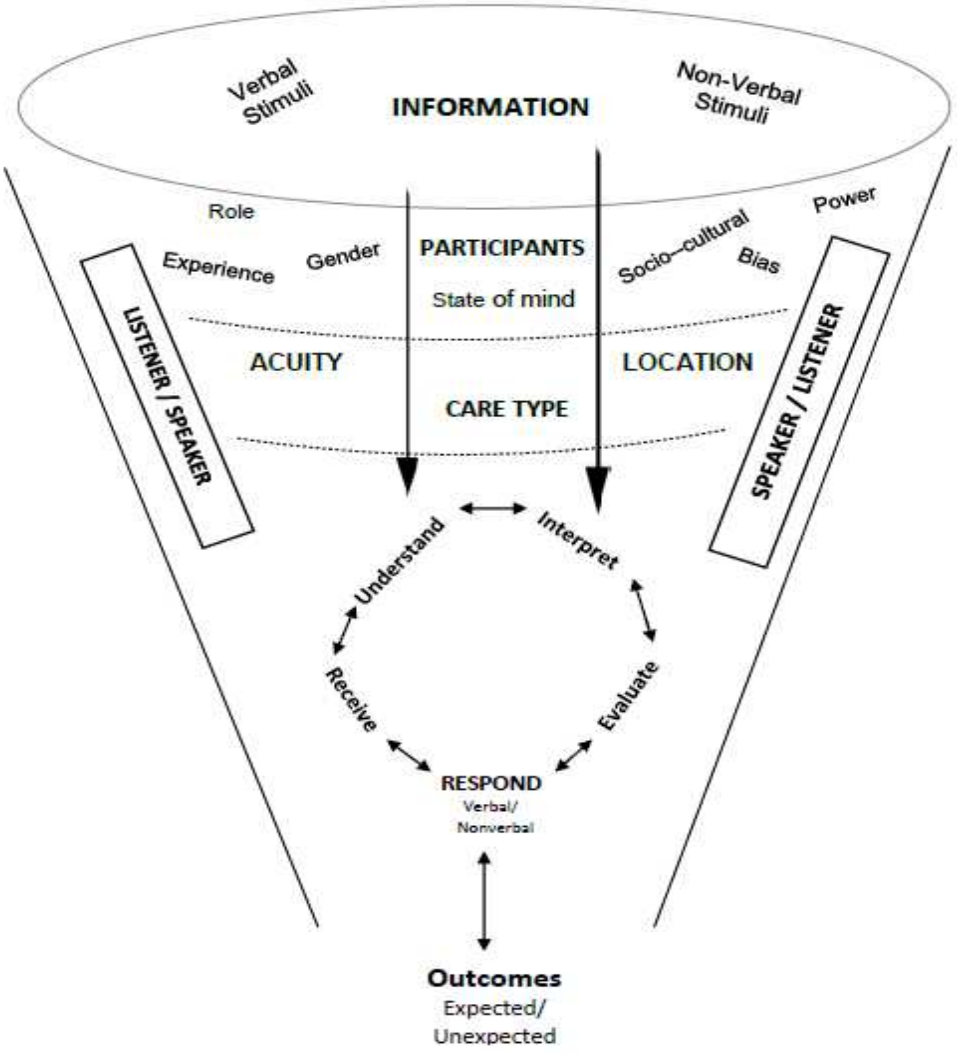

Figure 9. Proposed Model for Examining Communication in Health Care Delivery

Information and Stimuli. Information is prominently placed at the top of the model to recognize the essential role of accurate exchanges of information from the beginning to completion of a care delivery episode. The flow of information through the entire model explains

the variations in length, complexity, completeness, and rate of comprehension of exchanges of information. Exchanges are directly impacted by participants, type of care being delivered, delivery location, and acuity of the condition being managed (Beach & Inui, 2006; Mulanax & Powers, 2001).

Few scholars explicitly include both verbal and nonverbal stimuli in their models. However a care delivery episode can be as replete with nonverbal information, if not more so, than verbal information. Care type and acuity and the number and characteristics of participants can increase the intensity of the exchanges and compromise the quality or amount of stimuli (Lynn Yancey, personal communication, October 29, 2012).

Participants. Participants in an exchange of information can include professionals, individuals or teams, in clinical and administrative roles as well as patients, family members, and other advocates.

Care Type, Acuity, and Delivery Location. Participants' exchange of information during a care delivery episode must consider the type of care, the acuity level of the care, and the location where the care is delivered. The care type can range from an annual physical exam that emphasizes preventive care to treating an acute, life-threatening injury or disease. The acuity level will likely increase as the location shifts from home care or provider exam room, to inpatient bedside, labor and delivery suite, operating room, or critical care unit (Lynn Yancey, personal communication, October 29, 2012).

Variables. Scholars often refer to the following as variables, all of which may influence the flow of information among participants.

***Role and experience*.** Participants in a care delivery episode have roles, as care providers, patient, and family member and varying experiences in those roles. Role and experience directly

impact the exchanges of information, especially as acuity increases. Is the most appropriate team of providers included? Is the patient alone or with family or friends? How many years has the provider(s) been in practice; is the patient newly diagnosed, or knowledgeable and involved as a result of a chronic condition (K. Broadfoot, personal communication, October 29, 2012)?

***Socio-cultural and Gender*.** Socio-cultural background of each participant includes language, customs, beliefs, and values that impact participants, and continues to be one of the most dynamic factors for all parties to address (van den Brink-Muinen, 2002). Gender is possibly the most unambiguous factor among participants: considerable literature is available to substantiate differences among women and men's communication styles and skills (Davis, Foley et al., 2008; Shipley, 2010; van den Brink-Muinen, 2002) as well as their health care experiences.

***Power*.** Power is described by scholars, practitioners, and laypersons using a variety of terms, taxonomies, and precision (Northouse, 2013). The history of health care is manifested in hierarchies within care type, health professions, and facilities. The ascribed power of hierarchies in education and practice remains a prominent factor in care delivery. However traditional power positions are yielding to new models that require closer collaborations among providers for delivery of care; successful collaborations will be based on reduction of power differentials (Berwick, 2011; Devers & Berenson, 2009; Goldsmith, 2010a). Patient centeredness and patient empowerment are further impetus for change coming from waves of patient activism, bolstered by law, ready access to information, and wider dissemination of curricular and practice concepts. (Interprofessional Education Collaborative, 2011b; Manchikanti et al., 2011)

***Bias and State of Mind*.** Participants bring varying biases, stereotypes, and states of mind to any care delivery episode. Bias and state of mind fluctuate within the care delivery episode, impacted by all other variables (van den Brink-Muinen, 2002).

Speaker-Listener. Participants in a care delivery episode hold the role of speaker or listener throughout exchanges of information, alternating roles according to changes in or impacts from all other components of the model. Schramm in 1954 (Bowman & Targowski, 1987) and Yngve (1970) make an early case for the dynamic, frequently-shifting roles of the participants as speaker and listener. Bavelas and Gerwing (2011) verify the premise with over 20 years of research in face-to-face dialogue. A case for the importance of the speaker-listener relationship and the quality of the information exchange can be made in all contexts, but arguably no context for listening involves more sensitive or potentially high stakes outcomes than care delivery.

Elements. The model's cognitive and behavioral processes differ little from those proposed by interpersonal communication scholars. Behavioral processes occupy a more prominent role than other elements to call attention to the importance of verbal and nonverbal behaviors in confirming the expectation of accurate exchanges of information among participants in care delivery. The two-way flow of information depicts the potential for participants to seek additional information or clarification before fully processing the message. The circular positioning of the elements highlights their importance in the process of successfully closing communication loops.

Research in Health Care Delivery Communication

The model for listening and the study are built upon definitions and models in listening studies and refined with input from health care educators and providers as well as from industry observers and others with experience in health care delivery. The study also builds on contributions from communications research in various care delivery environments and on input from a variety of health care professionals. One reality of health care communication research

has been previously noted--the predominance of studies focused on the physician-patient encounter.

Studies of care delivery environments. The most frequently researched environments are general medicine units and the various procedural, recovery, and high acuity care departments in hospitals (Coiera & Tombs, 1998; Conn et al., 2012; Hargestam et al., 2013; Lyndon et al., 2011; Marjamaa & Kirvela, 2007; Parker-Raley et al., 2012). These studies serve primarily to affirm the conceptual framework of this study that critical information is regularly exchanged between providers, providers' compatibility with colleagues' communication styles and competence vary considerably, and communication remains burdened by historical education and practice models. Little of the preceding informs this study's design.

Studies that examined specialized care delivery settings are less numerous but do contribute to this study's design. In some cases the studies proceeded from expected outcomes or study designs from fields other than health care, approaches that contributed to this study design (Conn et al., 2012; Hargestam et al., 2013; Kirschbaum, 2012; Kirschbaum & Fortner, 2012; Marjamaa & Kirvela, 2007; O'Leary et al., 2009; Parker-Raley et al., 2012). Hargestam et al. (2013) employed CLC to examine simulator-driven training for trauma team training. Kirschbaum (2012) examined the communication between surgeons and anesthesiologists during surgery as a form of intercultural communication. She based her work on the study by Ting-Toomey (2005) who developed face-negotiation theory and the hypothesis that "Closer examination suggests systematic and shared values, behaviors, and norms that are historically based and learned within the medical system. From this perspective, an intercultural communication framework is ideal to study communication among physicians" (Kirshbaum, 2012, p. 293).

Conn et al. (2012) used a case study methodology to examine communication between various health care professionals on hospitalist-staffed inpatient medicine floors and achieved findings similar to those from Kirschbaum and Fortner (2012), that professions have their own communication cultures. “Previous research on this topic has shown that GIM [general internal medicine] wards are over-loaded with communication ‘genres’ or types that are enacted by varying health care providers at different times to meet their contrasting information needs” (Conn et al., 2009, as found in Conn et al., 2012, p. 2). Lyndon et al. (2011) provide a scenario of communication between an obstetrician and nurse in a high risk labor and delivery unit that demonstrates how historical education models inhibit trust and potentially compromise optimal patient care.

Parker-Raley et al. (2012) discovered that communication among highly-skilled members of a hospital-based pediatric trauma unit team experienced various failures because they lacked training in team communication. O'Leary et al. (2009) found that locating physicians on select inpatient care delivery units improved the volume and accuracy of physician-nurse communication, though study participants noted they believed little improvement was achieved in agreement about how to develop care plans. A key component of team communication is designation of one team member as the leader (Hargestam et al., 2013; Marjamaa & Kirvela, 2007). In a survey-based study of anesthesiologists and nurses in 130 surgical units in 60 hospitals, Marjamaa and Kirvela (2007) found chief anesthesiologists and head nurses “…differed significantly on which care provider they held responsible for the daily operative management of the operating room” (p. 809).

Several additional factors make hospital high acuity care units the most compelling locations for listening research: 65% of sentinel events between 2004 and June, 2013, occurred in acute

care hospitals (The Joint Commission, 2013a); at least 44,000 people die yearly in hospitals as a result of medical errors (Institute of Medicine, 1999). A report for the California Healthcare Foundation (Protocare Sciences, 2001) noted 15% of deaths in hospitals are attributable to medication errors. Studies by Hickey et al. (2012), Ong and Coiera (2015), Rabøl et al. (2012), Riesenberg et al. (2010), and Rothberg et al. (2012) examine, respectively, an institution-wide communication initiative, barriers to such strategies, patient handoff scenarios, and the implications of significant commitment to procedures that, at the most frequent points of communication, hold promise for successful exchanges.

The studies cited in the preceding paragraphs further suggest that hospitals are preferred locations for listening studies because of the number and mix of professions involved in care delivery, greater frequency and more serious consequences of medical errors, higher patient acuity, and overall cost of care (Sternberg, 2012). With these conditions, a significant quantity of stimuli and other variables becomes available in an observation-rich environment. The concentration of expertise and intensity of care delivery accentuates the challenge and opportunity for focused studies such as the one in this dissertation.

As Conn et al. (2012) and Kirshbaum and Fortner (2012) point out differing communication genres and cultures, respectively, among multiple professions on one hospital care unit present complex scenarios of information exchange and fertile environments for observational studies. The immediate challenges to research in these locations include unobtrusively locating observers and patient and provider confidentiality.

An acceptable proxy for actual care delivery environments can be simulations of care delivery encounters where students attend standardized patients and HPS at sites such as the CAPE. Simulations generally are sufficiently representative and complex to produce a mix of listening

behaviors among team members that allows researchers to hypothesize about the role of listening behaviors in the information exchanges that occur during the simulation (Issenberg et al., 1999; McFetrich, 2007, Tullmann, Shilling, Goeke, Wright, & Littlewood, 2013).

The preceding studies represent a small number of the possible care delivery settings, but do demonstrate the role of increasing acuity as a confounding factor in provider-provider communication. The number of studies in hospitals compared to providers' private practice locations infers a previously made assertion in this review is that providers' practice locations are less accessible locations for studies (Bitton, Martin, & Landon, 2010). Nevertheless the high volume of care delivery encounters that occur in settings other than hospitals holds open the possibility studies in any one setting can establish information about listening that is generalizable across multiple settings. All studies must account for variables associated with locations, participants, and conditions treated, but researchers may anticipate the components of successful communication will be the same or similar from location to the next; acuity intensifies care delivery conditions, but does not necessarily change the components of successful communication. The scope of this study does not presume to address that question.

Studies of care delivery professions. Most provider-provider studies examine physician-nurse communication because these two professions generate the highest volume of and most decisive information exchanges (Burke et al., 2005; Corser, 2000; Crawford, Ornery, & Seago, 2012; Curtis, Tzannes, & Rudge, 2011; Flicek, 2012). Studies describe various situations where physicians and nurses fail to communicate well (Arford, 2005; Burke et al., 2005; Lyndon et al., 2011; Marjamaa & Kirvela, 2007; O'Leary et al., 2009) and describe reasons for communication failure (Crawford et al., 2012; Flicek, 2012; Foli, 1990; Lyndon et al., 2011). The focus on

physician-nurse communication offers depth of information with minimal direct contribution to studies of other providers' communication in teams.

Coiera and Tombs (1998) observed routine information exchanges between physicians and nurses in a general inpatient setting. They tracked a troubling mix of interruptions during information exchanges, staff inferring the meaning of electronic, phone, and verbal messages, and reliance on technology without certainty of accuracy. Suter et al. (2009) conducted studies of inpatient settings that examined how health professions' education predisposed them to narrow understandings of their roles in care delivery and of their relationships with each other. They noted communication behaviors that bewilder scholars from non-clinical disciplines, especially those scholars in communication, organizational behavior, and workforce and process performance (Garman et al., 2006). Two recent studies looked at the role of advanced practice nurses, RNs with training past the Bachelor of Science and Master of Science levels: nurse practitioners had more exchanges with other nurses than physicians on a team (Kilpatrick, 2012); Kilpatrick et al. (2011) noted that further studies are needed to confirm that the addition of advanced practice nurse to multi-profession teams improves communication and teamwork.

Kagan (2008b) and Corser (2000) provide perspectives on physician-nurse communication from non-clinical scholars in sociology, anthropology, medical history, psychology, communications, and listening. Both authors believe traditional understandings of role definition and communication styles inhibit all providers' communication with each other. Corser (2000) speculates studies that examine the components of listening in physician-nurse exchanges may reveal points where training interventions could improve all providers' ability to communicate, which provides support for this dissertation study. Studies of initiatives to reduce errors caused by communication failure since Corser's (2000) work cite promising results but his literature

review noted “Today, few nurses or physicians may fully appreciate how their routine interpersonal exchanges may still be influenced by the organizational, educational, or communication legacies that have been internalized through multiple generations of caregivers (Corser, 2000, p. 264); and evidence suggests 15 years later few changes have occurred (M. Earnest, M. D., Ph.D., personal communication, October 29, 2012). Studies affirm the need for the IP competencies previously described, including working in teams, role definitions, and communications (Interprofessional Education Collaborative, 2011a, 2011b). The void of studies that examine the unique characteristics and perspectives of all health professions’ communication is underscored.

Two conclusions can reasonably be reached from sources reviewed here and neither conclusion provides an encouraging perspective on reducing communication failure in the near term. First, the bulk of training and experience of current providers still limits their awareness and understanding of the other disciplines and continues to constrain productive relationships and communication (Suter et al., 2009). Second, the literature points out how the agreed upon competencies and IPE can improve provider–provider communication but IPE’s most dedicated advocates admit IPE will change the prevailing conditions at a very slow pace (M. Earnest, M.D., Ph.D., personal communication, October 29, 2012).

However, these conclusions should be weighed against the likelihood for new models and concepts of care delivery that may accelerate improvements in communication among all parties despite the *weight* of history (Frieden, 2015; Interprofessional Education Collaborative, 2011b). This potential adds urgency for studies of provider-provider communication that provide new insights to their exchanges of information (A. Blue, Ph.D., personal communication, July 13, 2013).

Care delivery models and concepts. The Department of Health and Human Services (HHS) recently announced ambitious goals to change reimbursement for Medicare providers that will force providers to adopt outcomes-focused and collaborative practice models (Frieden, 2015). Providers' choice to opt out of the Medicare system may be of little consolation because the historic pattern is for commercial health insurance companies to adopt Medicare's practices.

The care delivery concepts that will implement changes to provider practice are ACOs and PCMHs; these concepts are already disrupting the care delivery landscape (see Chapter 1). The care delivery concepts such as patient-centered care (PCC) and relationship-centered care (RCC) pose the real challenge for providers. Both concepts underscore the need for providers to develop communication skills that align "…with the patient's values, needs and preferences, and that allows patients to provide input and participate actively in decisions regarding their health and health care" (Epstein et al., 2005, p. 1516). The requirements have catalyzed a growing tension for providers: their training has not prepared them for these conditions, but their ability to practice successfully depends on their adoption and adaption of the skills (Powell & Davies, 2012; Suter et al., 2009).

A study by Wanzer et al. (2004) found application of PCC at a children's hospital correlated with improved satisfaction with care and improved quality of communication, specifically with perceived listening, reported by providers and parents. The study reported that PCC was applied more frequently with children whose conditions were less acute (Wanzer et al., 2004) suggesting that acuity challenges providers to maintain a balanced approach to care management. This finding also affirms the role for acuity as shown in the listening model included in this dissertation.

PCC is applied more thoroughly in the PCMH model for care delivery because PCC is the most elemental factor in the success of the model (Bitton et al., 2010; Ferrante et al., 2010; Stange et al., 2010) and to a less decisive degree in ACOs (Berwick, 2011; Press et al., 2012). RCC adds emphasis to provider-patient equality in care decisions and expands the concept by including "…the relationships of clinicians with themselves, with each other and with community…" (Beach & Inui, 2006, p. S3). RCC is derived from principles cited by the Pew Health Professions Commission's report that proposed "…a future vision for education in the health professions, attempting to bridge workforce demands of health care delivery systems on the one hand, and the health of the public conversely" (Beach & Inui, 2006, p. S3).

Levinson et al. (2010) make the case for systematically infusing communication curriculum content beyond the customary first or second year of [physicians] training to clinical rotations with preceptors and into their practices. They cite the growing emphasis on PCC as catalyzed by the ACA as ample reason to increase the emphasis on communication curriculum (Levinson et al., 2010). However, this emphasis will encounter considerable resistance from educators who may not easily concede any time to communication that lessens the curriculum's clinical components (M. Earnest, M.D., Ph.D., personal communication, October 2, 2013). Educators have navigated the tension between available faculty, course scheduling, and classroom space, and expectations for their curriculum from program accrediting bodies and provider licensure boards with varying degrees of success. IPE strains educators' philosophical and practical capacities further. IPE leaders have already begun to feel pressure to adjust their programs from their own institutions and from changing skill sets and care delivery models (Dow et al., 2013; Earnest & Brandt, 2014).

Observational Studies

Notwithstanding the dearth of observational studies on provider-provider communication during care delivery, researchers can design studies by drawing from studies that have identified characteristics of communication that led to discernable outcomes (Burke et al., 2004; Denham et al., 2012; Hargestam et al., 2013; Manojlovich et al., 2014; Neville, 2006, 2007; Sexton & Helmreich, 2000). These studies include settings where mixes of disciplines, participants, and requirements for precision produce a volume of information exchanges and variety of communication behaviors sufficient to inform study design. The settings include surgery (Lingard et al., 2004; Lingard et al., 2005; Lingard et al., 2008; Kilpatrick, 2012; Kirshbaum, 2012; Parker, Yule, Flin, & McKinley, 2012), high risk obstetrics (Siassakos et al., 2009), and critical care/emergency situations (Brindley & Reynolds, 2011; Hargestam et al., 2013). For the most part providers train and practice independent of each other, but settings with higher acuity require providers to communicate, coordinate tasks, and acknowledge each other's expertise, and the *cultural differences* created by separate training and practice (Kirshbaum & Fortner, 2012; Kirschbaum et al., 2015).

Studies from these settings describe characteristics of communication from varying perspectives: cultural communication (Kirshbaum & Fortner, 2012), use of checklists (Lingard et al., 2005; Lingard et al., 2008), team training (Burke et al., 2004; Siassakos et al., 2009), and leadership (Parker et al., 2004). Unifying themes are the researchers' expectations that recording and analyzing the characteristics of communication in exchanges of information contribute to a better understanding of communication success and failure and to the characteristics of better-performing teams (Bowers & Jentsch, 1998; Burke et al., 2004; Hargestam et al., 2013; Manojlovich et al., 2014; Sexton & Helmreich, 2000). Bowers and Jentsch (1998) note "…that

pattern analyses reveal additional strong differences between performance groups that would have been overlooked by simple frequency counts of communication" (p. 672). Manojlovich et al. (2014) "…used a sequential qualitative mixed method design beginning with general observation, progressing to shadowing and focus groups of physicians and nurses who worked on two medical--surgical units…" (p. 1). The studies' core questions in the content analysis of exchanges of information are tied to Lasswell's (1948) seminal model of communication flow. Lasswell was the first to describe a role for the listener, asking "'Who says what, to whom, why, to what extent and with what effect?'" (Lasswell, 1948 as cited in Siassakos et al., 2009).

The need for this study is based on the limited understanding of communication failures in care delivery: failures are manifested after the fact when the expected outcome does not occur, errors are committed, and the result is injury or death (Brindley & Reynolds, 2011; The Joint Commission, 2013; Manojlovich et al., 2014). "Regrettably, there is neither an adequate definition of good communication nor an attempt to quantify communication as meeting minimal criteria for effectiveness. Indeed, very limited research on what type of communication actually occurs between health professionals exists" (Alvarez & Coiera, 2006, p. 236). Rationales for limited research on the components of communication in healthcare are provided by numerous sources (Burke et al., 2004; Carracio, Wolfstal, Englander, Ferentz, & Martin, 2002; Fook et al., 2013; Institute of Medicine, 1972/2003; Interprofessional Education Collaborative, 2011b).

The lack of understanding for provider-provider communication will become more problematic as care delivery models and provider reimbursement methods require teams of providers to manage an increasing number and type of conditions (Frieden, 2015). The key writings on IPE name IP communication skills and teams and teamwork as two of the four pillars IP practice (Interprofessional Education Collaborative, 2011a, 2011b). The problem facing

health care communication researchers and faculty, even in the education settings that have begun to deliver interprofessional education, is the dominance of the historical provider education and practice models. Burke et al. (2004) make a case for this study's framework:

> Training can be defined as the systematic acquisition of knowledge (what we think), skills (what we do), and attitudes (what we feel) (KSAs) that lead to improved performance in a particular environment. The medical community has typically focused on training task work skills, that is, the technical aspects of the job, but as the use of interdisciplinary health care teams increases, training task work skills will no longer be sufficient. (, p. i96-i97).
>
> In this work, task work skills are those skills that members must understand and acquire for individual task performance, while teamwork skills are the cognitive, behavioural, and attitudinal actions that members need to function effectively as part of an interdependent team (Burke et al., 2004, i97).

Burke et al. (2004) point to the 30 years of investment by the commercial aviation (and military) sector to identify the requisite competencies for successful communication and teams and team training. A review of literature identified studies in aviation that sufficiently mirror the conditions of care delivery encounters and focus on exchanges of information among participants directly involved in the event (Bowers et al., 1998; Burke et al., 2004; Denham et al., 2012; Hargestam et al., 2013; Lingard et al., 2004; Sexton & Helmreich, 2000; Siassakos et al., 2009). As is the case throughout this review of the literature, acknowledgement of both the utility and limitations of information, models, etc. is warranted. Ricci et al. (2012) "…challenge the prevailing notion that aviation is invariably a good model to study human errors in health care, and discuss the dimensions in which aviation and health care differ (p. 798). Their precise delineation of differences in the two environments underscores the need for studies in provider-provider communication to identify hypotheses for testing that establish a distinct care delivery context for the additional research to describe the reasons for communication success and failure.

Educators acknowledge that current provider communication curriculum offers little consistency from which to derive a conceptual framework for new studies. Providers' communication training varies from a "presumed imbedded" approach in "…task work skill…" based programs (Burke et al, 2004, p. i96-i97; L. Suit, R.N., personal communication, February 11, 2014) to formal curriculum including relationship-centered communication (Beach & Innui, 2006; K. Broadfoot, Ph.D., personal communication, November 8, 2012). A suitable framework can be assembled from the literature on aviators' training on effective communications processes (Bowers & Jentch, 1998; Denham, et al., 2012) and some applications of that training in health care settings (Alvarez & Coiera, 2006; Burke, et al., 2004; Hargestam, et al., 2013).

Introduction of the Study

The review of literature confirms the following:

1) Changes in health care system's environmental factors will impact care delivery and add urgency to better understandings of the causes of medical errors related to communication failure.
2) Known information and limitations from studies of listening and in communication can inform more in-depth studies of provider-provider communication during health care delivery.
3) Viable research strategy options, given the preceding, may advance understanding communication failure.

Despite a substantial body of knowledge, little contribution is found for a better understanding of communication failure in care delivery. Health professions' educators lack the ability to confidently refine curriculum to train providers in the skill sets, including effective communication, that are clearly required by emerging care delivery models,.

Verbal and nonverbal listening behaviors are acknowledged components of communication, but studies in care delivery rarely examine or attempt to leverage those behaviors to improve research into communication. The setting and participants in completed studies are narrow in scope and leave largely unexamined care delivery encounters of participants and their location who produce the most communication errors. Studies of communication in other professions offer the most promising frameworks to study provider-provider communication.

CHAPTER THREE: METHODOLOGY

This chapter describes the rationale for and design of the study's exploratory strategy of inquiry. Observations were conducted of teams of medical and nursing students' Emergency Medicine (EM) encounters at the Center for Advancing Professional Excellence (CAPE). The study identifies and characterizes specific steps in exchanges of information including the listening behaviors in Closed Loop Communication (CLC). The findings can be applied to describe characteristics of communication that inform patient safety initiatives and providers' communication curriculum. The chapter includes study introduction, rationale for the exploratory inquiry strategy, research site, population and sampling procedure, data collection, data analysis, reliability, validity, and limitations.

Introduction

Studies of the root causes for errors in health care show communication failure is no less than the fourth-ranked cause (The Joint Commission, 2014; Singh et al., 2008). The number of reported medical errors has decreased since 2011, but appears to be leveling at a number that remains of concern (The Joint Commission, 2013) and exceeds acceptable ethical levels. A considerable factor in this circumstance is that research has yet to identify when and why provider-provider communication breaks down (Parker-Raley et al., 2012; Rabøl et al., 2012; Siassakos et al., 2011). Gaining and applying this knowledge can inform provider communication curriculum and post-education professional development as additional research characterizes communication in exchanges of information among providers. Siassakos et al. (2011) assert "If the specific behaviours of more effective teams could be identified through research, the information could be useful to evidence-based training programmes" (p. 597). Listening and health care communication scholars and health professions educators alike are

saying more in depth understanding is needed about specific communication characteristics of successful and failed exchanges of information (Bodie, 2013; Manser, Foster, Flin, & Patey, 2012; Rabøl et al., 2012; Siassakos et al., 2011; Wolvin, 2013).

Manojlovich et al.'s (2014) extensive literature review found "…little guidance on what qualitative methods are best for capturing the different types of communication patterns that occur on a medical--surgical unit " (p.2). The argument made for this dissertation is that efforts to significantly reduce communication failure in care delivery are stalling for lack of research tools to probe further into characteristics of provider-provider information exchanges. Educators acknowledge the need for outcomes from studies of communication interventions that will inform those curriculums (Interprofessional Education Collaborative, 2011b; M. Earnest, M.D., Ph.D., personal communication, October 30, 2012).

This study drew on the understanding of verbal listening behaviors and the considerable number of studies in aviation cockpit communication to conduct observations of provider-provider communication during care delivery. The focus of observations was on the exchanges of information, each of which is one communication loop. Precedent for this approach comes from studies of provider communication that apply communication loops learned in aviation (Burke et al., 2004; Hargestam et al., 2013; Lingard et al., 2004; Siassakos et al., 2009; Singh et al., 2006). The available studies provided sufficient rationale for exploring CLC in exchanges of information during care delivery, despite the limited number of studies to establish CLC as a definitive component of provider-provider communication.

This study built upon information on observing listening behaviors and acknowledges the limitations and confounding impact of that information. The following goals were set for the study:

1. To identify specific steps in provider-provider exchanges of information where communication succeeds and fails
2. To describe the characteristics of communication sufficiently to assess outcomes of communication loops not being closed.
3. To recommend hypotheses to study to inform providers' communication curriculum, professional development, and subsequent research.

Group of Interest

The group of interest was medical students from the UC/AMC School of Medicine and nursing students from the Loretta Heights School of Nursing in Regis University's Rueckert Hartman College for Health Professions (RHCHP) and from Arapahoe Community College (ACC). The medical students were in their third of four years in medical school; RHCHP students were 18-24 months into a 4-year Bachelor of Science in Nursing (BSN) program and ACC students had completed their second or third semesters of a 2-year Associate of Applied Science in Nursing (ADN) program. The medical students and RHCHP nursing students had completed the majority if not all of their communication curriculum within their programs, some of which was delivered in teams conducted at the CAPE (K. Broadfoot, Ph.D., personal communication, November 8, 2012). ACC nursing students had taken introductory communication training.

The teams are formed by CAPE staff prior to the simulation sessions based on the number of medical and nursing students expected. CAPE staff determined which two of the three cases were run at a given session, based on availability of CAPE personnel and ER faculty. The study includes 15 teams who each managed both cases during their CAPE session. The distribution of MD and RN students into the 15 teams (two encounters per team) varied between the largest

teams of four MD and three RN students (2 teams) and smallest teams of two MD and two RN students (6 teams). The average team size was three MD and two RN students. ACC RN students staffed the 22 encounters in January-March; RHCHP RN students staffed the eight April encounters

Study Setting

The site is the CAPE is an 18,000 square foot state of the art simulation facility.

> CAPE is housed in an 18,000-square-foot space inside the Education I tower. This space includes 15 examination rooms, 3 consult rooms, and 4 high fidelity simulation rooms that can function as an OR, Emergency Room, hospital room, ICU, labor and delivery suite and apartment. All rooms have video and audio recording capability. The high fidelity simulation rooms have two-way mirrors with adjacent control rooms. We also have 2 classrooms and a central control room. These can be used to observe any of the simulation spaces during education and assessment activities. The CAPE space allows us to perform small and large scale education and assessment activities using standardized patients and high fidelity mannequins and tools for health profession learners across the spectrum of training. (G. Barley, Ph.D., personal communication, October 23, 2011).

The conditions for conducting observations are optimized by CAPE technology: "The Center is fully integrated and digitized with the EMS Arcadia software system serving as its backbone" (Center for Advancing Professional Excellence, 2012, para 3). The majority of simulations are videotaped and archived for at least as long as student participants are active in their respective programs. Rooms in the simulation suite are each equipped with three cameras which provide multiple angles from which to conduct observations.

The CAPE offers HPS and standardized patients to create a wide range of care delivery settings and patient conditions. The EM encounters chosen for this study use HPS. McFetrich (2007) reviewed the literature on the use of HPS in education to make a case for improving EM practice. He acknowledges the limited number of studies "…are clearly open to bias from positive reporting. Most of the papers reviewed on simulation were understandably from centres with a simulator" (McFetrich, 2007, pp. 509-510). He cites disadvantages associated with cost

and infrastructure (HPS programmers, operators, and curricula) and he cites Issenberg et al., 1999 for the advantages:

> Unlike patients, simulators do not become embarrassed or stressed; have predictable behaviour; are available at any time to fit curriculum needs; can be programmed to simulate selected findings, conditions, situations, complications; allow standardized experience for all trainees; can be used repeatedly with fidelity and reproducibility; and can be used to train both for procedures and difficult management situations (p. 862).

The availability of the CAPE, the advantages cited by Blum, Raemer, Carroll, Dufresne, & Cooper (2005), Issenberg et al. (1999) and Siassakos et al. (2009), and the disadvantages of live observations noted by Kilpatrick (K. Kilpatrick, Ph.D., personal communication, November 7, 2013), make a compelling case for this location as the study site.

Observations

To provide context for the study this section describes the rationale for observations, the choice of care delivery encounters, the choice of videotaped instead of live encounters, unit of analysis, and population, sample, and sampling procedure,.

Rationale for observations. The choice of non-participant observations of videotaped encounters is made for two reasons. First, an exploratory study in health care delivery aligns with the need for context-specific bases for listening and the need to inform further understanding of communication in care delivery. The logistical and data collection challenges for observational research are well known (Bavelas & Gerwing, 2011; Bodie, 2013); access to the sophisticated capabilities of the CAPE and to the students during simulations sets aside most of those challenges.

Second, the limitations of self-report instruments and researcher-conducted interviews pose the risk of subjective interpretation by participants or by an interviewer during the posing of and

responses to questions when studying communication (Bavelas & Gerwing, 2011; Bodie, 2013). Bodie stresses:

> "…what we are most interested in is what listeners do when interacting with others and whether the enactment of specific behaviors impacts important outcomes. If so, relying too heavily on self report measurement for the advancement of knowledge about listening seems counterproductive" (2013, p. 79).

Care delivery encounter selection. This section includes a description of encounters chosen and the several reasons to observe videotaped encounters. The latter decision is informed by consideration of the CAPE's encounter design, informal observations of live and videotaped CAPE encounters, and findings and recommendations from recent studies in care delivery that surveyed providers (Kilpatrick, 2012; Kirschbaum et al., 2015) and conducted observations (Epstein et al., 2005; Hargestam, 2013; Kilpatrick, 2012; Siassakos et al., 2009; Siassakos et al., 2011).

Simulations of EM encounters are more suitable than the multidisciplinary team encounters in the Clinical Transformations (CT) portion of training that were considered. The multidisciplinary CT encounters include several different encounters and 2-3 additional provider types. Siassakos et al. (2009) advocate the use of simulations, but note the unique factors in a given care delivery inhibit the ability to generalize findings for any study. The accumulated findings of multiple observational studies of care delivery might identify shared characteristics of successful and unsuccessful communication but, the number, scope, and type of such studies are not yet available (Siassakos et al., 2009). Substantive progress remains to be made and researchers remain focused on specific provider(s) and/or care delivery settings (K. Kilpatrick, Ph.D., personal communication, November 7, 2013).

Encounter description. The 30 EM encounters used in the study were recorded between January 16 and April 24, 2015. Observations of the videotaped encounters were conducted

between February 1 and April 30, 2015. Reconciliation of multiple observations of each encounter was completed in May and June, 2015.

Encounters are conducted in morning sessions at the CAPE and included medical and nursing students delivering care using HPS. The goals of the encounters are to improve students' teamwork, clinical decision-making, and communication skills. The student teams are assigned to a CAPE staff person who facilitates pre- and post-encounter briefings and provides feedback to the student-driven post-encounter evaluation of their performance in teamwork and communication. The live EM encounters are viewed by one emergency medicine faculty who adds an evaluation of the teams' clinical decision-making to the facilitator's feedback, all in the post-briefing.

The EM encounters were accessed on videotape archived at the CAPE. Using the same three encounters, EM teams were composed of medical students from the University of Colorado/Anschutz Medical Campus (UC/AMC) School of Medicine and nursing students from the Rueckert-Hartman College for Health Professions (RHCHP) and Arapahoe Community College (ACC). The encounter types include a young adult with an aspirin overdose (ASA), a nine-month baby in septic shock (SS), and an eight month old in neurogenic shock (NAT).

The encounters are part of 3-hour morning CAPE sessions. Students spend the first 30 minutes receiving an orientation to the CAPE rooms, the HPS, and staff. Then each team goes through two EM encounters. Each encounter includes a pre-briefing for the teams to review the assigned patient case, to assign roles, and agree on an overall plan for the encounter, the simulation, and a de-briefing to review and evaluate their performance with their facilitator. The simulation time is 18-20 minutes; the pre-and post-briefings and simulations are separately

videotaped and maintained for 18-24 months at the CAPE. Observations in this study were conducted of the videotaped simulations.

Observations of videotaped versus live encounters. The choice of videotaped encounters to observe exchanges of information is made for two reasons: to maximize the quality and accuracy of observations and to mitigate the confounding effects of acuity and number of encounter participants.

Live encounters are more problematic for observing listening behaviors. Kilpatrick's (2012) observational/descriptive study of two multi-discipline teams closely resembles the study described here and is helpful in evaluating videotape versus live encounters. Her live observations focused on the impact of cardiology acute care nurse practitioners on multi-discipline team communication and decision-making (Kilpatrick, 2012). Two observers in one case and four observers in a second case noted 9.5 and 13.8 behaviors per minute, respectively (Kilpatrick, 2012). In the field tests of her instrument Kilpatrick discovered additional communication behaviors by participants, secondary to the focus of the study, created considerable distraction for observers as acuity and the number of participants increased. Her recommendation was that videotaped encounters would improve the number and quality of observations. (K. Kilpatrick, Ph.D., personal communication, November 7, 2013).

The limited number of observational studies in listening necessitate detailed planning for new observational studies, particularly studies of live encounters (Bavelas & Gerwing, 2011; Bodie, 2013). One hazard of conducting observations is observer-induced bias. Though the issue is not well-understood (Adair, 1984), it is a consideration in this study design. Students in CAPE encounters are aware they are observed, but the one-way windows of the simulation suites and exclusive student and staff hallways lower that awareness, as seen from informal observations of

live encounters prior to the study. Use of multiple observers and videotape further minimizes bias such as the Hawthorne effect (Kilpatrick, 2012).

The confounding effects of encounter acuity and number of encounter participants on observers' ability to capture targeted behaviors is documented by several researchers (Kilpatrick, 2012; Kirschbaum & Fortner, 2012; Parker-Raley et al., 2012). Overall acuity is clear from the description of each type of encounter in this study; within an encounter fluctuations in acuity occur and can be readily linked to provider decisions or symptoms generally attributed to the patient condition. Students' interaction with the family member or colleague of the encounter patients (secondary participants) varied and, when done poorly, students were distracted. The distracting effects of acuity and secondary encounter participants is mitigated by the data collection procedure (see Table 4).

Secondary participant impact was noted in the second review of each encounter and weighed during data analysis. Caldwell and Atwal (2005) "…argue that the use of videos can enhance the credibility of non-participant observation studies through the minimization of selectivity and bias…" (p. 42). Caldwell and Atwal (2005) further note "Observation can be combined with other research methods, and is a technique that allows researchers to observe what people actually do, as opposed to what they think they do, or would like others to think they do (p. 42).

Videotaped encounters can be reviewed in their entirety or by sections of an encounter repeatedly to optimize observation integrity. Notable threats to observation integrity include participants' enunciation, fluctuations in encounter acuity and the number of participants and different disciplines, and the presence of a family member or friend in the encounters.

Study observers noted that participants' natural speaking style, volume, and clarity varied, on occasion to the point of being inaudible or indecipherable. Videotape allowed observers to

review problematic portions of an exchange and decide either what is being said or reasonably infer meaning by understanding the listening behaviors on either side of the problematic part. Participants' enunciation and positioning in the simulation room varied according to the case they managed: in the ASA encounters the participants dispersed and maintained their positions in the room according to their roles and generally employed more relaxed speaking styles; during both pediatric encounters participants tended to hover around the patient and speak in lower tones.

Observers had two options for accessing videotaped encounters: in the CAPE's technical control room or remotely. The technical room was available during regular hours of operation, regardless of activity elsewhere in the CAPE. Observations of videotape could be scheduled at times simultaneous with reviews of video by others in the technical control room: the room includes six viewing stations and high quality headsets that screen out distracting noises. Technical room viewing equipment provides the same sight lines for observers as do live encounters, albeit with some potential limitations. Previous informal observations of videotape by the researcher showed varying lines of sight as a result of camera angles in the simulation suites. Live observations conducted informally by the researcher demonstrated several limitations not found in observing videotaped encounters. The limitations are collectively caused by the number of people in the CAPE's task simulator corridor, a space substantially smaller and more crowded than the CAPE's technical control room.

The observers agreed remote access eliminated the distractions of live observations and agreed this capability was the best choice for all observations. This capability shortened the time required for observers to view and code the encounters. Remote access allowed one camera to be utilized at a time as compared to the 3-camera view afforded by the Arcadia software, but the

observers agreed after viewing the first five encounters that ease of movement between cameras mitigated the need for 3-camera display.

Unit of analysis. The unit of analysis is the exchanges of information that occur within the encounter. An exchange of information in the encounter is initiated by a verbal listening behavior from any participant and is concluded by any participant in the encounter when the situation that catalyzed the initial behavior resolves. Some exchanges are extended or concluded by a nonverbal behavior and, although nonverbal behaviors were not the focus of this study, their role in an exchange was noted by observers when those behaviors were judged consequential.

This study focuses on the exchanges between the medical and nursing students in each of the EM encounters and utilizes their verbal listening behaviors to characterize the exchanges. Each exchange is a discrete communication loop that is either closed or left open by the type, timing, and sequence of verbal (or nonverbal) listening behaviors among the medical and nursing students during the exchange.

The study employs the verbal listening behaviors in CLC to characterize the exchanges of information, drawing on similar applications of CLC in aviation studies (Bowers & Jentsch, 1998; Neville, 2006, 2007) and recent studies of provider-provider communication in acute care delivery settings (Hargestam et al., 2013; Kilpatrick, 2012; Lingard et al., 2004; Siassakos et al., 2009; Simonoff & Step, 2011). Hargestam et al. (2013) note,

> CLC can be described as a transmission model where verbal feed-back is of great importance to ensure that the team members correctly understand the message. The communication strategy involves three steps: (1) the sender transmits a message: the CO (call out], (2) the receiver accepts the message and acknowledges its receipt, the check-back and (3) the sender verifies that the message has been received and interpreted correctly (i.e, [sic] the loop) (p. 2).

Observers recorded the verbal listening behaviors that correspond to the three steps of CLC during exchanges of information. Exchanges of information were used to identify the

characteristics of communication in the encounters. The verbal listening behaviors of other participants, such as the patient or the family member, are noted when those behaviors impacted an exchange.

Some exchanges of information appear to end without resolution as a new exchange is initiated because the patient's condition changes or new information is contributed spontaneously by a participant. Situations that catalyze an exchange of information include a request for an action/behavior (e.g., order an x-ray, physician consult, or procedure), an inquiry suggesting an action or asking for information (e.g., about the patient's vital signs), or questions and statements directed by any participant to another participant (e.g., one student would ask another student if any issue was being overlooked during treatment of the patient). Observers agreed that conditions during the encounter occasionally disrupted their ability to clearly identify the behavior that concluded an exchange; when in doubt the observers agreed to code the exchange ending as an open loop.

In some encounters more than one exchange was needed to conclude the situation that catalyzed the initial verbal listening behavior in the exchange (s).

Population, sample, sampling procedure. The study population is videotaped EM encounters. The population includes approximately 80 encounters based on the CAPE schedule of 20 EM sessions per year. Each session includes four EM encounters, two per 4-6 student team. The sample size is all 30 encounters recorded at the CAPE between January 16 and March 24, 2015.

The sampling procedure was simplified by several factors. First the CAPE has not recorded EM encounters other than those encounters used in a 2012-13 discrete study; access by the researcher was prevented by that study's consent process. After obtaining IRB approvals the rate

at which videotaped encounters accrued and the desired completion date for data-gathering combined to make the sample the population dating from IRB approval. The initial screening step was to obtain consent to participate from every student in an encounter.

The researcher made the final determination if a given encounter was included in the sample. An encounter was included in the sample if it allowed observers to accomplish the following:

- To identify each student's discipline, i.e., medical or nursing
- The quality of video images and audio was sufficient to hear and see participants' listening behaviors; these conditions were determined within five minutes of the encounter start.

Form Used to Record Observations of Encounters

Data was recorded using a form designed specifically for the study. The form is in Appendix E. The observers recorded the following information on the form:

- Students' discipline
- Patient chief complaint
- Family member/colleague present
- Students' listening behaviors
    - Discipline
    - Speaker's behavior types
    - Responder's discipline
    - Responder's behavioral types
- General observations

The observed listening behaviors are shown in Table 1.

Table 1.

Verbal Listening Behaviors and Observational Codes

Verbal Behaviors	*Observation code*
Agree	A
Confirm	C
Disagree	D
Inquire	I
Propose	P
Request	R

General observations included any statements or actions by encounter participants such as patient, family member, or colleague comments that were not coded. A delay in the completion of an exchange of information that appeared consequential to an observer was noted in general observations.

The form was tested via observations of the same five (5) videotaped EM encounters by each of the three observers independently. Observers then compared their coding and reconciled differences in interpretations of behaviors (e.g., Confirm behaviors end an exchange and include an action; State behaviors can end an exchange but do not include an action). Adjustments were made to the form and to the data-gathering process (See Observers and Training).

Observers and Training

In addition to the researcher, two additional observers were chosen, both of whom are directly work with HPS, at the CAPE and the simulation lab at RHCHP, respectively. The two observers' understanding of the context for the observations and familiarity with structure and delivery of encounters diminished time required for training and to do observations.

Videotaped and live encounters were used to orient observers to the study form and the behaviors to be tracked as well as to develop observers' ability to consistently identify and code

behaviors. The Arcadia system review features, such as videotape rewinding, marking, and fast-forwarding, allowed observers to sharpen their behavior recognition skills.

Observers' training focused on establishing recognition and consistency of the chosen listening behaviors and of closed loop communication and included acquiring:

- Competency in recognition of the initiation and conclusion of exchanges of information
- An understanding of the listening behaviors (Table 1) sufficient to recognize the behaviors during encounters
- Competency in efficiently coding the behaviors in the observation form

The training sessions used the same first five (5) encounters each observer made. The training and #2-8 below contributed to establishing inter-rater reliability (See Reliability section). The three observers met to determine the extent to which the observations were consistent. They accomplished the following:

1. The researcher would continue to observe each encounter twice; the other observers would conduct one observation of each encounter.
2. Continue coding all six verbal listening behaviors though all observers noted the Disagree behavior was seen infrequently.
3. Agreed on words for each of the six verbal behaviors that indicated participants had exhibited a given behavior.
4. Agreed that Confirm behaviors corresponded to participants' physical movement to complete an action within an exchange or to complete the exchange (loop).
5. Agreed that the State behavior could extend an exchange or conclude an exchange, but did not include action by a participant.

6. Continue counting nonverbal behaviors because those behaviors were appearing frequently, as behaviors within exchanges that closed with verbal behaviors and as the concluding behavior in some exchanges.
7. The researcher maintained a log of comments or questions from each observer to describe and reconcile any issues of coding or videotape quality that occurred during the observation period.
8. Inaudible behaviors were ignored unless they were links between important parts of an exchange. Observers agreed to note if they inferred meaning to an inaudible behavior.
9. Important exchanges were designated by the time stamp and a 2-4 word description
10. Additions were made to the Demographic page of the Observation form: lines for observation number (1^{st} or 2^{nd}) and camera (A, B, C)
11. The response to a team member's information request from a CAPE staff --glucose level, re-cycle vital signs monitor--would be coded in the MD or RN column based on which discipline made the request.

Observers employed the following steps to gather data in the 30 encounters:

1. Each observer viewed 15 encounters.
2. Exchanges of information were delineated using students' listening behaviors in the exchanges' communication loop(s).
3. Observers conferred to address new information surfaced with regard to the form, videotaped encounters, or the data.
4. Observers viewed and delineated exchanges of information as in Step 2 using 15 additional encounters.

Observation Time

The time required to conduct observations was significantly reduced by the viability of remote access to the videotaped encounters. No more than five minutes was required to log into the EMS Arcadia software and locate the encounters to be reviewed. The time required to conduct the data collection procedure (i.e., complete the observation form) as described in Table 4 was normally 60-75 minutes, including coding the encounter and organizing notes made during the observation. Observers reported that 3-4 observations a day were manageable.

Data Collection Procedures

During the medical and nursing students' encounter with the patient, the observers coded the behaviors in each exchange of information on the observation form. Data collection procedures are described in Table 2. Four observations of each encounter were conducted. The researcher is Observer #1.

While making the observations, the observers made descriptive notes on the observation form to provide supplemental context for the encounter, to the extent such note-making did not detract from tracking behaviors. A descriptive note could mention an unusually slow rate of response during an exchange that, taken with the coded behaviors of that exchange, giving indications of the success or failure of that exchange. Although the videotape could be stopped, re-wound, marked, and fast-forwarded, observers balanced time allotted to noting descriptive comments and the need to code the most possible exchanges accurately.

Completed hard copy of observation forms were submitted to the researcher who scanned the forms and retained the hard copy. Observers' forms were aggregated by encounter type in separate files. The researcher copied all observation forms to a separate, secure external hard drive.

Table 2

Data Collection Procedures Per Encounter by Each Observer

Encounter Events	Observer Actions	Comments/Notes
Pre-encounter Briefing	Complete the 1st page of the Observation Form	
Encounter (Observer #1; 1st observation)	Record the listening behaviors that appear in each exchange of information among the medical and nursing students	
Encounter (Observer #1; 2nd observation)	Record the listening behaviors that appear in each exchange of information among the medical and nursing students independent of the first observation coding Note any distractions caused by changes in acuity or a secondary participant	
Encounter (Observers #2 & #3)	Complete one observation of each encounter following Observer #1 (1st observation) actions	
Post-encounter	Record any information that clarifies and elaborates On notes made while observing the encounter	

Data Analysis

This section describes the step-by-step process to code and analyze the data by the researcher. Data analysis steps are described in the figure below.

Step 1: March 1-May 15. 2015

The researcher collected observation forms; forms were aggregated by encounter. The researcher reviewed the four observation forms for each encounter to reconcile obvious coding errors in data collection.

Step 2: May 1-June 30, 2015

The researcher reconciled data on exchanges from the multiple observations of each encounter to produce one compilation of each encounter—including coded behavior types and descriptive notes.

Step 3: July 1-August 30, 2015

The researcher examined verbal listening behaviors in the exchanges' communication loops and loops were categorized by:

- Call out only
- Call out & check back only
- Open loop (concluded by nonverbal behavior)
- Closed loop (concluded by verbal behavior included nonverbal behavior)
- Closed loop (concluded by verbal behavior without nonverbal behaviors)

Step 4: July 1-August 30, 2015

The researcher characterized the exchanges in each encounter using the categories in Step 3 and the verbal (and nonverbal) listening behaviors from Table 1. Descriptive notes were not used in this step or on any other study information.

Step 5: August 1-30, 2015

The researcher examined each exchange using the categories from Steps 3 and Step 4 to rate encounters and describe the characteristics of the highest to lowest rated encounters. Encounter rating was based on the number of closed loops in the encounter.

Step 6: August 15-October 12, 2015

The researcher employed appropriate descriptive and analytical statistics, such as ANOVA to identify and validate communication characteristics from the observed data.

This step contributes to meeting study goals 1 and 2 (See Chapter One, p. 3).

Step 7: September 15-October 12, 2015

The researcher assessed data quality and implications of analysis.

Step 8: September 15-October 12

The researcher reviewed literature to determine consistency with previous studies.

Step 9: October 1-12, 2015

The researcher proposed hypotheses from the communication characteristics based on support from the final data analysis.

Figure 10. **Data Analysis Process**

Reliability

The verbal listening behavior codes shown in Table 3 are coding patterns found in studies from aviation and health care literature (Bales, 1950, 1976; Bowers & Jentsch, 1998; Kilpatrick, 2012; Roter & Larson, 2001; Simonoff & Step, 2011; Sissakos et al., 2009). Bales' (1950, 1976) pioneering work to characterize small group communication includes the precursors to the verbal listening behavior codes shown in Table 3 and his work is referenced by numerous current researchers. The strength of these codes is mitigated by the small number of provider-provider studies during care delivery that have been published.

Intra-rater reliability for the study was achieved on two bases. The two observers each had a minimum of three years' experience managing, participating in, or viewing various encounters; the researcher had acquired experience in viewing encounters from his work at the CAPE the past three years. Intra-rater reliability was established during testing of the form with the first five encounters as the three observers recorded data using the observation form's procedure for

each encounter. The observers agreed that the verbal listening behaviors were readily distinguishable from each other during observations and were able to reconcile initially differing interpretations of observed behaviors.

Further evidence of reliability was obtained via multiple observations of each encounter. Each encounter was observed five times: the researcher conducted two observations of each encounter, the observers conducted one observation each, and the fifth observation was conducted by the researcher in the process to reconcile the coding done in the previous four observations. Analysis of data gathered included assurance that drift in the definition of behaviors did not occur.

During reconciliation of the observation forms for each encounter the researcher noted the number of exchanges he and one observer coded in each encounter were consistently higher than the number of exchanges coded by the third observer. The former exceeded the latter by 5-8 exchanges per encounter. The researcher continued to examine this observers' forms throughout the reconciliation. The number and type of behaviors coded in each observer's encounter observation forms were not tabulated but the researcher's estimate of number and type of behaviors showed little variation when the initial four forms were viewed side-by-side.

Validity

This section examines the study's internal, form, and external validity.

Internal validity. The extensive work by the Victoria Microanalysis Associates provided modest validity to the study here. Additional internal validity was realized through the following attention to study design and implementation conditions:

- Form design and refinement
- Observers' experience in conducting, staffing, and/or observing CAPE encounters
- Observers' collaboration in initial data analysis (*Figure 10*, Step 2)

- Repeated observations of each encounter
- Regular dialogue among the observers.

Bodie (2013) cites numerous studies by the Victoria Microanalysis Associates as the most comprehensive efforts to observe and analyze listening behaviors.

Form validity. Early communication analysis methods including Bales' (1950, 1970) interaction process approach laid the foundation to describe (code) exchanges of information among two or more people using verbal listening behaviors. Information from studies by Bowers and Jentsch (1998), Kilpatrick (2012), and Sissakos et al. (2009) contributed to decisions about behavior coding in this study. The choices of behaviors shown in Table 3 were influenced by Bales' early work. Communication and listening scholars who followed Bales added definition and utility to listening behaviors though a few scholars have pursued studies that employ listening behaviors as research data (Bavelas & Gerwing, 2011; Bodie, 2013; Bodie et al., 2012; Roter & Larson, 2001; Siminoff & Step, 2012).

As the decisive role of communication became more fully understood, especially in high risk fields as the military and aviation, scholars and practitioners used listening behaviors to characterize exchanges of information among soldiers and aviators to improve training and reduce errors. Numerous researchers have used communication loops to characterize cockpit crew communication and modify crew communication training (Bowers & Jentsch, 1998; Burke et al., 2004; Salas et al., 2001; Singh et al., 2006). The parallels among cockpit crew and providers' training, required competencies, team-based decision-making, and high stakes for attaining desired outcomes affirm the use of communication loops and identification of their elements were key components in the design and refinement of this study's observation form.

The decision to design the form to record verbal listening behaviors and characterize communication loops draws from observational studies in care delivery settings involving multiple providers. Lingard et al.'s (2004) observational study noted,

> …we have found that these failures are based in strikingly simple factors: communication is too late to be effective, content is not consistently complete and accurate, key individuals are excluded, and issues are left unresolved until the point of urgency (p. 332).

Lingard's (2004) findings were organized in seven situations from which listening behaviors used for this study's observation form were, in part, identified to attend to these concerns for completeness, accuracy, and inclusion of dyad observations. Siassakos et al. (2009) observed videotaped simulations of labor and delivery emergencies and coded the verbal listening behaviors of the senior physician and primary nurse dyad. Kilpatrick (2012) and her team observed live exchanges of information among multiple providers on a hospital inpatient unit. The behavior codes she used were adapted from Bales (1950, 1976) and she acknowledged the work by Lingard et al. (2004) as part of the basis for chosing the communication patterns she anticipated from her study population**.** In Hargestam et al.'s (2013) exploratory study, videotapes of experienced providers in simulated EM encounters were observed and exchanges were characterized by the number of call outs and closed loops. The preceding studies each characterize exchanges of information and correlate, respectively, open and closed loops and specific verbal behaviors, with successful and failed communication in varying degrees. These observational studies and others of provider-provider communication are based on analyzing the number, completeness, and timing of the participants' CLC and they informed the data collection and analysis in this study.

Kilpatrick (2012) and Lingard et al. (2004) noted how increasing the number of encounter participants and acuity level increase the number, pace, and type of verbal behaviors. They

advocated for more studies that focus on subsets of encounter participants to assure accuaracy of observations.

External validity. Communication researchers agree that care delivery processes include generally expected exchanges of information among customary participants and that listening behaviors can be observed. However that knowledge provides little basis for identifying when and why exchanges of information succeed or break down. Their findings support three broad conclusions to inform establishing study validity:

- Similarities between aviation cockpits and care delivery settings align closely enough for the former to inform provider-provider studies. CLC as used in the aviation studies provides a tool to explore provider-provider communication in this study. Sexton and Helmreich (2000) note "These are preliminary data, in that this method of linguistic analysis is currently being developed and integrated with a content-coding method of communication analysis and models of threat and error" (p. 63). The method referred to continues to evolve and coupled with increasingly sophisticated flight simulators cockpit communication errors have become the exception more than in any analogous profession (Denham et al., 2012).
- Care delivery settings and patient condition affect the amount, type, frequency, and intensity of information exchange within teams of providers. To prevent the preceding factors from becoming confounders, initial studies must tightly limit the variability of study settings. The three EM encounters used in this study have few variations given the significant range of conditions and acuity found in emergency care centers.

- The number of observational studies of provider-provider communication must be increased before bases for establishing validity of confirmatory studies can be confidently proposed.

The boundaries of the preceding conclusions affirmed the choice of an exploratory inquiry strategy study and added to potentiality of study validity.

Limitations

Last, the researcher acknowledges his career working with health care providers might have created preconceptions about study design, observer training, or data gathering, analysis, and presentation. The researcher's novice status at the outset and the paucity of similar studies on which to model this study tend to mitigate preconceptions about study design and implementation.

CHAPTER FOUR: DATA ANALYSIS

The problem addressed in this dissertation is the lack of tools to study health care provider communication in progress. This study attempts to show that verbal listening behaviors have utility to characterize provider-provider communication and the overall study design is a valid means to improve the understanding of complete and incomplete closed loops (CLC). Employing an exploratory inquiry strategy to conduct observations of simulated emergency medicine (EM) encounters, this study describes the characteristics of medical (MD) and nursing (RN) students' team communication.

The study design is informed by communication research in commercial aviation cockpits and health care delivery settings. Cockpit conversations between pilots has been studied for over 30 years (Bowers et al., 1998; Burke et al., 2004; Denham et al., 2012; Hargestam et al., 2013; Lingard et al., 2004; Sexton & Helmreich, 2000; Siassakos et al., 2009). While findings offer utility to health care researchers, adaptations from studies must recognize the limitations of those findings (Ricci et al., 2012). CLC is taken from commercial aviation studies to serve as this study's framework. General communication and listening studies propose methods by which the exchange of information between two or more people can be examined (Bavelas & Gerwing, 2013; Bodie, 2013). A small number of health care communication researchers have examined provider-provider communication (Hargestam et al., 2013; Kilpatrick, 2012; Kirschbaum, 2012; Kirschbaum et al., 2015; Manojlovich et al., 2014). These studies are the basis for choosing verbal listening behaviors to characterize the EM encounters communication among MD/RN student teams.

The chapter has three sections. The first section includes findings that apply across the entire study; the second section evaluates the extent to which the study's three goals were met. The last section summarizes the study findings and introduces Chapter Five.

Study Design and Initial Data Decisions

This section addresses study setting, observations of encounters, and the group of interest. The last part includes the basis for initial decisions about formatting data.

Study Setting. The CAPE proved to be a stable, consistent study setting: simulations were conducted from the same script for each of the three simulations and ranged from 18-20 minutes for 29 of the 30 encounters. One encounter was shortened by four minutes due to technical problems with an in-room monitor; the encounter was included because observers agreed the type and quality of the data were consistent with other encounters. CAPE staff or the attending School of Medicine ER faculty members occasionally made minor alterations to the patient's conditions in the simulation in response to student team decisions: slight changes to patient vital signs or symptoms or shift in the personality of the CAPE staff person taking the role of patient family member. These changes had only a nominal impact on the observations.

CAPE staff made small adjustments to the settings of the three cameras in the simulation rooms at the researcher's request to maximize observers' view of the room and the team interactions. These changes were made after the first five encounters were observed. Videotaped encounters were immediately available to the observers on site and via remote access. This allowed efficient access to encounters and effective completion of the observations.

Observations and Encounters. Initial encounter observations were conducted by the researcher and two colleagues between February 1 and April 30, 2015; the four observations of

each encounter were reconciled into one final data compilation by the researcher in May and June while doing a fifth observation. The reconciliation process included these steps:

1. The researcher reconciled his two observations of each encounter into one form.
2. The researcher's form and each of the observers' forms (two) from each encounter were collated to support the creation of the final observation form for each encounter.
3. The researcher conducted a 5th observation of each encounter and verified the coded behaviors on the final form using the three forms from #2..

The data were extracted, formatted, and analyzed in June and July.

The data is taken from 30 EM encounters, videotaped between January 16 and March 24, 2015. The 30 encounters include 15 with a young adult with an aspirin overdose (ASA), 11 with an eight-month old baby in septic shock (SS), and four encounters with an eight month old in neurogenic shock (NAT). Each encounter was characterized using five verbal listening behaviors and the nonverbal listening behaviors for a total of 3,581 verbal behaviors and 339 nonverbal behaviors. After initial analysis of the data the observers agreed that the Disagree behavior would not be included in analysis: it was coded 15 times (0.004 % of behaviors) in all encounters. Behaviors were extracted from a total of 1,084 discrete exchanges of information, 738 of which ended in closed loops (68%); 346 exchanges ended in one of three types of open loops.

Encounters were placed into one of three groups of ten (10), a Top, Middle, and Bottom**,** determined by the number of exchanges (loops) in each closed with verbal behaviors. The Exchanges: Highest to Lowest Analysis includes all 30 encounters, described by the students' exchanges, and rated highest to lowest by number of closed loops. This determination included

exchanges with and without nonverbal behaviors during the exchange. Exchanges that ended in nonverbal behaviors as well as Call Outs and Call Outs/Call Backs were defined as open loops.

Although the encounter types required that teams seek and make care decisions on varying types of information these variables (i.e., test results, changes to patient vital signs, colleagues' input) are incidental to the study's primary purpose to characterize provider-provider exchanges of information.

The basis for the encounter rating is shown in Table 3. No more than one closed loop separates the encounter ratings moving from top to bottom in 27 of 30 encounters (see Appendix I); encounters with the same number of closed loops were differentiated by the number of closed loops that included nonverbals. Table 3 shows the rating scale based on number of closed loops that was developed after reviewing the data in Appendix I. Table 3 and Appendix I suggest there is a small difference between encounters when number of closed loops is the basis for ratings.

Table 3

Encounter Rating Scale by Number of Closed Loops

# of Closed Loops (n = 738)	Scale	# of Encounters (n = 30)
> 30	5.00	8
25-29	4.50-4.99	7
20-24	4.00-4.49	9
15-19	3.50-3.99	5
< 14	3.49	1

Table 4 shows the ratings distribution for the three groups and the distribution of exchanges. The data in Table 4 is drawn from the analysis in Appendix I. Exchanges: Highest to Lowest Analysis.

The ratings in Table 4 taken alone suggest few similarities can be claimed from one group to the next moving from highest- to lowest-grouped encounters. The data in the 3rd and 4th columns of the table begins to show distinctions between the three groups although overlap in the ranges give a mixed message when compared to information drawn from encounter by encounter examination. No relationship could be established between the number of closed loops in an encounter and the total of all types of exchanges in an encounter.

Table 4

Encounter Ratings Distribution

Group	Rating	Range of # of Exchanges	Average
Top 10	5.00-4.75 (0.25)	34-62	42
Middle 10	4.75-4.15 (0.60)	30-41	34
Bottom 10	4.15-3.49 (0.75)	21-41	32

An ANOVA was used to determine if the difference of mean exchanges ratings among the Top 10, Middle 10, and Bottom 10 groups is significant. The ANOVA Table 5 shows that the p-value is small (less than .0001), which indicates that at least two groups do not have the same mean number of exchanges. A Bonferroni test shows all groups are significantly different from one another (Table 6).

Table 5: *ANOVA Table for Rating*

Group	2	5.74	2.87	94.27	<.0001
Error	27	0.82	0.03		
Total	29	6.57			

Table 6: *Bonferroni Test for Rating*

Means with the same letter are not significantly different.			
Bon Grouping	Mean	N	GROUP
A	4.95500	10	TOP10
B	4.45500	10	MD10
C	3.88400	10	BM10

Frequency of open loops and loops that closed with nonverbal behaviors increased and the loops that closed with verbal behaviors decreased from highest to lowest ranked encounters. The total exchanges in each group of encounters suggests highest-rated encounters had more exchanges.

Group of Interest. MD students were in their third of four years in medical school; RN students were 12-18 months into 3-year programs. The researcher expected the number and type of communication behaviors by MD and RN students to demonstrate the prevalence of hierarchical perceptions on the part of students found in the literature and among educators (M. Earnest, M. D., Ph.D, personal communication, October 29, 2012). Data in Tables 7 and 8 affirmed the expectation.

The researcher decided that coding the behaviors of each student in an encounter individually presented data collection and analysis challenges. Therefore; behaviors by MD and RN students in each team were coded collectively as MD students' behaviors or as RN students' behaviors. Observation forms captured MD-RN, MD-MD, and RN-RN behaviors. The patterns of MD and RN students' behaviors held a steady 70: 30 ratio or higher throughout the encounters with few notable exceptions. Tables 7 and 8 show the percentage distribution and number of behaviors, respectively, by MD and RN student behaviors; Table 9 includes examples of the few exceptions to the prevailing ratio of MD to RN student behaviors.

Table 7 shows the percentages of total verbal behaviors by MD students. In 20 of 30 (66%) encounters, the ratio of MD to RN students' verbal listening behaviors was as great as 70:30; in 24 of 30 (80%) encounters the ratio was 60:40.

Table 7

MD Students' Percentage of Total Verbal Behaviors and Number of Encounters

MD Students' Behaviors	
Percentage	# of Encounters
> 90	4
80-89	8
70-79	8
60-69	4
50-59	5
0-49	1

Table 8 provides a numeric and percentage distribution of MD and RN students' six behaviors.

Table 8

Frequencies Distribution of MD and RN Student Behaviors

Behavior	**MD**	**%**	**RN**	**%**
Agree	166	95	8	5
Confirm	337	61	243	39
Inquire	577	70	172	30
State	1216	80	247	20
Respond	536	85	78	15
Nonverbal	136	33	203	67
Total	**2863**	**74**	**752**	**26**

The data show RN students had notably fewer of each of five behaviors across all encounters with the exception of nonverbal behaviors. RN students' largest number of behaviors were Confirm and State which indicate their primary activity was esponding to MD students' Request and Inquire behaviors. This dynamic was noted on numerous occasions by the observers in the Other Information section of the observation forms. A sample of Other Information sections from encounters in January-March frequently described RN students as "unengaged", "timid", and "nonfactors". Observers concluded MD students'number of State behaviors indicate the high frequency of exchanges among the medical students as well as their use of State behaviors to direct RN students.

It was observed that the nonverbal behavior distribution is further confirmation of the MD students' lead role in the encounters as RN students acted on MD students' behaviors, but

deferred to the MDs' perceived authority by not verbally engaging them. The MD/RN student nonverbal distribution was 136/203.

The distribution of Confirm behaviors suggests a departure from the overall imbalance toward MD students: in 14 of 30 encounters RN students' Confirm behaviors equaled or exceeded those of MD students. This data may be a more subtle indication of deference by RN students within the hierarchy. Observers agreed that Confirm behaviors corresponded to physical movements to complete actions. The number, and more so, the percentage of RN students' Confirm behaviors suggest they were inclined to follow MD students' directive behaviors (Inquire, State, Request) than the MD students' Agree, Diagree, or Confirm behaviors.

The percentagee of MD students' total behaviors in the Top 10 encounters was 74% or more in 7 of 10 encounters; in the Middle 10 MD student behaviors were 72% or higher in 8 of 10 encounters. In the Bottom 10 MD student behaviors were 65% more frequent in 7 of 10 encounters. Each group had 4 of 10 encounters with MD students' percentages of behaviors equal to or higher than 80%. See Appendix J. for a full analysis. Encounters are listed from highest to lowest by the number of closed loops.

One tenet of IPE asserts that as providers gain better understanding and acceptance of each others' scope of practice, communication is more equitably distributed and improved (Interprofessional Education Collaborative, 2011b). Table 9 shows percentage differences between MD and RN students' behaviors that suggest considerable effort will be needed to achieve the IPE assertion. The selected encounters in Table 9 are chosen to show there is no relationship between encounter ranking and more equitable behavior distribution among the MD and RN students.

Table 9

Impact of Close Percentage Difference MD/RN Behaviors

Encounter	Ranking	MD/RN % Total Behaviors
Mar 13 09.43 (NAT)	#4	57/43
Apr 24 11.11 (SS)	#7	59/41
Jan 30 10.08 (SS)	#8	62/38
Apr 24 09.42 (SS)	#11	60/40
Apr 24 10.12 (SS)	#18	53/47
Feb 27 10.46 (ASA)	#21	54/46
Mar 27 09.13 (SS)	#23	59/41

The student teams are not evenly matched in terms of length of training in their respetive programs so this example may be limited in adding to understanding. However Kilpatrick's (2012) observational study of IP team focused on the role and communication behaviors of nurse practitioners and did not findexperienced providers had modified their adherence to the traditional provider hierarchy. She noted "…when RNs interacted outside of the nursing team, their communication behaviours appeared to change and RNs were described as silent or lacking in confidence and assertiveness within the inter-professional team" (p. 169). This portion of study data supports the need for groups of interest in future studies to be more closely matched with respect to members' point in their training—or years of experience in practice (See Hypothesis Two).

IPE advocates will assert the preceding paragraphs underscore the role of socialization students bring to their respective training programs and the challenges of revising the students' expectations for their roles and responsibilities in practice. This study lends support to the expectation among health professions educators that acquiring communication competency, not

just communication training, early in students' training process contributes to their ability to successfully communicate in team care delivery and mitigates the effect of established providers' siloed approaches (Interprofessional Education Collaborative, 2011b). The study may lend credence to those who advocate for communication curriculum to extend beyond the first years of training well into the clinical portions of training (Levinson et al., 2010).

Study Goals' Achievements

Two general statements can be made that sum up the findings from data analysis; these statements influence changes to study goals and significantly shape the outcome of the analysis:

1. An exchange of information among two or more providers is a series of behaviors, when concluded with a behavior that closes a communication loop, has the most probability of achieving the desired outcome.
2. An exchange of information among two or more providers is a series of behaviors, concluded with any behavior that does not close a communication loop, has less probability of achieving the desired outcome.

The study gathered a significant amount of data but despite formatting the data in a variety of relationships and applying modest analysis these statements are the strongest assertions that can make. The value of the study is in successfully meeting the revised first goal, to characterize provider-provider communication, and in identifying hypotheses for additional studies to test (Goal Three).

Steps in exchanges: Goal One. *To identify specific steps in provider-provider exchanges of information where communication succeeds and fails.*

The data does not support this goal: specific points of successful and failed communication could not be identified. The observers could determine when an exchange ended

with a closed loop or without a closed loop; the verbal listening behaviors in exchanges were identified. The observers noted they could determine if an expected outcome had occurred in some exchanges: an MD student requests a glucose level and an RN student is clearly observed performing a finger stick and announcing the result; an MD student asks for a drug to be administered and the MD or RN student can be seen drawing up the medication, confirming it is the correct medication, and administering it. The expected outcome of other exchanges could not be confirmed despite observing all participants' behaviors: lab tests are requested and a student is observed calling the lab and correctly requesting the desired tests. Observers could not confirm that the laboratory staff person who took the call heard the requested labs correctly or that the tests were performed correctly and in a timely manner.

The analysis suggets that the following goal should be posed and can be achieved within the bounds of the study design: *To characterize the exchanges of information among the MD and RN student teams during simulated care delivery.*

Table 10 provides an example of how each encounter was initially characterized in a completed form. Across the top of the form are the exchange types in the encounter.

1. A Call Out exchange includes one verbal behavior by an MD and/or RN student.
2. A Call + Call Back exchange includes two or more behaviors by an MD and/or RN student and does not close with a verbal or nonverbal behavior.
3. A Closed Loop by Nonverbal exchange includes two or more behaviors by an MD and/or RN student and ends with a nonverbal behavior.
4. A Closed Loop by Verbal (inc NV) exchange includes two or more behaviors by an MD and/or RN student, one or more of which is nonverbal, and ends with a verbal behavior.

5. A Closed Loop by Verbal exchange includes two or more behaviors by an MD and/or RN student and ends with a verbal behavior.

The other data in the form are behaviors by MD and RN students.

Table 10

Sample: Complete Analysis Form

ENCOUNTER: Mar 13 10.13 (NAT)

Call Out	Call Out + Call Back	Closed Loop by Nonverbal	Closed Loop By Verbal (inc NV)	Closed Loop By Verbal	Rating [2]
16	7	4	11 (2/9) [1]	24 (18/6) [1]	35/5.00

Verbal Behaviors	MD	RN	Total
Agree	4	1	5
Confirm	15	6	21
Disagree	1	0	1
Inquire	25	6	31
State	88	4	92
Request	27	0	27
TOTAL-Verbal Behaviors	160	17	177
Nonverbal Behaviors	12	5	17

[1] Loop closed with Statement/Action

[2] # of closed loops

Initial data from observations was formatted in several reports that examine listening behaviors and exchanges separately--Appendices H. and I., respectively--and together, Appendix J. Representations of how the data in each of those appendices are formatted are shown in Table 11, Table 12, and Table 16, respectively. The Disagree behavior does not appear in subsequent tables or in presentations of data in the Appendices.

The analysis in Appendix H, MD/RN Student Behaviors by Encounter analysis is an initial step toward a more detailed description of each encounter. That report includes all 30 encounters,

described by the students' behaviors, and ordered from highest to lowest by the number of closed loops. Table 16 data are an aggregation of the individual encounter forms (Table 10) for the Top, Middle, and Bottom 10 groups according to the number of closed loops in each encounter.

Table 11

Five Behavior Frequencies and Nonverbal Behaviors by Group for 30 All Encounters

Group	Agree	Confirm	Inquire	State	Request	Total[1]	NV
Top 10	71	246	312	636	222	1487	111
Middle 10	53	196	226	423	205	1103	107
Bottom 10	50	138	212	404	187	990	122
Total	174	580	750	1463	614	3581	340

[1] Does not include nonverbal behaviors

The Top 10 encounters have decisively more behaviors than the Middle (384) and Bottom (497) groups: more total verbal listening behaviors and more of each of the individual verbal listening behavior. Total nonverbal behaviors are slightly higher in the Top versus the Middle 10 (4) and lower than the Bottom 10 (11), but the nonverbal behaviors by Top, Middle, and Bottom 10 group are 7%, 9%, and 12%, respectively of each group's total behaviors.

Table 12 summarizes the analysis of exchanges in each encounter; the full analysis of exchanges in each encounter is in Appendix I.

Table 12

Exchange Descriptions by Numbers and Percentage of Total[1]

Group	Call Out #/%	Call Out/Call Back #/%	Closed Loop-NV[2] #/%	Closed Loop-V (NV)[3] #/%	Closed Loop-V[4] #/%	Total Exchanges	All Closed Loops #/%
Top 10	45/11	28/6	38/9	46/11	267/63	424	313/74
Middle 10	39/11	24/7	42/12	52/15	191/55	348	243/70
Bottom 10	38/12	38/12	62/19	44/14	140/43	322	184/57
Total	122/11	90/8	142/13	142/13	598/55	1094	740/68

[1] Data is expressed as the total of exchange type/percentage of total exchanges for the group
[2] Loops closed with a nonverbal listening behavior
[3] Loops closed by verbal listening behaviors that included a nonverbal behavior
[4] Loops closed by verbal listening behaviors without any nonverbal behaviors

Communication researchers and health care practitioners would assert a reasonable expectation is increasing numbers of exchanges that end with Call Outs, Call Out/Call Back, and Closed Loops by Nonverbal Behaviors as encounter ratings drops. However, the data in Table 12 are ambiguous. The pattern of Closed Loops by Nonverbal Behaviors meet the expectation that they increase as encounter rankings drop. Call Outs and Call Out/Call Back run almost opposite to expectations: the total of both exchanges is highest in the Top 10 encounters and only slightly lower than the total in the Bottom 10; the pattern of Call Outs is completely opposite to expectations. This pattern can at best be explained as a function of the increasing number of total behaviors as an encounter's rating are higher. The assertion that a decreasing number of both

types of Closed Loops by Verbal Behaviors as an encounter's ratings drop is borne out by the Table 12 data.

A second ANOVA was done by Top 10, Middle 10, and Bottom 10 groups to determine if the difference of numbers of the exchanges that ended with closed loops and included at least one nonverbal behavior was significant. The ANOVA Table 13 shows the p-value is greater than the alpha level of .05, indicating one cannot conclude that the groups have different means of these exchanges.

Table 13: *ANOVA of Closed Loops with Nonverbal Behaviors*

Group	2	3.47	1.73	0.22	0.81
Error	27	216.4	8.02		
Total	29	219.87			

A third ANOVA was done by Top, Middle, and Bottom 10 groups to determine if the difference of numbers of the exchanges that ended with closed loops and had no nonverbal behaviors was significant. The ANOVA Table 14 shows the p-value (less than .0001) suggests that at least two groups have different means. The Bonferroni test shows each group mean is significantly different from the other two (Table 15).

Table 14: *ANOVA of Closed Loops Without Nonverbal Behaviors*

Group	2	816.87	408.43	43.25	<.0001
Error	27	255	9.44		
Total	29	1071.87			

Table 15: *Bonferroni Test of Closed Loops Without Nonverbal Behaviors*

Means with the same letter are not significantly different.			
Bon Grouping	Mean	N	GROUP
A	26.700	10	TOP10
B	19.100	10	MD10
C	14.000	10	BM10

Table 16 shows the format of all 30 encounters in the Exchanges/Behaviors: Patterns Analysis; the analysis of all 30 encounters is in Appendix J. This analysis includes a combination of exchange types and behaviors; Call Outs and CallOut/Call backs are aggregated as are both types of closed loop exchanges.

Table 16

Exchanges/Behaviors: Patterns Analysis

Date (Dx)	MD/RN Verbal Behaviors	CO-CO/CB	CL-NV	CL(NV)/CL	Rating	NVs
Mar 13 10.13 (NAT)	160/17/177 90/10%	23	4	11/24	5.00	17

Encounters were also compared using their exchanges in a Highest to Lowest Rated Pairs Analysis; Table 17 provides a sample of that format; the full analysis is in Appendix K.

Table 17. Appendix K shows the 30 encounters in pairs, starting with the highest- and lowest-rated encounters and proceeding through to all fifteen pairs. The analysis shows the difference in the exchange types in each pair.

Table 17

Highest to Lowest Ranked Pairs Encounter Analysis

Date/Time Encounter		Call Out		Call Out + Call Back		Closed Loop by Nonverbal		Closed Loop by Verbal (inc NV)		Closed Loop by Verbal		Closed Loops/ Rating	
Mar 13/ 10.13 NAT	Jan 16/ 10.46 SS	16	4	7	2	4	10	11	1	24	13	35/ 5.00	14/ 3.49

Other presentations of the data can be made, but given the boundaries and limitations previously described, no significant additional information about characterizing these encounters was anticipated.

Characteristics of communication: Goal Two. *To describe the characteristics of communication sufficiently to assess outcomes of communication loops not being closed.*

The data does not support this goal. Characterization of the communication in the EM encounters' exchanges is demonstrated by meeting revised Goal One, but the data are insufficient to do more than speculate about the outcome of loops whether closed or not closed. Researchers conducting studies similar to this one need to acknowledge the following with respect to outcomes from communication:

1. Closed loops do not necessarily guarantee that expected the outcome will occur.
2. More needs to be known about characterizing communication before attempting to reach conclusions about comunication outcomes.

De Haes and Bensing (2009) note "Ideally, medical communication research will first clarify what happens during medical encounters. Subsequently, it can explain if what happens, i.e., the communicative behavior displayed, is effective or not" (p. 288). The design of encounters

prevents a full understanding of what happened in all encounter exchanges. De Haes and Bensing (2009) emphasize far more needs to be known about the components [listening behaviors] in communication pathways [exchanges] among all providers involvd before the desired outcome can be confirmed. They point out communication researchers "…have, so far, not developed a consistent framework [CLC] for explaining 'why' (the mechanism) [listening behaviors] and 'how' (the pathway) [exchanges] certain specified communication elements would succeed in reaching the articulated endpoint [desired outcome]" (p. 292). Hulsman (2009) points out that "Communication skills teaching would be influenced more by research that looks more closely at the impact of certain behaviors" (p. 303).

Kilpatrick (2012) and Manojlovich et al. (2014) conclude little has changed with regard to the available research tools and frameworks. De Haes and Bensing (2009) provide one of the most useful and recent studies to inform design of studies to examine successful and unsuccessful communication. They argue

> The evidence base of medical communication has been underdeveloped and the field was felt to be in need for thorough empirical investigation. Studying medical communication can help to clarify what happens during medical encounters and, subsequently, whether the behavior displayed is effective. However, before effectiveness can be established, one should argue what functions or goals the communication has and what outcomes are relevant in medical communication research (de Haes & Bensing, 2009, p. 287).

Kilpatrick (2012) and her colleagues observed live encounters and found determining patterns of communication was considerably easier than confirming the quality of outcomes, even during encounters that allowed observers to see all exchanges among providers from beginning to the completion of the encounter (K. Kilpatrick, PhD., personal communication, Novermber 7, 2013). She points out how any changes in acuity or number of participants in a care delivery encounter increases the number of communication behaviors and complicates the ability of observers to capture the nuances of communication that may pinpoint when communication succeeds or fails

(K. Kilpatrick, PhD., personal communication, Novermber 7, 2013). “It is unclear how this increased pace of communication affects patient care or patient safety or whether the faster pace of communication leads to an increased risk of errors” (Kilpatrick, 2012, p. 175).

Manojlovich et al. (2104) sequentially observed, shadowed, and conducted focus groups with the same physicians and nurses on two medicial-surgical units at an academically affiliated U.S. Department of Veterans Affairs (VA) hospital. They note:

> Through observation we were able to see the “what”: communication activities. Shadowing was most useful for understanding “how” physicians and nurses communicated. Focus groups helped answer “why” certain patterns emerged and allowed us to further explore communication events within a group setting. By using all three methods we were able to more thoroughly characterize communication events than by using a single method alone, providing a more holistic picture of how communication occurs on an inpatient medical–surgical unit (Manojovich et al., 2014, p. 1-2).

Hargestam et al. (2013) conducted an exploratory study that observed trauma teams of physician and nurses with and without previous trauma team communication training that emphasized use of CLC; the use of CLC was also emphasized in pre-study training. “This study showed that despite focus on the importance of communication in terms of…CLC, the difficulty in achieving safe and reliable verbal communication within the interdisciplinary team remained” (Hargestam et al., 2013, p. 1). They note the significant challenge encountered when trying to observe and code live encounters (Hargestam et al., 2013).

Hypotheses to test: Goal Three. *To recommend hypotheses for testing in subsequent studies to inform providers’ communication curriculum and professional development.*

The data supports this goal. Hypotheses are proposed here that may allow researchers to satisfactorily establish a firm basis for characterizing provider-provider communication from which studies could be designed to identify specific points of success and failure and inform curriculum. Hall and Schmid Mast (2009) assert “Good hypotheses need not be deduced from a

formal theory, but can come from many sources, such as the author's own experience, common beliefs or observations, the desire to reconcile conflicting empirical results, or a surprising result" (p. 283). The following hypotheses are proposed for subsequent studies.

Competencies and decision-making: Hypothesis One. There is a negative correlation between students' demonstration of specific communication competencies and specific clinical decision-making competencies in the same simulation of care delivery.

One criticism by educators for simulations such as the CAPE's EM encounters is students are placed in realistically high pressure conditions that work against building communication competency because they are being simultaneously evaluated on communication and clinical decision-making. The counter argument is that 3rd year medical and nursing students are in the period of their training when they are seeing patients and they are expected to be making clinical decisions, notwithstanding they are supervised by a preceptor or the pressure of the situation.

If good communication habits are not formed by this point students are unlikely to acquire them as their professional formation is furthered by providers who were trained and have practiced in the silos that have historically limited provider-provider collaboration and created conditions that many say lead to medical errors. One contribution from IPE may be to justify less classroom time and more simulation time that impart content and gradually increases complexity of the conditions. Veldhuijzen et al. (2013) suggest

> Other efforts to enhance the effectiveness of communication training stress the importance of just-in-time teaching, and integrated-teaching in the medical context. Both principles suggest to plan communication skills teaching not too early in the curriculum and to start just before and in the clinical years (As cited in Hulsman & Visser, 2013), p. 145).

Levinson et al. (2010) make the case for systematically infusing communication training beyond the customary first or second year of [physicians] training to clinical rotations with preceptors, to graduate training, and into their practices for professional development and life-

long learning. Smith et al. (2003) describe the competency-based and individual student-driven curriculum in the Alpert School of Medicine at Brown University; faculty "…use multiple performance measures and mentoring over time to assess not only what the students know, but also their abilities to do what they know (Smith et al., 2003, p. 106).

Critics of traditional high pressure, lock-step provider training programs call for the process by which providers' acquire increasingly more sophisticated skills to consider the format for how much and what type of skills are learned as well as the degree of competency expected at any given point in providers' training.

Level of communication skill and competencies: Hypothesis Two. There is no relationship between IP teams whose members are closely matched with respect to their level of acquired communication skill and their ability to demonstrate communication competencies.

This study affirms the need to test this hypothesis. Teams in this study consisted of 3rd year medical students and 1st (ACC) or 2nd year (RHCHP) nursing students. The disproportionately high number of listening behaviors by medical student demonstrated an expected deference by nursing students to the prevailing hierarchy, but the disparity in number and type of behaviors also suggests the RN students' lack of experience asserting their expected role in care delivery. Observers noted on numerous occasions nursing students appeared overwhelmed by the conditions in the encounter—patient acuity, family member interaction, multiple simultaneous exchanges—and were unable or unwilling to initiate action or information even in situations for which their training had prepared them.

A number of well-known scheduling issues inhibit assembling IP student teams (M. Earnest, M.D., Ph.D., personal communication, October 30, 2012). These issues include carving out time for IP sessions from required, discipline-specific didactic and simulation sessions, obtaining

classroom and lab space, and variations in student availability due to discipline-specific activities. This hypothesis might also be tested with teams of providers in settings such as hospital operating rooms, critical care units, and emergency rooms. In these settings providers will have varying amounts of experience but can be expected to have more closely matched competencies. Providers in high acuity settings are naturally brought together and conditions for observations can more likely be controlled (Hargestam et al., 2013; Kirschbaum, 2012; Kirschbaum & Fortner, 2012; Lingard et al., 2004). Higher acuity settings require providers to communicate, coordinate tasks, and acknowledge each other's expertise, notwithstanding the *cultural differences* created by separate training and practice.

Several additional factors make hospital high acuity care units the most compelling locations for listening research: 65% of sentinel events between 2004 and June, 2013, occurred in acute care hospitals (The Joint Commission, 2013a); at least 98,000 people die yearly in hospitals as a result of medical errors (Institute of Medicine, 1999).

One challenge remains in deciding if valid studies can result from live encounters considering the volume and complexity of exchanges and actions. Cockpit crew communication has been researched using videotaped flight simulator sessions; voice recordings from simulator sessions have been analyzed with the matching crew actions recorded by the flight simulator. Kilpatrick (2102) describes the difficulties in observing live encounters and limited opportunity for de-briefing participants. Any care delivery events that are videotaped include significant issues with equipment, consent, and access to settings that do not disrupt the care delivery process. Even with the availability of quality videotaped encounters as was the case with this study, Bavelas (1987) cites the challenges of working with videotaped encounters:

> The method is labor-intensive, often requiring multiple hours of watching and coding for a single video, and this only after the researcher has made decisions regarding which

> behavior(s) to analyze systematically. Even more labor is involved if the researcher takes an inductive approach (As cited in Bodie, 2013, p. 80).

New studies will require significant planning and collaboration among researchers, study participants, and study sites. The literature provides few, if any, alternative approaches. Listening scholars and health communication researchers have employed definitions, models, surveys, and various inquiry strategies without definitively describing why communication succeeds or fails. Bodie (2013) offers support for observational studies:

> That is, while we know with great precision what listening looks like in naturalistic dialogue, we are unfortunately unable to document the impact of specific behaviors and their relative importance in contributing to individual health and well-being, relational satisfaction, affect improvement, liking, rapport, and a range of other outcomes (p. 81).

Nonverbal behaviors: Hypothesis Three. There is no relationship between nonverbal behaviors and the ability to more thoroughly identify the contributing factors for successful and unsuccessful communication.

Patterson (2014) reviews the historical trends and contemporary issues in nonverbal behavior research and notes how nonverbal behaviors supplement, expand, and give clues to underlying issues in the associated verbal behaviors. Ledford, Canzona, and Cafferty (2015) point out "Researchers now recognize that verbal behavior is not the sole means through which clinicians communicate. Nonverbal behaviors are a critical factor to consider when examining the nature and delivery of clinical care" (Riddle et al., 2002, as cited in Ledford, Canzona, & Cafferty, 2015, p. 29).

Successful studies of providers' nonverbal behaviors during care delivery are arguably more challenging than observations of verbal behaviors and would likely require delivery encounters to be videotaped.

Hypothesis Four. There is no relationship between increasing acuity of the care delivery encounter and the number of information exchanges that end in closed loops.

A number of studies reveal the complexity present in care delivery encounters: patient and other participants' cognitive and behavioral factors environmental variations, and acuity of condition treated (See A Model for Examining Communication during care Delivery) (L. Yancey, M.D., personal communication, October 29, 2012). Beach and Inui (2006) and Mulanax and Powers (2001) show how exchanges are directly impacted by participants, type of care being delivered, delivery location, and acuity of the condition being managed. Kilpatrick's (2012) study affirmed the choice of videotape with her descriptions of the confounding effects on observers' ability to capture targeted behaviors during live encounters from increases in acuity and the number of encounter participants.

Wanzer et al. (2004) reported that Patient-Centered Care (PCC) was applied more frequently with children whose condition was less acute suggesting that acuity challenges providers to maintain a balanced approach to care management. Acute conditions necessarily increase the number and type of providers and the degree of collaboration required to deliver PCC. PCC introduces a more prominent role for non-clinical professionals such as case workers, financial advisors, and patient advocates.

This finding also affirms the role for acuity as shown in the listening model included in this dissertation. Acuity is only one of several variables that can be separately studied to inform a more precise understanding of communication (see Figure. 9).

Summary of Findings

Chapter Four presents the study methodology and the data collected from the encounter observations. Data are formatted in various reports that examine encounters using listening

behaviors and exchanges of information; full and sample reports were presented. All full reports are found in Appendices H.-K. Analysis of data is used to revisions of study goals.

This exploratory study can claim two outcomes that make valuable contributions to characterizing provider-provider communication and proposing testable hypotheses. These are modest achievements in a research *community* that still prefers the perceived strength of confirmatory studies. Yet a number of researchers advocate for the confident use of exploratory designs (Hall & Schmid Mast, 2009; Manojlovich et al., 2014; Reiter, 2013).

New research no longer faces quite the same challenges Hall and Schmid Mast (2009) cite as the "…uphill battle with reviewers who are skeptical of research that is not directly derived from a recognized theory (p. 283). Reiter (2013) provides affirmation for this study's design and admonishes exploratory researchers to state and adhere to firm study boundaries and goals:

> Proceeding in such a way allows for a clearly defined starting position in the process of knowledge building and gaining understanding and familiarity with a subject or problem. It also allows for a delimitation of the empirical field that is relevant to a given research question – as purely exploratory research would otherwise be endless and lead into the traps of infinite regression (Reiter, 2013, pp. 10-11).

CHAPTER FIVE: SUMMARY

The following sections summarize the study, describe alignment of study findings with the literature, present conclusions, and make recommendations for future studies in provider-provider communication.

Summary of the Study

This study is based on the need for research tools that improve the understanding of communication failure during care delivery. "Poor communication is the leading cause of preventable adverse events in hospitals, as well as a major root cause of sentinel events" (Manojlovich et al., 2014).

Situation. Care delivery remains burdened internally by errors that lead to inadequate or incorrect care, injury, and death and externally by shifting priorities among patients, payors, education, and regulation (Hannawa et al., 2013; The Joint Commission, 2012, 2014; Rutherford, 2013; Singh, 2014; Sternberg, 2012). These errors are formalized as *sentinel events* or unexpected incidents that result in death or permanent loss of function (The Joint Commission, 2013a, 2014). Recent studies of the root causes for sentinel events in health care show communication failure is no less than the fourth-ranked cause (The Joint Commission, 2014; Singh et al., 2008). In 21 types of tracked sentinel events, communication failure was the third or higher cause in 15 of the events (The Joint Commission, 2012). Researchers have actively conducted studies on communication failure for over 25 years; and studies to date conclude with calls for more study. Progress to understanding of communication failure has slowed: Manojlovich et al. (2014) preface their study by noting "Despite the importance of communication to patient safety in hospital settings, we know surprisingly little about

communication patterns between physicians and nurses, particularly on general medical–surgical units" (p. 1).

Problem. The problem this study addresses is the lack of tools to study provider-provider communication. Current knowledge about the causes for provider-provider communication failure comes primarily after the fact: the patient's adverse reaction to receiving the wrong medication or removal of the wrong limb. The focus of new efforts to reduce medical errors is primarily on providers' communication with each other (Allen, Caton, Cluver, Mainous, & Clyburn, 2014; Drazen, Shields, & Loscalzo, 2014; Gillespie, Gwinner, Chaboyer, & Fairweather, 2013; Hargestam et al., 2013; Kilpatrick, 2012; Manojlovich et al., 2014; Singh et al., 2008). Research into provider-provider communication remains sparse and new studies are enthusiastically welcomed (A. Blue, Ph.D., personal communication, July 26, 2013).

The study design draws primarily from a small number of observational studies of provider-provider communication and from studies of commercial aviation cockpit conversations, Study design is also informed by findings from general and health care communication studies including the large body of provider-patient studies.

Purpose and research goals. The purpose of the study was to explore how verbal listening behaviors can be used as tools to characterize the exchanges of information in provider-provider communication. A secondary purpose was to inform communication curriculum revision and future study design to gain more understanding for the causes of communication failure. Study findings meet the primary and secondary purposes of the study.

Study findings make two contributions: to justify revisions to the original study goals and to support posing hypotheses for future testing. The following are the study's original goals and the revisions made to them.

1. To identify specific steps in provider-provider exchanges of information where communication succeeds and fails.

   The data do not support this goal because specific points of successful and failed communication could not be identified; but data do support the following revised first goal:

   To describe the characteristics of provider-provider exchanges of information during simulated care delivery.

2. To describe the characteristics of communication that lead to successful and failed exchanges of information.

   The data do not support this goal because specific points of successful and failed communication could not be identified; the goal was deleted.

3. To recommend hypotheses for testing in subsequent studies to inform providers' communication curriculum and professional development.

   The data supports this goal and it is retained as is. Hypotheses for future studies are detailed in Chapter Four.

Review of methodology. An exploratory inquiry strategy was selected for the study. Studies in patient safety note the difficulties in finding theories, data collection strategies and approaches, and care delivery settings for research that are generalizable (Hagopian et al., 2010). Reiter's (2013) argument for the confident use of exploratory research in the social sciences provided decisive support for its choice. He affirms the validity of acknowledging from the outset of a study that its findings may be tentative. "Instead of advancing arguments that make exclusive truths claims, exploratory research provides more or less plausible and hence fruitful

ways to examine and explain reality that can be shared, if successful and plausible, after a critical evaluation" (Reiter, 2013, p. 4).

Study design had to address four challenges recognized by health communication scholars:

1. Access to a suitable population
2. Lack of research tools
3. Dearth of provider-provider studies from which to obtain a study framework
4. The focus of strategies to reduce errors on provider teams as opposed to individuals

The study population challenge was met by conducting observations of videotaped simulations of medical and nursing students delivering care during Emergency Medicine (EM) encounters at the Center for Advancing Professional Excellence (CAPE) at the University of Colorado Denver's Anschutz Medical Campus (UC/AMC). Research tools were drawn from three sources: the commercial aviation industry, health care communication researchers, and listening scholars. The commercial aviation industry has over 25 years of research in and training of cockpit crews (Burke et al., 2004; Denham et al., 2012; Foushee & Manos, 1981; Helmeich, 2000; Rutherford, 2013). Gilardi, Guglielmetti, and Pravettoni (2013), Hargestam et al. (2013), Kilpatrick (2012), and Lingard et al. (2004, 2008) have conducted studies in care delivery settings that focus on successfully closing communication loops. Listening scholars have not advanced research in their field to provide theoretical underpinnings for research tools, but have delineated six verbal listening behaviors that were used for the data gathering during the observations of student teams delivering care to characterize their exchanges of information (communication loops).

Sources for the choice of closed loop communication (CLC) as the study framework include studies of provider-patient communication (Hickey et al., 2012; Kilpatrick, 2012; Levinson, Lesser, & Epstein, 2010), communication studies in analogous professions (Burke et al., 2004;

Singh, Peterson, & Thomas, 2006**),** and a limited number of listening behavior studies (Bavelas & Gerwing, 2011; Hargestam et al., 2013; Roter & Larson, 2001; Simonoff & Step, 2011).

The culture of care delivery has long focused on identifying the person(s) whose performance caused the error and on their remediation (Liang, 2002). The shift away from a culture of shame and blame is underway (Hagopian, et al., 2010), but more evidence is needed to confirm Parker-Raley's (2012) assertion that "Many medical errors are due to frequent miscommunication among teams instead of the individual medical performance of health care providers" (p. 103). This study design responds to this need by focusing on exchanges between medical and nursing student team members.

Major findings. The data gathered from observing EM encounters allowed the researcher to characterize the medical and nursing students' exchanges of information during care delivery and to show the extent to which exchanges ended in closed loops. Study boundaries and limitations on the design of the EM encounters prevented a determination of the outcomes from open and closed loops.

The data informed the proposal of hypotheses for testing. The limited number of provider-provider studies call for knowledge of factors that, once identified through testing of hypotheses, can inform design of additional studies, minimize confounders, improve sample selection, improve observation techniques, and strengthen the validity of study design and findings.

The four hypotheses proposed by the study are as follows:

1. There is a negative correlation between students' ability to demonstrate specific communication competencies and specific clinical decision-making competencies in the same simulation of care delivery.

2. There is no relationship between IP teams whose members are closely matched with respect to their level of acquired communication skill and their ability to demonstrate communication competencies.
3. There is no relationship between nonverbal behaviors and the ability to more thoroughly identify the contributing factors for successful and unsuccessful communication.
4. There is no relationship between increasing delivery encounter acuity and the number of information exchanges that end in closed loops.

Relationship to the literature. The call to action from the most recent studies, to reduce errors from communication failure during care delivery, is for subsequent studies to identify tools that confidently characterize the components of an exchange of information, to access provider-provider care delivery situations, and to conduct observational studies of team delivery of care. This study responded to those calls.

The study adopted recommendations from several researchers to use verbal listening behaviors to characterize communication (Abraham et al., 2014; Bales, 1950; Bavelas & Gerwing, 2011; Bowers & Jentsch, 1998; Brindley & Reynolds, 2011; Hargestam et al., 2013; Kilpatrick, 2012; Siassakos et al., 2009; Simonoff & Step, 2011; Singh, 2008). Brindley and Reynolds (2011), Hargestam et al. (2013, Lingard et al. (2004), Lingard et al. (2005), and Lingard et al. (2010) use CLC to observe provider-provider communication in high acuity encounters. This study's use of CLC considered the design and findings of the preceding as well as cautions from Ricci et al. (2102) against over-stating the utility of CLC as a study framework. Ricci et al. (2012) acknowledge the similarities in participants, expectations for outcomes, and risks from communication failures, and point out significant differences between airline cockpits

and care delivery settings that underscore the need for studies to build a body of knowledge for provider-provider communication that stands on its own.

The study proceeds from recommendations by communication and listening researchers in and outside health care to design and conduct observational studies of multi-disciplinary provider-provider care delivery encounters (Bavelas & Gerwing, 2011; Bodie, 2013; Graham Bodie, Ph.D., Personal Communication, February 17, 2014; Jennifer Gerwing, Ph.D., Personal Communication, February 18, 2014; Hargestam, 2013; Hickey et al., 2012; L. Janusik, Ph.D., personal communication, November 8, 2013; Kilpatrick, 2012; Ong & Coiera, 2015; Riesenberg et al., 2010; Siassakos et al., 2009).

This study aligns with the increasing focus on providers' communication with each other to reduce medical errors (Gillespie et al., 2013; Kirschbaum et al.; 2015; Manojlovich et al., 2014; Manser et al., 2012; Matziou et al., 2014; Parker-Raley et al., 2012; Singh et al., 2008). The researcher accessed videotaped simulations of medical and nursing students delivering care during EM encounters at the UC/AMC's simulation center, the CAPE. Observations of live encounters that include a variety of providers are possible at the CAPE, but accurate observations become problematic as the number and type of provider disciplines increases, as acuity fluctuates, and as a number of other factors come to bear (K. Kilpatrick, Ph.D., personal communication, November 7, 2013).

This study used medical and nursing student teams in response to Parker-Raley's (2012) assertion that "Many medical errors are due to frequent miscommunication among teams instead of the individual medical performance of health care providers" (p. 103). The study supports the shift away from a culture of shame and blame of individual providers (Liang, 2002) to studies of teams (Hagopian et al., 2010). "When things go wrong, it is often a potentially preventable

incident, caused by the interaction of several human factors rather than the result of a single mistake by an individual" (Hagopian et al., 2010).

New studies in provider-provider communication can only make claims about findings with care: new studies proceed with limited grounding in validated theory; the term of their usefulness will be challenged by tumultuous and rapidly evolving education and practice environments. By the same token well-conceived studies will be welcomed responses to the need for tools to evaluate communication, in practice and education (A. Blue, personal communication, July 26, 2013). This study provides one example of how a well-conceived study to characterize communication can contribute more understanding to study design.

Unexpected outcomes. The observers anticipated they would see evidence of the provider hierarchy that is well established in practice settings; a degree of role socialization among new students in all provider disciplines has long been understood (M. Earnest, M. D., Ph.D, personal communication, October 29, 2012). The observers suggested the difference in amount of training between the MD and RN students may relate to the disparity in amount and type of behaviors between the MD and RN students. RN students in this study deferred excessively to the MD students in the expected clinical decision-making situations and in situations that were routine conversations. Observers agree that no more than five of the 30 encounters could be considered balanced in terms of number and type of MD and RN behaviors. This condition is the catalyst for Hypothesis #2.

Tables 18 and 19 provide data to support the disparity in amount and type of behaviors between the MD and RN students. The five highest ranked encounters (Table 18) and five lowest-ranked encounters (Table 19) show the MD percentage of individual behaviors, MD/RN

total behaviors, and nonverbal behaviors. Observers expected the number of RN nonverbal behaviors to exceed or be close to the number of MD nonverbal but this pattern is not consistent.

Table 18.

MD Student Percentage of Behaviors in the Five Highest Ranked Encounters

[1] Does not include nonverbal behaviors

Encounters Five Highest Rated	Agree %	Confirm %	Inquire %	State %	Request %	MD/RN/Total Behaviors[1] MD %	NV %
Mar 13/ 10.13 NAT	92	71	81	96	100	159/17/ 176 90	71
Apr 10 10.17/ NAT	100	79	100	91	100	172/13/ 185 93	15
Jan 30 09.42/ ASA	100	63	78	91	92	117/22/ 139 84	50
Mar 13 09.43/ NAT	92	42	64	71	92	131/57/ 188 70	40
Apr 10 11.18/ ASA	83	88	71	80	65	102/27 129 79	70

Table 20 presents the highest-and lowest-rated encounters in a pairs' analysis to show differences in the number and type of exchanges.

Table 19.

MD Student Percentage of Behaviors in the Five Lowest Ranked Encounter

Encounters Five Lowest Rated	Agree %	Confirm %	Inquire %	State %	Request %	MD/RN/Total Behaviors[1] MD %	NV %
Jan 30/ 10.41 SS	100	81	86	91	87	65/9/74 88	75
Feb 13/ 10.10 SS	100	47	73	84	78	70/20/90 79	10
Mar 13/ 11.14 ASA	100	0	72	88	87	87/28/115 76	8
Feb 13/ 11.14 ASA	100	31	71	96	81	58/19/77 75	29
Jan 16/ 10.46 SS	100	55	84	95	100	89/11/100 89	46

Table 20.

Exchange Difference Highest/Lowest Ranked Five Encounters Pairs Analysis

Encounters		Call Out		Call Out + Call Back		Closed Loop by Non verbal		Closed Loop by Verbal (inc NV)		Closed Loop by Verbal		Total Close Loops		Total Exchanges	
1-5	30-26														
Mar 13/ 10.13 NAT	Jan 16/ 10.46 SS	16	4	7	2	4	**10**	11	1	24	13	35	14	62	30
Apr 10 10.17/ NAT	Feb 13/ 11.14 ASA	3	4	4	0	5	1	8	5	27	11	35	16	47	21
Jan 30 09.42/ ASA	Mar 13/ 11.14 ASA	3	9	2	8	2	7	6	4	27	12	33	16	40	40
Mar 13 09.43/ NAT	Feb 13/ 10.10 SS	7	6	4	9	4	3	3	5	29	12	32	17	47	35
Apr 10 11.18/A SA	Jan 30/ 10.41 SS	0	1	1	3	5	5	3	2	28	17	31	19	37	28

Study data lacks extensive analysis to make firm statements about causes for the varied patterns though they do add support for studies that examine variables in provider-provider communication such as those identified in the Model for Examining Communication during Health Care Delivery (Figure. 9).

Conclusions

The study provides one response to the problem of a lack of tools to study provider-provider communication. Verbal listening behaviors successfully characterize the exchanges of

information within teams of MD and RN students during simulated care delivery encounters. The exchanges are further characterized using the components of closed loop communication.

The study provided the basis for proposing four hypotheses for testing in future studies, an outcome that arguably is as important, or more so, than study tools. Previous research has sought to describe provider-provider communication using a variety of approaches: face-negotiation theory and concepts from intercultural communication (Kirshbaum, 2012, Kirshbaum & Fortner, 2012; Kirshbaum et al., 2015), through analysis of nonverbal behavior (Roter, Frankel, Hall, & Sluy, 2006); social exchange theory (Roter & Larson, 2001), assessment tools (Assis-Hassid, Heart, Reychav, Pliskin, & Reis, 2013; Simonoff & Step, 2011), communication genre theory (Conn et al., 2009), and various single and combinations of tools such as the sequential mixed methods by Manojlovich et al. (2014). Health care communication researchers cite the Roter Interaction Analysis System (RIAS) instrument (Roter & Larson, 2001) and the Simonoff Communication Context & Affect Program (SCCAP) instrument (Simonoff & Step, 2011) as two of the most powerful and validated instruments available, but both instruments are focused on the provider-patient dyad.

The preceding researchers and numerous others can claim valid study outcomes and have increased the potential for understanding provider-provider communication sufficiently to diagnosis the cause for failed communication. Observers, researchers, educators, and regulators cited in this study continue to advocate for more definitive studies for the causes of communication failure. Numerous studies have been conducted to identify the type and etiology of medical errors; error rates have fallen since 2012 from research and numerous government and provider error-reduction initiatives but the number of errors remains at troubling levels (Singh et al., 2008; Singh, 2014; Sternberg, 2012). The health care communication literature is

substantial in volume but dominated by studies of patient-physicians encounters and by studies that inform government- and provider-driven initiatives on rationalizing care delivery processes and re-training personnel who contribute to errors (Arford, P. H., 2005; Interprofessional Education Collaborative, 2011b; Lingard et al., 2004).

The hypotheses proposed in this study are a logical outcome from study design and data that is promising in its ability to characterize communication and limited in its power to allow any conclusions about the causes of successful or failed communication. That dichotomy reveals the limitations of the study, suggests an as yet fully-explored complexity to care delivery communication (see Figure 9), and delineates more specific research topics than were available at the outset of the study. Research must continue to define and test many variables before conclusions can be made as the components of successful provider-provider communication.

The final conclusion segues into specific recommendations for future studies: observational studies are the design most likely to produce the substantive outcomes in provider-provider communication needed to inform curriculum and practice.

Recommendations for Additional Studies

This researcher subscribes to Bodie's (2013) succinct rationale and recommendation for observational behavior-based studies: "What we are most interested in is what listeners do when interacting with others and whether the enactment of specific behaviors impacts important outcomes" (p. 79). Observational studies include several daunting challenges: new studies must carefully weigh a number of components such as choice of participants, type and number of variables to be tested, which care delivery setting to choose, type and acuity of the condition being treated, and when to conduct observations of live or videotaped care delivery encounters (See A Model for Examining Communication During Health Care Delivery, Figure. 9).

Participants in the care encounters include provider disciplines, patient, and family member or other support. Studies must factor which participants are the focus of data-gathering and how to control for and consider the impact of secondary participants: patient, family member, etc. Variables include participants' gender, race, socio-economic status, state of mind, experience, bias, and power.

Setting is the location where communications occur and data are collected: simulation lab, provider's office, or facility. The latter can be free-standing or any hospital subacute or acute care unit.

The preceding components are intertwined and, to a degree, some are inversely related. The most available setting may or may not be conducive to observing the desired variable(s); the number and type of observable variables may diminish as the acuity of the setting and the number of participants increases. The challenges of assembling suitable participants have been noted in previous sections.

The decision about observing live versus videotaped encounters raises multiple questions about resources: observation time, number of observers needed/available, access to care delivery units or videotape, obtaining consent, equipment (live encounters), and suitable study populations. All recent observational studies of live encounters note the significant number of behaviors and the factors that can confound quality data gathering. Simulation labs that are equipped to record encounters with the sophistication of the CAPE are not numerous or readily accessed.

Additional studies should consider how government and private organizations such as the NCQA, that have produced quality guidelines in the past like HEDIS and TeamSTEPPS, may offer new programs that inform the design of provider-provider communication studies.

Standards for Quality Improvement Reporting Excellence (SQUIRE) is a product of a multi-institutional initiative that offers a framework for quality and patient safety research; the Joint Commission is calling for more work with structured handoffs (Riesenberg et al., 2010).

This study calls attention the importance of selecting a population whose characteristics optimize potential to generate substantive data as to frequency, amount, type, and quality of exchanges. The group of interest for this study was readily available for consenting and observing, both of which are key factors. The MD and RN teams were mis-matched in terms of years of training; the likelihood of realistic, representative exchanges was diminished as a result (see Hypothesis Two). This condition is likely to be a factor for any future studies and researchers will need to account for the same or similar matches. The most desirable populations are almost certainly going to be found in practice settings which come with previously-described challenges.

The literature on provider-provider communication repeatedly cites the need for more studies; the level of errors associated with communication failure underscores that need. The volume of studies must increase and researchers should consider study designs that yield the needed short[er] term findings and can be conducted longitudinally. Separate examinations of communication in educational and practice settings are worthy; studies initiated in the former and extended into the same participants' practice years offer researchers, educators, and providers the opportunity to distinguish between short- and long-term phenomena.

Much of the preceding recommends the use of other tools in combination with observations. Manojlovich et al. (2014) conducted an ambitious study using observations, shadowing, and focus groups of the same physicians and nurses on two medical-surgical units:

> Through observation we were able to see the "what": communication activities. Shadowing was most useful for understanding "how" physicians and nurses communicated. Focus groups

> helped answer "why" certain patterns emerged and allowed us to further explore communication events within a group setting. By using all three methods we were able to more thoroughly characterize communication events than by using a single method alone, providing a more holistic picture of how communication occurs…" (p. 1-2).

Such multiple, sequential approaches are an inquiry strategy that will achieve the granularity of understanding it appears will be required to diagnose the reasons for successful and failed communication.

Limitations

Study limitations are cautionary and potential guidelines for researchers. The researcher anticipates subsequent observational studies in provider-provider communication will need to address some or all of the following issues.

1. Study design and research tools: The number of provider-provider communication research studies is limited and validated design methods and data collection tools have not been developed. This study design cautiously leverages over 25 years of research in and training of aviation cockpit crews and a small number of studies in care delivery settings that focus on successfully closing communication loops.
2. Data statistical power: The exploratory approach and the study boundaries and delimitations of the EM encounters limited the statistical power and precluded conclusions that open loops assured unintended outcomes or closed loops assured the intended outcome.
3. Observation time: Observers reported that 3-4 observations a day is the maximum they could conduct with confidence and consistency in their coding.
4. Teams: The study did not code the behaviors of each MD and each RN student; the researcher decided the additional time and number of observers required was not practicable. MD-MD and RN-RN exchanges were coded.

Studies should evaluate the resources required and increased validity of data obtained from a design that characterizes the communication of each study participant.

MD/RN student teams varied in size and number of each student; the average of all teams was three MD and two RN students. The largest teams included four MD and three RN students and the smallest teams included two MD and two RN students; teams of three MD and one RN student and two MD and four RN students are included.

Studies should consider how the number and type of participants in teams can be matched.

5. Time in program disparities: The students' training program length and curriculum delivery order varied; 73% of the encounters (22 of 30) matched 3rd year MD students with ACC RN students, many of whom had completed one year or less of training. This condition contributed to the 70-30% distribution of MD/RN behaviors for all encounters; 14 of 30 encounters had MD/RN behavior distributions of 80%/20% or more.

   Studies that work with practicing providers must address the analogous situation of providers whose years in practice and practice settings will vary.

6. Variations in observers' interpretation of behaviors: The observers met after coding the first five encounters but thereafter compared findings via an online discussion forum. The researcher noted inconsistencies in coding that might have been avoided if observers had met as a group 1-2 more times during the observation period.

7. Choice of simulated cases: CAPE staff and ER faculty chose the type and schedule of the cases for EM sessions. The potential existed for encounter variables that differed among the three cases to effect the MD/RN exchanges (See A Model for Examining Communication During Health Care Delivery). The confounding effects of variables

within one case are problematic; the challenges among two or more cases in one study require precise study design

8. Videotape review: The researcher chose to access the videotaped encounters remotely as opposed to using the equipment at the CAPE. CAPE software displays all three camera angle on one screen where remote access limited the observers to one camera angle at a time.

Closing Thoughts

Researchers can make contributions to the knowledge of provider-provider communication by replicating many of the studies previously cited here, particularly the studies conducted in care delivery settings. The amount of literature on health care communication is considerable: 10 years ago Roter and Larson's (2006) meta-analysis of provider-patient and provider-provider studies included "Over 250 different elements of communication…in the 61 studies reviewed" (p. 34); this study considered over 200 relevant sources published since 2006.

The progress to knowledge that confidently informs curriculum and practice appears to be proceeding slowly despite the unanswered questions. It seems possible that health care communication research is being driven by one of two forces: studies based on discrete theories, hypotheses, and perspectives that perpetuate fragmentation rather than integration of findings--not unlike the accusations made of listening scholars too busy advancing individual definitions for listening rather than prioritizing theory-based research (Bodie, 2009; Bodie et al., 2008; Bodie, Worthington, et al., 2008; Witkin, 1990; Wolvin, 1989, 2013); or too few studies trying to meet Bodie's (2013) urging "What we are most interested in is what listeners do when interacting with others…" p. 79) to make significant progress.

Researchers may do well to seek the safety of acknowledging and extending existing studies; but medical errors from communictaion failures quickly takes on a distinct human quality. Sentinel event data says reductions in error occurance rates since 2012 are not significant so the following quote remains grimly relevant:

> ’I don't think that crashing a 727 jet every day and killing everybody aboard is a good standard of care in U.S. hospitals,’ says author, speaker, and corporate adviser Paul Levy, the former CEO of Beth Israel Deaconess Medical Center in Boston, whose ‘Not Running a Hospital’ blog is about improving healthcare. ‘If that happened in aviation, they would shut the airlines down’ (Sternberg, 2012, para 4).

The urgency such a scenario conveys requires that researchers, educators, providers, and regulators set aside their *silos* and find common ground to assemble the resources needed to accelerate the rate at which definitive studies of communication success and failure are launched. There is a research agenda that emerges from this study that will be actively pursued to that end.

REFERENCES

Abraham, J., Kannampallil, T. G., Almoosa, K. F., Patel, B., & Patel, V. L. (2011). Falling through the cracks: Information breakdowns in critical care handoff communication. *AMIA Annual Symposium Proceedings Archive.* 28-37. Retrieved September 03, 2015 from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3243259/

Abraham, J., Kannampallil, T. G., Almoosa, K. F., Patel, B., & Patel, V. L. (2014). Comparative evaluation of the content and structure of communication using two handoff tools: Implications for patient safety. *Journal of Critical Care, 29.* 311.e1–311.e7. doi: 10.1016/j.jcrc.2013.11.014

Agarwal, R., Sands, D. Z., & Schneider, J. D. (2010). Quantifying the economic impact of communication inefficiencies in U.S. hospitals. *Journal of Healthcare Management, 55*(4), 265281.

Agency for Healthcare Research and Quality. (2012). TeamSTEPPS: National implementation. Retrieved November 13, 2012, from http://teamstepps.ahrq.gov/

Allen, S., Caton, C., Cluver, J., Mainous, A. G. III, & Clyburn, B. (2014). Targeting improvements in patient safety at a large academic center: An institutional handoff curriculum for graduate medical education. *Academic Medicine, 89*(10), 1366-1369. doi: 10.1097/ACM.0000000000000462

Alvarez, G., & Coiera, E. (2006). Interdisciplinary communication: An uncharted source of medical error? *Journal of Critical Care, 21*, 236-242. doi: 10.1016/j.jcrc.2006.02.004

Arford, P. H. (2005). Nurse-physician communication: An organizational accountability. *Nursing Economics, 23*(2), 72-77.

Assis-Hassid, S., Heart, T., Reychav, I., Pliskin, J. S., & Reis, S. (2013). Existing instruments for assessing physician communication skills: Are they valid in a computerized setting? *Patient Education and Counseling*, 93 (3), 363-366. doi: 10.1016/j.pec.2013.03.017

Baker, L., Egan-Lee, E., Martimianakis, M. A., & Reeves, S. (2011). Relationships of power: Implications for interprofessional education. *Journal of Interprofessional Care, 25*(2), 98-104. doi: 10.3109/13561820.2010.505350

Bales, R. F. (1950). A set of categories for the analysis of small group interaction. *American Sociological Review, 15*(2), 257-263. doi: 10.2307/2086790

Bales, R. F. (1970). *Personality and interpersonal behavior*. New York, NY: Holt, Rinehart, and Winston

Barker, L. L. (1971). *Listening Behavior*. Englewood Cliffs, NJ: Prentice Hall.

Bavelas, J. B., & Gerwing, J. (2011). The listener as addressee in face-to-face dialogue. *International Journal of Listening, 25*(3), 178-198. doi: 10.1080/10904018.2010.508675

Beach, M. C., & Inui, T. (2006). Relationship-centered care. *Journal of General Internal Medicine, 21*(Suppl 1), S3-8. doi: 10.1111/j.1525-1497.2006.00302.x

Bentley, S. (1997). Benchmarking listening behaviors: Is effective listening what the speaker says it is? *International Journal of Listening, 11*(1), 51-68.

Bentley, S. (2000). Listening in the 21st century. *International Journal of Listening, 14*, 129-142.

Berelson, B. (1959). The state of communication research. *Public Opinion Quarterly, 23*(1), 1-6. doi: 10.1086/266840

Berlo, D. (1960). *The process of communication: An introduction to theory and practice*. New York, NY: Holt, Rinehart and Winston.

Berwick, D. M. (2011). Making good on ACOs' promise--The final rule for the Medicare Shared Savings Program. *New England Journal of Medicine, 365*(19), 1753-1756.

Berwick, D. M., & Finkelstein, J. A. (2010). Preparing medical students for the continual improvement of health and health care: Abraham Flexner and the new "public interest". *Academic Medicine, 85*(Suppl 9), S56-65. doi: 10.1097/ACM.0b013e3181ead779

Bitton, A., Martin, C., & Landon, B. E. (2010). A nationwide survey of patient centered medical home demonstration projects. *Journal of General Internal Medicine, 25*(6), 584-592. doi: 10.1007/s11606-010-1262-8

Blue, A. V., Zoller, J., Stratton, T. D., Elam, C. L., & Gilbert, J. (2010). Interprofessional education in US medical schools. *Journal of Interprofessional Care, 24*(2), 204-206. doi: 10.3109/13561820903442887

Blum, R. H., Raemer, D. B., Carroll, J. S., Dufresne, R. L., & Cooper, J. B. (2005). A method for measuring the effectiveness of simulation-based team training for improving communication skills. *Anesthesia & Analgesia, 100*(5), 1375-1380. doi: 10.1213/01.ANE.0000148058.64834.80

Bodie, G. D. (2009). Evaluating listening theory: Development and illustration of five criteria. *International Journal of Listening, 23*(2), 81-103. doi: 10.1080/10904010903014434

Bodie, G. D. (2011a). The active-empathic listening scale (AELS): Conceptualization and evidence of validity within the interpersonal domain. *Communication Quarterly, 59*(3), 277-295. doi: 10.1080/01463373.2011.583495

Bodie, G. D. (2011b). Theory and the advancement of listening research: A reply to Purdy. *International Journal of Listening, 25*(3), 139-144. doi: 10.1080/10904018.2011.537149

Bodie, G. D. (2013). Issues in the measurement of listening. *Communication Research Reports, 30*(1), 76-84. doi: 10.1080/08824096.2012.733981

Bodie, G. D., Janusik, L. A., & Valikoski, T. R. (2008). *Priorities of listening research: Four interrelated initiatives. A white paper sponsored by the Research Committee of the International Listening Association*. Paper presented at the International Listening Association Convention, Frankfurt, DE.

Bodie, G. D., St. Cyr, K., Pence, M., Rold, M., & Honeycutt, J. (2012). Listening competence in initial interactions I: Distinguishing between what listening is and what listeners do. *International Journal of Listening, 26*(1), 1-28. doi: 10.1080/10904018.2012.639645

Bodie, G. D., Worthington, D., Imhof, M., & Cooper, L. O. (2008). What would a unified field of listening look like? *International Journal of Listening, 22*(1), 103-122. doi: 10,1080/10904010802174867

Bodie, G. D., & Worthington, D. L. (2010). Revisiting the Listening Styles Profile (LSP-16): A confirmatory factor analytic approach to scale validation and reliability estimation. *International Journal of Listening, 24*(2), 69-88. doi: 10.1080/10904011003744516

Bostrom, R. N. (1990). *Listening behavior: Measurement and application*. New York, NY: Guilford Press.

Bostrom, R. N. (2011). Rethinking conceptual approaches to the study of "listening". *International Journal of Listening, 25*(1-2), 10-26. doi: 10.1080/10904018.2011.536467

Boulos, M. N., Wheeler, S., Tavares, C., & Jones, R. (2011). How smartphones are changing the face of mobile and participatory healthcare: An overview, with example from eCAALYX. *Biomedical Engineering Online, 10*(24), 14. doi: 10.1186/1475-925X-10-24

Bowman, J. P., & Targowski, A. S. (1987). Modeling the communication process: The map is not the territory. *Journal of Business Communication, 24*(4), 21-36.

Bowers, C. A., Jentsch, F., Salas, E., & Braun, C. C. (1998). Analyzing communication sequences for team training needs assessment. *Human Factors, 40*(4), 672-679.

Brasel, K. J., Bragg, D., Simpson, D. E., & Weigelt, J. A. (2004). Meeting the Accreditation Council for Graduate Medical Education competencies using established residency training program assessment tools. *American Journal of Surgery, 188*(1), 9-12. doi: 10.1016/j.amjsurg.2003.11.036

Brickhouse, T., & Smith, N. (2005). Plato's Writings. In J. Fieser & B. Dowden (Eds.), *Internet Encyclopedia of Philosophy*. Martin, TN: University of Tennessee at Martin. Retrieved November 12, 2012 from http://www.iep.utm.edu/plato/

Brindley, P. G., & Reynolds, S. F. (2011). Improving verbal communication in critical care medicine. *Journal of Critical Care, 26*, 155-159. doi: 10.1016/j.jcrc.2011.03.004

Brownell, J. (1986). *Building active listening skills*. Englewood Cliffs, NJ: Prentice-Hall.

Brownell, J. (1990). Perceptions of effective listeners: A management study. *Journal of Business Communication, 27*(4), 401-415.

Brownell, J. (2010a). *Listening: attitudes, principles, and skills*. Boston, MA: Allyn Bacon.

Brownell, J. (2010b). The skills of listening-centered communicatio. In A. Wolvin (Ed.), *Listening and human communication in the 21st century* (pp. 141-157). Oxford, UK: Wiley-Blackwell.

Brue, C. (1988). *Identifying effective listening behaviors used by supervisors involved in dyadic conversations with subordinates.* (PhD), University of Texas, Austin, TX.

Buring, S. M., Bhushan, A., Broeseker, A., Conway, S., Duncan-Hewitt, W., Hansen, L., & Westberg, S. (2009). Interprofessional education: Definitions, student competencies, and guidelines for implementation. *American Journal of Pharmaceutical Education, 73*(4), 1-8.

Burke, C. S., Salas, E., Wilson-Donnelly, K., & Priest, H. (2004). How to turn a team of experts into an expert medical team: Guidance from the aviation and military communities. *Quality and Safety in Health Care, 13*(suppl 1), i96-i104. doi: 10.1136/qshc.2004.009829

Burke, M., Boal, J., & Mitchell, R. (2005). Communicating for better care: Improving nurse-physician communication. *Education for Primary Care, 16*(2), 40-48.

Cameron, K. A., de Haes, H., & Visser, A. (2009). Theories in health communication research. *Patient Education and Counseling, 74*(3), 279-281. doi: 10.1016/j.pec.2008.12.021

Campbell, D. P., & Level, D. (1985). A black box model of communications. *The Journal of Business Communication, 22*(3), 37-47. doi: 10.1177/002194368502200304

Canadian Interprofessional Health Collaborative. (2007*). Interprofessional education & core competencies*. Vancouver, BC: University of British Columbia

CAPHIS. (2013, March 7). Top 100 list: Health websites you can trust. Retrieved August 2, 2013, from http://caphis.mlanet.org/consumer/index.html

Carraccio, C., Wolfsthal, S., Englander, R., Ferentz, K., & Martin, C. (2002). Shifting paradigm: From Flexner to competencies. *Academic Medicine, 77*(5), 361-367.

Castells, M. (2009). *The rise of the network society: The Information Age - Economy, society, and culture* (Vol. 1). Chichester, UK: John Wiley & Sons, Ltd.

Castells, M. (2010). *The rise of the network society: The Information Age - Economy, society, and culture* (Vol. 2). Chichester, UK: John Wiley & Sons, Ltd.

Centers for Medicare & Medicaid Services. (2013). EHR Incentive Programs. Retrieved September 15, 2013, from https://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/index.html?redirect=/EHRIncentivePrograms/30_Meaningful_Use.asp

Chandler, D. (2008, August 7). The transmission model of communication. Retrieved September 20, 2012, from http://www.aber.ac.uk/media/Documents/short/trans.html

Chen, F. M., Williams, S. D., & Gardner, D. B. (2013). The case for a National Center for Interprofessional Practice and Education. *Journal of Interprofessional Care, 27*(5), 356-357. doi: 10.3109/13561820.2013.786691

Chesser, A. K. (2013). Physician communication with patients: Research findings and challenges *Health Communication*, 1-4. doi: 10.1080/10410236.2012.754329

Christianson, J. B., Warrick, L. H., Finch, M., & Jonas, W. (2012). *Physician communication with patients: Research findings and challenges*. Ann Arbor, MI: University of Michigan Press.

Clayton, C. (2005). Cicero. In J. Fieser & B. Dowden (Eds.), *Internet encyclopedia of philosophy*. Martin, TN: University of Tennessee-Martin. Retrieved November 12, 2012 from http://www.iep.utm.edu/cicero/.

Cocksedge, S. C., & May, C. (2005). The listening loop: A model of choice about cues within primary care consultations. *Medical Education, 39*(10), 999-1005. doi: 10.1111/j.1365-2929.2005.02264.x

Coiera, E., & Tombs, V. (1998). Information in practice. *British Medical Journal, 316*, 673-676.

Conn, L. G., Lingard, L., Reeves, S., Miller, K. L., Russell, A., & Zwarenstein, M. (2009). Communication channels in general internal medicine: A description of baseline patterns for improved interprofessional collaboration. *Qualitative Health Research, 19*(7), 943-953. doi: 10.1177/1049732309338282

Conn, L. G., Reeves, S., Dainty, K., Kenaszchuk, C., & Zwarenstein, M. (2012). Interprofessional communication with hospitalist and consultant physicians in general internal medicine-A qualitative study. *BMC Health Services Research, 12*(437), 1-10.

Coordinating Center. (2012). New Coordinating Center will promote interprofessional education and collaborative practice in health care. Retrieved August 6, 2013, from http://www.hrsa.gov/about/news/pressreleases/120914interprofessional.html

Corser, W. D. (2000). The contemporary nurse-physician relationship: Insights from scholars outside the two professions. *Nursing Outlook, 48*(6), 263-268. doi: 10.1067/mno.2000.109154

Crawford, C. L., Ornery, A., & Seago, J. A. (2012). The challenges of nurse-physician communication. *Journal of Nursing Administration, 42*(12), 548-550. doi: 10.1097/NNA.0b013e318274b4c0

Curtis, K., Tzannes, A., & Rudge, T. (2011). How to talk to doctors: A guide for effective communication. *International Nursing Review, 58*, 13-20.

Davis, D. L. (2010). Simple but not always easy: Improving doctor–patient communication. *Journal of Communication in Healthcare, 3*(3), 240-245. doi: 10.1179/175380710x12870623776397

Davis, J., Foley, A., Crigger, N., & Brannigan, M. C. (2008). Healthcare and listening: A relationship for caring. *International Journal of Listening, 22*(2), 168-175. doi: 10.1080/10904010802174891

Davis, J., Thompson, C. R., Foley, A., Bond, C. D., & DeWitt, J. (2008). An examination of listening concepts in the healthcare context: Differences among nurses, physicians, and administrators. *International Journal of Listening, 22*(2), 152-167. doi: 10.1080/10904010802181524

Deledda, G., Moretti, F., Rimondini, M., & Zimmermann, C. (2013). How patients want their doctor to communicate. A literature review on primary care patients' perspective. *Patient Education and Counseling, 90*(3), 297-306. doi: 10.1016/j.pec.2012.05.005

Denham, C. R., Sullenberger, C. B., Quaid, D. W., & Nance, J. J. (2012). An NTSB for health care - Learning from innovation: Debate and innovate or capitulate. *Journal of Patient Safety, 8*(1), 3-14. doi: 10.1097/PTS.0b013e3182446c51

Dentzer, S. (2011). Still crossing the quality chasm--Or suspended over it? *Health Affairs, 30*(4), 554-555.

Deutsch, K. W. (1952). On communication models in the social sciences. *The Public Opinion Quarterly, 16*(3), 356-380. doi: 10.2307/2745780

Devers, K., & Berenson, R. (2009). Can accountable care organizations improve the value of health care by solving the cost and quality quandaries? *Timely Analysis of Immediate Health Policy Issues*. Princeton, NJ: Robert Wood Johnson Foundation

Dow, A., Blue, A., Konrad, S. C., Earnest, M., & Reeves, S. (2013). The moving target: Outcomes of interprofessional education. *Journal of Interprofessional Care, Early Online*, 1-3. doi: 10.3109/13561820.2013.806449

Drazen, J. M., Shields,, H. M., & Loscalzo, J. (2014). A division of medical communications in an academic medical center's department of medicine. *Academic Medicine, 89*(12), 1623-1629. doi: 10.1097/ACM.0000000000000472

Duffy, F. D., Gordon, G. H., Whelan, G., Cole-Kelly, K., & Frankel, R. (2004). Assessing competence in communication and interpersonal skills: The Kalamazoo II Report. *Academic Medicine, 79*(6), 495-507.

Earnest, M., & Brandt, B. (2014). Aligning practice redesign and interprofessional education to advance triple aim outcomes. *Journal of Interprofessional Care, 28*(6), 497-500. doi: 10.3109/13561820.2014.933650

Edwards, R. (2011). Listening and message interpretation. *International Journal of Listening, 25*(1-2), 47-65. doi: 10.1080/10904018.2011.536471

Edwards, R., & McDonald, J. (1993). Schema theory and listening. In A. Wolvin & C. Coakley (Eds.), *Perspectives on listening* (pp. 60-76). Norwood, NJ: Ablex Publishing.

Epstein, R. M., Franks, P., Fiscella, K., Shields, C. G., Meldrum, S. C., Kravitz, R. L., & Duberstein, P. R. (2005). Measuring patient-centered communication in patient–physician consultations: Theoretical and practical issues. *Social Science & Medicine, 61*, 1516-1528.

Fassaert, T., van Dulmen, S., Schellevis, F., & Bensing, J. (2007). Active listening in medical consultations: Development of the Active Listening Observation Scale (ALOS-global). *Patient Education and Counseling, 68*(3), 258-264. doi: 10.1016/j.pec.2007.06.011

Ferrante, J. M., Balasubramanian, B. A., Hudson, S. V., & Crabtree, B. F. (2010). Principles of the patient-centered medical home and preventive services delivery. *Annals of Family Medicine, 8*(2), 108-116. doi: 10.1370/afm.1080

Fiske, J. (2011). *Introduction to Communication Studies* (Vol. 3). New York, NY: Routledge.

Flexner, A. (1910). *Flexner report: Medical education in the US and Canada* (pp. 1-364). Boston, MA: Carnegie Foundation

Flicek, C. L. (2012). Communication: A dynamic between nurses and physicians. *Medsurg Nursing, 21*(5), 385-387.

Foli, K. J. (1990). *Metaphors in nurse-physician communication.* (Ph.D. Communications), University of Illinois at Urbana-Champaign, Urbana, Illinois. (9114236)

Fook, J., D'Avray, L., Norrie, C., Psoinos, M., Lamb, B., & Ross, F. (2013). Taking the long view: Exploring the development of interprofessional education. *Journal of Interprofessional Care, 27*(4), 286-291. doi: 10.3109/13561820.2012.759911

Fox, S. (2013). Pew Internet: Health. *Pew Internet & American Life Project.* Retrieved July 31, 2013, from http://www.pewinternet.org/Commentary/2011/November/Pew-Internet-Health.aspx

Frieden, J. (2015, March 7). HHS outlines value-based payment goals. Retrieved September 23, 2015 from http://www.medpagetoday.com/PracticeManagement/Reimbursement/49727

Garman, A. N., Leach, D. C., & Spector, N. (2006). Worldviews in collision: Conflict and collaboration across professional lines. *Journal of Organizational Behavior, 27*(7), 829-849. doi: 10.2307/4093873

Gilardi, S., Guglielmetti, C., & Pravettoni, G. (2013). Interprofessional team dynamics and information flow management in emergency departments. *Journal of Advanced Nursing, 70*(6), 1299-1309. doi: 10.1111/jan.12284

Gilbert, J. (2005). Interprofessional education for collaborative, patient-centred care. *Nursing Leadership, 8*(2), 32-38.

Gillespie, B. M., Gwinner, K., Chaboyer, W., & Fairweather, N. (2013). Team communications in surgery: Creating a culture of safety. *Journal of Interprofessional Care, 27*(5), 387-393. doi:10.3109/13561820.2013.784243

Gillotti, C., Thompson, T., & McNeilis, K. (2002). Communicative competence in the delivery of bad news. *Social Science & Medicine, 54*(7), 1011-1023. doi: http://dx.doi.org/10.1016/S0277-9536(01)00073-9

Goldsmith, J. (2002). A paradigm-free period? The deceptive pause in strategy. *Healthcare Marketing Advisor, 3*(4), 1-4.

Goldsmith, J. (2007). Hospitals and physicians: Not a pretty picture. *Health Affairs, 26*(1), 72-75. doi: 10.1377/hlthaff.26.1.w72

Goldsmith, J. (2009, August 17). The accountable care organization: Not ready for prime time. Retrieved from http://healthaffairs.org/blog/2009/08/17/the-accountable-care-organization-not-ready-for-prime-time/

Goldsmith, J. (2010a). Analyzing shifts in economic risks to providers in proposed payment and delivery system reforms. *Health Affairs, 29*(7), 1299-1304. doi: 10.1377/hlthaff.2010.0423

Goldsmith, J. (2010b) Healthcare IT's unfulfilled promise: What we've got here is failure to communicate. *Futurescan,* 6, 32-35. Chicago. IL: American College of Healthcare Executives.

Goldsmith, J. (2013, May 21). Hospital twenty-first century time warp. *The Health Care Blog.* from http://thehealthcareblog.com/blog/2013/05/21/hospitals-twenty-first-century-time-warp/

Goss, B. (1982). Listening as information processing. *Communication Quarterly, 30*(4), 304-308.

Hagopian, B., Singer, M. E., Curry-Smith, A. C., Nottingham, K., & Hickner, J. (2012). Better medical office safety culture is not associated with better scores on quality measures. *Journal of Patient Safety, 8*(1), 15-21. doi: 10.1097/PTS.0b013e31823d047a

Hall, J. A., & Schmid Mast, M. (2009). Five ways of being "theoretical": Applications to provider-patient communication research. *Patient Education and Counseling, 74*(3), 282-286. doi: 10.1016/j.pec.2008.10.014

Hannawa, A. F., Beckman, H., Mazor, K. M., Paul, N., & Ramsey, J. V. (2013). Building bridges: Future directions for medical error disclosure research. *Patient Education and Counseling, 92*(3), 319-327. doi: 10.1016/j.pec.2013.05.017

Hargestam, M., Lindkvist, M., Brulin, C., Jacobsson, M., & Hultin, M. (2013). Communication in interdisciplinary teams: Exploring closed-loop communication during in situ trauma team. *BMJ Open, 3*(10), 1-8. doi: 10.1136/bmjopen-2013-003525

Mccann, E. (2014). Deaths by medical mistakes hit record high. *Healthcare IT News*. Retrieved October 29, 2015 from http://www.healthcareitnews.com/news/deaths-by-medical-mistakes-hit-records

Healthfinder.gov. (2013). Live well. Learn how. Retrieved August 4, 2013, from http://healthfinder.gov/

Hickey, P., Connor, J. A., Trainor, B., Brostoff, M., Blum, R., Jenkins, K., & Stuart-Shor, E. (2012). Implementation of an organization-wide standardized communication initiative. *Journal of Communication in Healthcare, 5*(1), 32-39. doi: 10.1179/1753807611y.0000000015

Holmes, F. (2007). If you listen the patient will tell you the diagnosis. *International Journal of Listening, 21*(2), 156-161.

Hulsman, R. L. (2009). Shifting goals in medical communication. Determinants of goal detection and response formation. *Patient Education Counseling, 74*(3), 302-308. doi: 10.1016/j.pec.2008.12.001

Hulsman, R. L., & Visser, A. (2013). Seven challenges in communication training: Learning from research. *Patient Education and Counseling, 90*(2), 145-146. doi: 10.1016/j.pec.2012.12.005

Imhoff, M. (1998). What makes a good listener? Listening behavior in instructional settings. *International Journal of Listening, 12*, 81-105.

Imhof, M., & Janusik, L. (2006). Development and validation of the Imhof-Janusik listening concepts inventory to measure listening conceptualization differences between cultures. *Journal of Intercultural Communication Research, 35*(2), 79-98. doi: 10.1080/17475750600909246

Institute of Medicine. (1972). *Educating for the health team*. Paper presented at the Conference on the Interrelationships of Educational Programs for Health Professionals Washington, DC. http://eric.ed.gov/?id=ED110819

Institute of Medicine. (1999). *To err is human: Building a safer health care system* (pp. 1-8). Washington, DC: National Academy of Sciences

Institute of Medicine. (2001). *Crossing the quality chasm: A new health system for the 21st century* (pp. 1-364). Washington, DC: National Academy of Sciences

Institute of Medicine. (2003). *Health professions education: A bridge to quality* (pp. 1-192). Washington, DC: National Academy of Sciences

Institute of Medicine. (2012, January 12). About The IOM. Retrieved August 4, 2013, from http://www.iom.edu/About-IOM.aspx

International Listening Association. (2000). History. Retrieved July 10, 2012, from http://www.listen.org/history

Interprofessional Education Collaborative (2011a). *Team-based competencies: Building a shared foundation for education and clinical practice.* Paper presented at the Team-Based Competencies Conference, Washington, DC.

Interprofessional Education Collaborative. (2011b). *Core competencies for interprofessional collaborative practice: Report of an expert panel, 2011*. Washington, DC. http://www.aacn.nche.edu/education-resources/ipecreport.pdf

Janusik, L. A. (2004). *Researching listening from the inside out: The relationship between conversational listening span and perceived communicative competence* (Ph.D.), University of Maryland, College Park, MD. Retrieved from http://drum.lib.umd.edu/bitstream/1903/1417/1/umi-umd-1429.pdf

Janusik, L. A. (2007). Building listening theory: The validation of the conversational listening span. *Communication Studies, 58*(2), 139-156. doi: 10.1080/10510970701341089

Janusik, L. A. (2008). Introduction to listening in contexts: A special edition of the *International Journal of Listening*. *International Journal of Listening, 22*(2), 99-102. doi: 10.1080/10904010802183058

The Joint Commission. (2012). Sentinel event data 2004-2012. Retrieved August 4, 2013, from http://www.jointcommission.org/Sentinel_Event_Policy_and_Procedures/

The Joint Commission. (2013a). Sentinel event. Retrieved August 20, 2013, from http://www.jointcommission.org/sentinel_event.aspx

The Joint Commission. (2013b). Sentinel event data 1995-2103. Retrieved August 20, 2013, from http://www.jointcommission.org/sentinel_event.aspx

The Joint Commission. (2014). Sentinel event data 1995-2103. Retrieved September 14, 2014 from http://www.jointcommission.org/assets/1/18/2004_to_2Q_2013_SE_Stats_-_Summary.pdf

The Joint Commission. (2015). Summary data of sentinel events reviewed by The Joint Commission. Retrieved October 5, 2015 from http://www.jointcommission.org/assets/1/18/2004-2015_2Q_SE_Stats-Summary.pdf

Josiah Macy Jr. Foundation. (2010, June 16-18). *Advancing inter-professional education in academic health centers.* Paper presented at the Educating Nurses and Physicians Conference, Palo Alto, CA.

Josiah Macy Jr. Foundation. (2011). *The Content and Format of GME '11.* Paper presented at the Ensuring an Effective Physician Workforce for the United States Conference, New York, NY.

Kagan, P. N. (2008a). Feeling listened to: A lived experience of humanbecoming. *Nursing Science Quarterly, 21*(1), 59-67. doi: 10.1177/0894318407310779

Kagan, P. N. (2008b). Listening: Selected perspectives in theory and research. *Nursing Science Quarterly, 21*(2), 105-110. doi: 10.1177/0894318408315027

Kemmerling, G. (1997). Socrates. *The Philosophy Pages*. Chicago, IL: Encyclopaedia Britannica. Retrieved November 12, 2012 from http://www.philosophypages.com/index.htm.

Kilpatrick, K. (2012). Understanding acute care nurse practitioner communication and decision-making in healthcare teams. *Journal of Clinical Nursing, 22*(1-2), 168-179. doi: 10.1111/j.1365-2702.2012.04119.x

Kirschbaum, K. (2012). Physician communication in the operating room: Expanding application of face-negotiation theory to the health communication context. *Health Communication, 27*(3), 292-301. doi: 10.1080/10410236.2011.585449

Kirschbaum, K., & Fortner, S. A. (2012). Medical culture and communication. *Journal of Communication in Healthcare, 5*(3), 182-189. doi: 10.1179/1753807612Y.0000000010

Kirschbaum, K., Rask, J. P., Fortner, S. A., Kulesher, R., Nelson, M. T., Yen, M., & Brennan, M. (2015). Physician communication in the operating room. *Health Communication,* 30(4), 317-327. doi: 10.1080/10410236.2013.856741

Kleinke, J. (1998). *The bleeding edge*. Gaithersburg, MD: Aspen Publishers, Inc.

Korn, C. J., Morreale, S. P., & Boileau, D. M. (2000). Defining the field: Revisiting the ACA 1995 definition of communication studies. *Journal of the Association for Communication Administration, 29*, 40-52.

Krautscheid, L. C. (2008). Improving communication among healthcare providers: Preparing student nurses for practice. *International Journal of Nursing Education Scholarship, 5*(1), 1-16.

Lasswell, H. (1948). *The structure and function of communication in society*. New York, NY: Harper and Row.

Lasswell's Model. (2010). *Communiction Theory.* Retrieved February 8, 2015, from http://communicationtheory.org/lasswells-model/

Leape, L. (1994). Error in medicine. *Journal of the American Medical Association, 272*(23), 1851-1857.

Ledford, C. J. W., Canzona, M. R., & Cafferty, L. A. (2015). Clinical communication in context: Applying cognitive role theory in a study of physician non-verbals. *Florida Communication Journal, 43*(1), 29-40.

Levinson, W., Lesser, C. S., & Epstein, R. M. (2010). Developing physician communication skills for patient-centered care. *Health Affairs, 29*(7), 1310-1318. doi: 10.1377/hlthaff.2009.0450

Lewbel, A. (2001). A personal tribute to Claude Shannon. *Juggle,* May/June, 16-17.

Lewis, T. R. (1958). Listening. *Review of Educational Research, 28*(2), 89-95. doi: 10.2307/1168863

Liang, B. A. (2002). A system of medical error disclosure. *Quality and Safety in Health Care, 11*(1), 64-68.

Lingard, L., Espin, S., Rubin, B., Whyte, S., Colmenares, M., Baker, G. R., …Reznick, R. (2005). Getting teams to talk: Development and pilot implementation of a checklist to promote interprofessional communication in the OR. *BMJ Quality and Safety, 14*, 340-346. doi: 10.1136/qshc.2004.012377

Lingard, L., Espin, S., Whyte, S, Regehr, G., Baker, G. R., Reznick, R., . . . Grober, E. (2004). Communication failures in the operating room: An observational classification of recurrent types and effects. *Quality and Safety in Health Care, 13*(5), 330-334. doi: 10.1136/qhc.13.5.330

Lingard, L., Regehr, G., Orser, B., Reznick, R., Baker, G. R., Doran, D.,… Whyte, S. (2008). Valuation of a preoperative checklist and team briefing among surgeons, nurses, and anesthesiologists to reduce failures in communication. *Archives of Surgery, 143*(1), 12-17.

Lundsteen, S. (1979). *Listening: Its impact at all levels on reading and the other language arts*. Urbana, IL: ERIC Clearinghouse on Reading and Communication Skills.

Lyndon, A., Zlatnik, M. G., & Wachter, R. M. (2011). Effective physician-nurse communication: A patient safety essential for labor and delivery. *American Journal of Obstetrics and Gynecology, 205*(2), 91-96. doi: 10.1016/j.ajog.2011.04.021

Maidment, R. (1984). *Timing in a guide to effective listening*. Gretna, LA: Pelican Publishing.

Manchikanti, L., Caraway, D., Parr, A. T., Fellows, B., & Hirsch, J. A. (2011). Patient Protection and Affordable Care Act of 2010: Reforming the health care reform for the new decade. *Pain Physician, 14*, E35-E67.

Mann, S., & Pratt, S. D. (2008). Team approach to care in labor and delivery. *Clinical Obstetrics and Gynecology, 51*(4), 666-679. doi: 10.1097/GRF.0b013e3181899ac2

Manojlovich, M., Harrod, M., Holtz, B., Hofer, T., Kuhn, L. A., & Krein, S. L. (2014). The use of multiple qualitative methods to characterize communication events between physicians and nurses. *Health Communication.* doi: 10.1080/10410236.2013.835894

Manser, T., Foster, S., Flin, R., & Patey, R. (2012). Team communication during patient handover from the operating room: More than facts and figures. *Human Factors: The Journal of the Human Factors and Ergonomics Society, 55*(1), 138-156. doi: 10.1177/0018720812451594

Marjamaa, R. A., & Kirvela, O. A. (2007). Who is responsible for operating room management and how do we measure how well we do it? *Acta Anaesthesiologica Scandinavica, 51*(7), 809-814. doi: 10.1111/j.1399-6576.2007.01368.x

Martin, C. (2011). To what end communication? Developing a conceptual framework for communication in medical education. *Academic Medicine, 86*(12), 1566-1570. doi: 10.1097/ACM.0b013e31823591bb

Matziou, V., Vlahioti, E., Perdikaris, P., Matziou, T., Megapanou, E., & Petsios, K. (2014). Physician and nursing perceptions concerning interprofessional communication and collaboration. *Journal of Interprofessional Care, 92*(3), 526-533. doi:10.3109/13561820.2014.934338

McKlin, T. E. (2004). *Analyzing cognitive presence in online courses using an artificial neural network.* (PhD), Georgia State University, Atlanta, GA.

McPherson, I. (2001). Kierkegaard as an educational thinker. *Journal of Philosophy of Education, 35*(2), 157-174. doi: 10.1111/1467-9752.00218

McQuail, D., & Windahl, S. (1993). *Communication models for the study of mass communications* (Vol. 2). London, UK: Longman.

Meldrum, H. (2011). The listening practices of exemplary physicians. *International Journal of Listening, 25*(3), 145-160. doi: 10.1080/10904018.2011.604603

Mills, E. (1974). *Listening: Key to communication*. New York, NY: Petrocelli Books.

Morey, J. C., Simon, R., Jay, G. D., Wears, R. L., Salisbury, M., Dukes, K. A., & Berns, S. D. (2002). Error reduction and performance improvement in the emergency department through formal teamwork training: Evaluation results of the MedTeams Project. *Health Services Research, 37*(6), 1553-1581. doi: 10.1111/1475-6773.01104

Mulanax, A., & Powers, W. G. (2001). Listening fidelity development and relationship to receiver apprehension and locus of control. *International Journal of Listening, 15*(1), 69-78. doi: 10.1080/10904018.2001.10499045

National Committee for Quality Assurance. (2013, 2013). About NCQA. *Website.* Retrieved August 18, 2013, from http://www.ncqa.org/AboutNCQA.aspx

Neville, M. (2006). Making sequentiality salient: And-prefacing in the talk of airline pilots. *Discourse Studies, 8*, 279-302. doi: 10.10170S0047404507070121

Neville, M. (2007). Action in time: Ensuring timeliness for collaborative work in the airline cockpit. *Language in Society, 36*(2), 233-257. doi: 10.10170S0047404507070121

Nichols, R. G. (1957). Listening is a 10-part skill. *Nation's Business, 45*(4), 1.

Nichols, R. G., & Stevens, L. A. (1958). If only someone would listen. *Journal of Communication, 8*, 8-15.

Niemi, J. I. (2005). Jürgen Habermas's theory of communicative rationality: The foundational distinction between communicative and strategic action. *Social Theory and Practice, 31*(4), 513-532.

Northouse, P. G. (2013). *Leadership: Theory and practice* (Vol. 5). Los Angeles, CA: Sage Publications.

Nunberg, G. (1996). *The future of the book*. Berkeley, CA: University of California Press.

Ok, H., Marks, R., & Allegrante, J. P. (2008). Perceptions of health care provider communication activity among American cancer survivors and adults without cancer histories: An analysis of the 2003 Health Information Trends Survey (HINTS) data. *Journal of Health Communication 13*(7), 637-653. doi: 10.1080/10810730802412172

O'Leary, K. J., Wayne, D. B., Landler, M. P., Kulkarni, N., Haviley, C., Hahn, K. J., . . . Williams, M. V. (2009). Impact of localizing physicians to hospital units on nurse-physician communication and agreement on the plan of care. *Journal of General Internal Medicine, 24*(11), 1223-1227. doi: 10.1007/s11606-009-1113-7

Ong, M., & Coiera, E. (2015). A systematic review of failures in handoff communication during intrahospital transfers. *The Joint Commission Journal on Quality and Patient Safety, 37* (6), 274-284.

Parker, S. H., Yule, S., Flin, R., McKinley, A. (2012). Surgeons' leadership in the operating room: An observational study. *American Journal of Surgery, 204*, 347-354. doi: 10.1016/j.amjsurg.2011.03.009

Parker-Raley, J., Mottet, T. P., Lawson, K. A., Duzinski, S. V., Cerroni, A., & Mercado, M. (2012). Investigating pediatric trauma team communication effectiveness phase one: The development of the assessment of pediatric resuscitation communication. *Journal of Communication in Healthcare, 5*(2), 102-115. doi: 10.1179/1753807612Y.0000000007

Parse, R. R. (1990). Parse's research methodology with an illustration of the lived experience of hope. *Nursing Science Quarterly*, *3*(1), 9-17. doi: 10.1177/089431849000300106

Patterson, M. (2014). Reflections on historical trends and prospects in contemporary nonverbal research. *Journal of Nonverbal Behavior, 38*(2), 171-180. doi: 10.1007/s10919-013-0171-z.

Perez, B. (2014, May 10). What is high-fidelity patient simulation? Retrieved from http://www.bryanhealth.com/whatishighfidelitypatientsimulation

Peters, J. (1999). *Speaking into the air: A history of the idea of communication*. Chicago, IL: University of Chicago Press.

Pooley, J. D. (2008). The new history of mass communication research. In D. Park & J. D. Pooley (Eds.), *In The history of media and communication research: Contested memories,* pp. 43-69. New York, NY: Peter Lang.

Pooley, J. D. & Park, D. W. (2012). The history of communication research. In P. Simonson, R. T. Craig, & J. P. Jackson (Eds), *The Handbook of Communication History,* pp. 1-21. New York, NY: Routledge.

Powell, A. E., & Davies, H. T. O. (2012). The struggle to improve patient care in the face of professional boundaries. *Social Science & Medicine, 75*(5), 807-814. doi: 10.1016/j.socscimed.2012.03.049

Powers, W. G., & Bodie, G. D. (2003). Listening fidelity: Seeking congruence between cognitions of the listener and the sender. *International Journal of Listening, 17*(1), 19-31. doi: 10.1080/10904018.2003.10499053

Press, M. J., Michelow, M. D., & MacPhail, L. H. (2012). Care coordination in accountable care organizations: Moving beyond structure and incentives. *American Journal of Managed Care, 18*(12), 778-780.

Protocare Sciences. (2001). *Addressing medication errors in hospitals* (pp. 1-60). Oakland, CA: California Healthcare Foundation

Purdy, M. (2000). Listening culture and structures: Ways of studying listening. *International Journal of Listening, 14,* 47-69. doi: 10.1080/10904018.2000.10499035

Purdy, M. (2006). Ralph Nichols A leader in and of his time. *International Journal of Listening, 20*, 20-21.

Rabøl, L. I., McPhail, M. A., Østergaard, D., Andersen, H. B., & Mogensen, T. (2012). Promoters and barriers in hospital team communication. A focus group study. *Journal of Communication in Healthcare, 5*(2), 129-139. doi: 10.1179/1753807612Y.0000000009

Reeves, S., Zwarenstein, M., Goldman, J., Barr, H., Freeth, D., Hammick, M., & Koppel, I. (2009). Interprofessional education: Effects on professional practice and health care outcomes (Review). *Cochrane Database of Systematic Reviews, 1*, 1-23. doi: 10.1002/14651858.CD002213.pub2

Reiter, B. (2013). The epistemology and methodology of exploratory social science research: Crossing Popper with Marcuse. In B. Reiter (Ed.), *The dialectics of citizenship: Exploring privilege, exclusion, and racialization*, pp. 1-17. East Lansing, MI: Michigan State University Press.

Rhodes, S. C. (1993). Listening: A relational process. In A. D. Wolvin, & C. G. Coakley (Eds.), *Perspectives on listening*, pp. 217-238. Norwood, NJ: Ablex Publishing.

Ricci, M., Panos, A. L., Lincoln, J., Salerno, T. A., & Warshauer, L. (2012). Is aviation a good model to study human errors in health care? *The American Journal of Surgery, 23*(6). 798-801. doi: 10.1016/j.amjsurg.2011.06.010

Riesenberg, L. A., Leitzsch, J., & Cunningham, J. M. (2010). Nursing handoffs: A systematic review of the literature. *American Journal of Nursing, 110*(4). 24-34. doi: 10.1097/01.NAJ.0000370154.79857.09

Rogers, E. (1994). *Wilber Schramm and the founding of communication studies*. New York, NY: The Free Press.

Rogers, E. (1997). *A history of communication studies*. New York, NY: The Free Press.

Rosenberg, S. (1967). Cool Hand Luke. In G. Carroll (Producer). U.S.: Warner Bros-Seven Arts.

Roter, D. L., Frankel, R.M., Hall, J. A., & Sluy, D. (2006). The expression of emotion through nonverbal behavior in medical visits. *Journal of General Internal Medicine, 21*(Suppl 1), S28-S34. doi: 10.1111/j.1525-1497.2006.00306.x

Roter, D. L., & Larson, S. (2001). The Roter interaction analysis system (RIAS): Utility and flexibility for analysis of medical interactions. *Patient Education and Counseling, 46*(4), 243-251. doi: 10.1016/S0738-3991(02)00012-5

Rothberg, M. B., Steele, J. R., Wheeler, J., Arora, A., Priya, A., & Lindenauer, P. K. (2012). The relationship between time spent communicating and communication outcomes on a hospital medicine service. *Journal of General Internal Medicine, 27*(2), 185-189. doi: 10.1007/s11606-011-1857-8

Rudolph, J. W., Simon, R., Dufresne, R. L., & Raemer, D. B. (2006). There's no such thing as "nonjudgmental" debriefing: A theory and method for debriefing with good judgment. *Simulation in Healthcare, 1*(1), 49-55.

Rutherford, W. (2013). Aviation safety: A model for health care? *Quality and Safety in Health Care, 12*(3), 161-162. doi: 10.1136/qhc.12.3.162

Schadewaldt, V., McInnes, E., Hiller, J. E., & Gardner, A. (2013). Investigating characteristics of collaboration between nurse practitioners and medical practitioners in primary healthcare: A mixed methods multiple case study protocol. *Journal of Advanced Nursing, 70*(5). 1184-1193. doi: 10.1111/jan.12269

Sexton, J. B., & Helmreich, R. L. (2000). Analyzing cockpit communications: The links between language, performance, error, and workload. *Journal of Human Performance in Extreme Environments, 5*(1), 53-70. doi: 10.7771/2327-2937.1007

Sharpe, V. A. (2000). Behind closed doors: Accountability and responsibility in patient care. *The Journal of Medicine and Philosophy, 28*(1), 28-47. doi: 10.1076/0360-5310(200002)25:1;1-V;FT028

Shipley, S. D. (2010). Listening: A concept analysis. *Nursing Forum, 45*(2), 125-134. doi: 10.1111/j.1744-6198.2010.00174.x

Siassakos, D., Bristowe, K., Draycott, T. J., Angouri, J., Hambly, H., Winter, C.,…Fox, R. (2011). Clinical efficiency in a simulated emergency and relationship to team behaviours: A multisite cross-sectional study. *British Journal of Obstetrics and Gynaecology, 118,* 596-607. doi: 10.1111/j.1471-0528.2010.02843.x

Siassakos, D., Draycott, T. J., Montague, I., & Harris, M. (2009). Content analysis of team communication in an obstetric emergency scenario. *Journal of Obstetrics and Gynaecology, 29*(6), 499-503. doi: 10.1080/01443610903039153

Siminoff, L. A., & Step, M. M. (2011). A comprehensive observational coding scheme for analyzing instrumental, affective, and relational communication in health care contexts. *Journal of Health Communication, 16*(2), 178-197. doi: 10.1080/10810730.2010.535109

Singh, H. (2014). The battle against misdiagnosis. *Wall Street Journal*. Retrieved August 10, 2014 from http://www.wsj.com/articles/hardeep-singh-the-battle-against-misdiagnosis-1407453373

Singh, H., Naik, A. D., Rao, R., & Petersen, L. A. (2008). Reducing diagnostic errors through effective communication: Harnessing the power of information technology. *Journal of General Internal Medicine, 23*(4), 489-494. doi: 10.1007/s11606-007-0393-z

Singh, H., Peterson, L. A., & Thomas, E. J. (2006). Understanding diagnostic errors in medicine: A lesson from aviation. *Quality and Safety in Health Care, 15*(3), 159-164. doi: 10.1136/qshc.2005.016444

Skochelak, S. E. (2010). A decade of reports calling for change in medical education: What do they say? *Academic Medicine, 85*(9 September Supplement), S26-S33. doi: 10.1097/ACM.0b013e3181f1323f

Smith, S., & Dollase, R. (1999). Planning, implementing and evaluating a competency-based curriculum. *Medical Teacher, 21*(1), 15-22.

Smith, S. R., Dollase, R. H., & Boss, J. A. (2003). Assessing students' performance in a competency-based curriculum. *Academic Medicine, 18*(1), 97-107.

Sommers, B. D., & Rosenbaum, S. (2011). Issues in health reform: How changes in eligibility may move millions back and forth between Medicaid and insurance exchanges. *Health Affairs, 30*(2), 228-236. doi: 10.1377/hlthaff.2010.1000

Spath, P. L. (2011). *Error reduction in health care: A systems approach to improving patient safety*. San Francisco, CA: Jossey-Bass.

Spunt, R. P. (2013). Mirroring, mentalizing, and the social neuroscience of listening. *International Journal of Listening, 27*(2), 61-72. doi: 10.1080/10904018.2012.756331

Stange, K. C., Nutting, P. A., Miller, W. L., Jaen, C. R., Crabtree, B. F., Flocke, S. A., & Gill, J. M. (2010). Defining and measuring the patient-centered medical home. *Journal of General Internal Medicine, 25*(6), 601-612. doi: 10.1007/s11606-010-1291-3

Starr, P. (1983). *The social transformation of American medicine*. New York, NY: Basic Books.

Steil, L., Barker, L. L., & Watson, K. (1983). *Effective listening*. Reading, MA: Addison-Wesley Publishing.

Sternberg, S. (2012). Medical errors harm huge number of patients. *Huffington Post.* Retrieved July 23, 2013, from http://www.huffingtonpost.com/2012/08/29/medical-errors-hospitals-harm-patients_n_1839814.html

Suter, E., Arndt, J., Arthur, N., Parboosingh, J., Taylor, E., & Deutschlander, S. (2009). Role understanding and effective communication as core competencies for collaborative practice. *Journal of Interprofessional Care, 23*(1), 41-51. doi: 10.1080/13561820802338579

Swanson, D. B., Norman, G. R., & Linn, R. L. (1995). Performance-based assessment: Lessons from the health professions. *Educational Researcher, 24*(5), 5-35. doi: 10.2307/1177072

Taylor, S. E. (1964). *Listening: What research says to the teacher*. Washington, DC: National Education Association.

Thibault, G. E. (2012). Interprofessional education in the USA: Current activities and future directions. *Journal of Interprofessional Care, 26*(6), 440-441. doi: 10.3109/13561820.2012.704778

Ting-Toomey, S. (2005). The matrix of updated face negotiation theory. In W. B. Gudykunst (Ed.), *Theorizing about intercultural communication* (pp. 351–372). Thousand Oaks, CA: Sage.

Tullmann, D. F., Shilling, A. M., Goeke, L. H., Wright, E. B., & Littlewood, K. E. (2013). Recreating simulation scenarios for interprofessional education: An example of educational interprofessional practice. *Journal of Interprofessional Care, 27*(5), 426-428. doi: 10.3109/13561820.2013.790880

van den Brink-Muinen, A. (2002). The role of gender in healthcare communication. *Patient Education and Counseling, 48*(3), 199-200. doi: http://dx.doi.org/10.1016/S0738-3991(02)00170-2

Virginia Mason Medical Center. (2013). Patient safety as our foundation. Retrieved July 23, 2013, from https://www.virginiamason.org/safety

Wahl-Jorgensen, K. (2003). *Wilbur Schramm was not the founder of our discipline: New findings on the history of communication research*. Paper presented at the International Communication Association, San Diego, CA. http://www.icahdq.org/

Wanzer, M. B., Booth-Butterfield, M., & Gruber, K. (2004). Perceptions of health care providers' communication: Relationships between patient-centered communication and satisfaction. *Health Communication, 16*(3), 363-383.

Wass, V., Jones, R., & Van der Vleuten, C. (2001). Standardized or real patients to test clinical competence? The long case revisited. *Medical Education, 35*(4), 321-325. doi: 10.1046/j.1365-2923.2001.00928.x

Witkin, R. (1990). Listening theory and research: The state of the art. *International Journal of Listening, 4*, 7-26. doi: 10.1207/s1932586xijl0401_3

Witkin, R., & Trochin, W. W. K. (1997). Toward a synthesis of listening constructs: A concept mapping analysis. *International Journal of Listening, 11*, 69-87. doi: 10.1207/s1932586xijl1101_5

Wolff, F. I., Marsnick, N. C., Tacey, W. S., & Nichols, R. G. (1983). *Perceptive Listening*. New York, NY: Holt, Rinehart, and Winston.

Wolvin, A. D. (1989). Models of the listening process. In C. Roberts (Ed.), *Intrapersonal communication processes* (pp. 508-528). Scottsdale, AZ: Gorsuch Scarsbrick.

Wolvin, A. D. (2006). Modeling listening scholarship: Ralph G. Nichols. *International Journal of Listening, 20*, 22-26.

Wolvin, A. D. (2013). Understanding the listening process: Rethinking the "one size fits all" model. *International Journal of Listening, 27*(2), 104-106. doi: 10.1080/10904018.2013.783351

Wolvin, A. D., & Coakley, C. G. (1988). *Listening* (Vol. 1). Dubuque, IA: William C. Brown.

Wolvin, A. D., & Coakley, C. G. (1993a). A listening taxonomy. In A. D. Wolvin & C. G. Coakley (Eds.), *Perspectives on listening*, pp. 15-22. Norwood, NJ: Ablex Publishing.

Wolvin, A. D., & Coakley, C. G. (1993b). *Perspectives on listening*. Norwood, NJ: Ablex Publishing.

Wolvin, A. D., & Cohen, S. D. (2012). An inventory of listening competency dimensions. *International Journal of Listening, 26*(2), 64-66. doi: 10.1080/10904018.2012.677665

Yngve, V. H. (1970). On getting a word in edgewise, presented at the Chicago Linguistic Society, Chicago, IL: Chicago Linguistic Society.

INTRODUCTION TO APPENDICES

Appendix A: Definition of Terms

Appendix A includes terms and acronyms that are commonly used by health care providers and educators, not considered part of mainstream knowledge

Appendix B: U.S. Interprofessional Education Initiatives

Appendix B lists the best-known IPE programs in the U.S. The particular emphasis for each program, if known, is provided in the right-hand column. (adapted from Thibault, 2012, p. 440)

Appendix C: Methodology for Literature Review

Appendix C describes the databases from which the sources for the literature review were taken.

Appendix D: IRB Approvals

The study was approved as an exempt study by the Colorado State University (CSU) IRB on September 17, 2014. Additional exempt approvals were obtained from the Colorado Multiple Institutional Review Board (COMIRB) and IRBs at Regis University (RU) and Arapahoe community College (ACC). COMIRB approval was sought because MD students from the University of Colorado School of Medicine are study participants, the encounters are videotaped and stored at the Center for Advancing Professional Excellence (CAPE), and a CAPE staff person was an observer in the study. Approvals were sought form RU and ACC because RN students from those institutions are study participants.

Appendix E: Study Consent Forms

The consent form for the study was reviewed and approved by the IRBs at CSU, UC/AMC (COMIRB), RU, and ACC. The researcher obtained consent from student teams the

day their EM encounters were recorded. All teams in the EM encounter recording period of January-April, 2013 agreed to be consented. Consent forms were scanned by the researcher and are stored on an external drive and on the researcher's document cloud. Hard copy consent forms are stored in a secured location.

Appendix F: Study Observation Form

The observation form in this appendix is the version modified after data were gathered from the first five encounters by all three observers; the changes made to the original version of the form are described in Chapter Three.

Appendix G: Instructions for Observers

The Instructions for Observers form was modified in January, 2015, from its original form after the researcher conducted informal observations to test the observation form. The initial behavior coding metric proved to be cumbersome and lacked specificity. The revised coding metric requires the initial behavior in an exchange be noted with the number "1" next to the behaviors code in the form and subsequent behaviors in each exchanges be consecutively numbered until the exchange ends. At the beginning of the next exchange the numbering starts from "1". Additional modifications to the coding metric were made to highlight the "Confirm" and "State" behaviors and nonverbal behaviors.

Appendix H: MD/RN Student Behaviors by Encounter

Appendix H is divided into three parts: the Top, Middle, and Bottom 10 encounters as determined by the number of closed loops in each encounter. The report shows the five (5) verbal listening behaviors used in the study[1], the nonverbal listening behaviors, the total behaviors. Nonverbal behaviors are not included in the total behaviors. Each column expresses frequencies for each behavior, for MD and RN students, collectively, in the encounter. The total

of each behavior and percentages of the total behavior made by the MD student group are shown. Numbers within an encounter that are bold-faced indicate a ratio of MD/RN behaviors inconsistent with the overall 70%/30% ratio of MD/RN behaviors.

[1] The "Disagree" behavior was dropped after completing observations: it was coded 15 times (0.004 % of behaviors) in all encounters.

Appendix I: Exchanges Highest to Lowest Ranked

Appendix I lists the 30 encounters from highest to lowest-ranked according to the number of closed loops in each encounter. Each encounter is described by the number and type of exchanges identified. The far right column shows total of loops closed by a verbal behavior and the encounter rating. The breakdown of State/Confirm behaviors in the two closed loop categories is shown in parentheses. State behaviors do not include action; Confirm behaviors include an action. The data does not allow firm conclusions, but the observers believe behaviors accompanied by actions appeared more likely to produce desired outcomes.

Appendix J: Exchanges/Behaviors Patterns

Appendix J lists the 30 encounters from highest to lowest-ranked according to the number of closed loops in each encounter. The analysis combines total behaviors by MD and RN student groups and a consolidated version of exchange types. The column with students' listening behaviors shows the percentage of behaviors by each group; numbers within an encounter that are bold-faced indicate a ratio of MD/RN behaviors inconsistent with the overall 70%/30% ratio of MD/RN behaviors (see p. 148). Nonverbal behaviors (NV) frequencies are shown.

Appendix K: Exchanges Highest to Lowest Ranked Pairs Top and Bottom 15

In this analysis the 30 encounters are presented in highest-lowest ranked pairs according to the number of closed loops in each encounter: the top 15 encounters are matched with the

bottom 15 encounters. The analysis examines the differences in the types and numbers/frequencies of exchanges. The far right column shows total closed loops and ratings. The green and red colors are used throughout to distinguish the higher and lower rated encounters

APPENDIX A: DEFINITION OF TERMS

1. Allied health professionals: Allied health professionals are a group of professions that include therapists, technicians, and technologists in physical therapy, occupational therapy (OT), respiratory therapy (RT), laboratories, and a variety of other testing and rehabilitative services.
2. American Medical Association (AMA): Since 1847 the American Medical Association has promoted scientific advancement, improved public health, and invested in the doctor and patient relationship (http://www.ama-assn.org/ama/home.page?). The AMA is largest advocacy, education, and physician practice support organization in the U.S.
3. Blue Cross: "The Blue Cross [and Blue Shield] Association is a national federation of 37 independent, community-based and locally operated Blue Cross® and Blue Shield® companies. The Association owns and manages the Blue Cross and Blue Shield trademarks and names in more than 170 countries and territories around the world. The Association grants licenses to independent companies to use the trademarks and names in exclusive geographic areas" to offer health care insurance coverage (http://www.bcbs.com/about-the-association/).
4. Bundled provider reimbursement plans: Bundled provider reimbursement plans are a method by providers who as a team collectively treat a patient's medical or surgical condition and are reimbursed by government of commercial payors. The providers of those services decide how the payment is allocated among the team members.
5. Causal Layered Analysis (CLA): CLA "…is a theory of knowledge and a methodology for creating more-effective policies and strategies. Since its invention in the late 1980s, it has been used successfully with governments, corporations, international think tanks, communities, and cities around the world. It has also been used as the primary research

method for dozens of doctoral and master's students around the world" (Inayatullah, 2014).

6. Centers for Medicare and Medicaid Services (CMS): CMS is the federal government agency which administers Medicare, Medicaid, and the states' Children's Health Insurance Program in the Department of Health and Human Services (HHS).
7. Chronic diseases: Chronic diseases are conditions for which little or no cure is known: symptoms re-occur and treatment is primarily designed to manage symptoms and minimizing complications.
8. Closed panels: Closed panels are limited-size groups of physicians of various specialties who are invited to be part of the group to provide services to a patient population.
9. Commercial payors: Commercial payer is a collective term referring to private health insurance providers, such as Anthem®Blue Cross, Cigna, and Aetna.
10. Competency-based training: Competency-based training is a form of health professions' education within which students acquire and demonstrate comprehension of and ability to apply knowledge in a subject area; an alternative to fixed duration models.
11. Electronic Health Record: EHRs are sophisticated computer-based replacements for the paper medical chart intended to improve accuracy of information, continuity of care, and efficiency of care delivery. The Centers for Medicare and Medicaid Services (CMS) have established a program to financially incentivize facility and individual providers to adopt EHRs (Lingard et al., 2004).
12. Graduate Medical Education (GME): GME includes internships, residency, and subspecialty or fellowship programs following earning a degree from a medical or osteopathic training program.

13. Health care providers: Any person or organization whose purpose is to deliver health care services, including health care delivery professionals in various private practice settings, hospitals, free-standing surgery, and diagnostic centers, and vertically-integrated organizations, such as Health Maintenance Organizations. In this dissertation, the term "facility provider" will be used for care delivery organizations to distinguish from individual health professions.
14. Health and Human Services (HHS): The HHS is a cabinet-level agency of the federal government that is charged with protecting the health of all Americans and especially those populations least able to care for themselves.
15. Health Insurance Exchanges (HIX): Health insurance exchanges, also known as the Health Insurance Marketplace, are state- or federal government-run sources for the health insurance plans created by the ACA (see 29). The intent of HIX is to reduce the number of un- and underinsured Americans.
16. High Fidelity Patient Simulators (HPS): HPS are life-like figures that can respond physiologically to clinical interventions. Pediatric and adult simulators "…have realistic features, such as blinking eyes with pupils that react to light, chests that rise and fall with respirations, palpable pulses, various heart and lung sounds, and the ability to cry, drool and bleed. The simulators have procedural features, which allow for chest tube and tracheotomy management, defibrillation and urinary catheter insertion (Perez, 2014. Para. 1).
17. Hospitalist: Hospitalists, a rapidly-growing hospital-based medical specialty, who treat inpatients only. The specialty's growth has been spurred by decreasing payment to private-practicing physicians to treat their hospitalized patients and by improved

continuity of care and some lowering of cost associated with hospitalist management of care delivery.

18. Institute of Medicine (IOM): "The Institute of Medicine (IOM) is an independent, nonprofit organization that works outside of government to provide unbiased and authoritative advice to decision makers and the public. Established in 1970, the IOM is the health arm of the National Academy of Sciences, which was chartered under President Abraham Lincoln in 1863" (Institute of Medicine, 2012, para. 2).
19. Interprofessional Education (IPE): "When students from two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes" (Interprofessional Education Collaborative Expert Panel, 2011, p. 2).
20. Interprofessional Education Collaborative (IPEC): The Interprofessional Education Collaborative consists of the national organizations representing education in medicine, nursing, osteopathy, pharmacy, dentistry, and public health charged with defining and advancing the competencies of interprofessional education.
21. Interprofessional Practice (IP): Interprofessional practice is a care delivery model that includes providers whose collaboration, communication, and team skills and understanding of roles allows them to maximize their contribution to deliver efficient, quality, and safe care.
22. Medical education: The formal system that prepares students through medical school to become licensed medical or osteopathic physicians.
23. Medicaid: Medicaid is a joint federal-state insurance plan established by the Social Security Amendments of 1965 to provide health care for people without the means to afford care themselves.

24. Medicare: Medicare was established by the Social Security Amendments of 1965 and has become the single largest provider of health care services in the U.S., serving persons 65 or older and people of all ages with disabilities or end stage renal disease.
25. Mobile Electronic Devices (MED): Mobile electronic devices include the numerous wrist-band, phones, tablets, and pads that receive, process, and transmit health information among providers and patients.
26. National Committee for Quality Assurance (NCQA): The NCQA is is a private, 501(c) (3) non-profit organization founded in 1990 that has become a singularly credible and influential force for improving the quality of health care (National Committee for Quality Assurance, 2013).
27. National Consumer League (NCL): "The National Consumers League is America's oldest consumer organization, representing consumers and workers on marketplace and workplace issues since our founding in 1899" (http://www.nclnet.org/about-ncl).
28. Nonverbal behaviors: These listening behaviors include head nods or shakes, gaze (eye contact), shoulder shrug, and proximity or moving toward a person in response to a verbal behavior.
29. Patient Protection and Affordable Care Act (ACA): The ACA of 2010, also known as "Obamacare", is intended to increase access to, quality of, and affordability of health insurance. The ACA is the most significant reform to the U.S. health care system since the inception of Medicare and Medicaid in 1965.
30. Pay for Performance (PFP): PFP is an emerging method for reimbursing providers for delivering care that is in part, or all, based on the patient realizing the expected outcome.

31. Preceptor: A preceptor is a licensed provider under whose supervision health professions students treat actual patients.
32. Primary care physician (PCP): A physician whose residency was in family medicine, internal medicine, pediatrics, or obstetrics and gynecology.
33. Realizing Educational Advancement for Collaborative Health (REACH): REACH is the interprofessional education initiative at the University of Colorado/ Anschutz Medical Campus.
34. Residency: A residency is a 3-5 year period after medical school during which a physician acquires specific medical or surgical expertise.
35. Root cause analyses: A structured method used to analyze serious adverse events. Initially developed to analyze industrial accidents, RCA is now employed as an error analysis tool in health care (Parker-Raley et al., 2012).
36. Schema theory: Schema theory says all knowledge is organized into units, a generalized description or a conceptual system to enable an understanding of knowledge.
37. Sentinel events: Sentinel events are "Medical errors can be defined as the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim" (Institute of Medicine, 1999, p. 1). Examples of sentinel events are a medication administration error, wrong-patient, wrong-site, wrong-procedure incident, or patient suicide while under treatment (The Joint Commission, 2014)
38. Specialty physicians: Specialists are physicians who have completed a residency after medical school during which they acquire expertise in a specific medical or surgical area.
39. TeamSTEPPS - Team Strategies and Tools to Enhance Performance and Patient Safety is a teamwork system designed by the Department of Defense (DOD) Patient Safety

Program (PSP), in collaboration with the Department of Health & Human Services' (HHS) Agency for Health care Research and Quality (AHRQ) to improve the quality, safety and efficiency of health care.

40. The Joint Commission (TJC): The Joint Commission is a private, non-governmental agency whose mission is to establish guidelines for the operation of hospitals and other health care facilities.
41. UC/AMC – University of Colorado/Anschutz Medical Campus is one of two campuses that comprise the University of Colorado in the Denver metro area. The campus includes health care educational, research, and care delivery units.
42. Vertically integrated organizations – Health Maintenance Organizations (HMO) or Preferred Provider Organizations (PPO) include a health plan (payer) and a group of contracted providers. Providers may be in closed panels, such as the Kaiser Permanente model or open panel participants – accepting patients from other sources than the HMO or PPO.

APPENDIX B: U.S. INTERPROFESSIONAL EDUCATION INITIATIVES

Organization/Location	Program Distinction
Medical University of South Carolina (Columbia, SC)	IPE as the focus for its 10-year Quality Enhancement Plan as required by the Southern Association of colleges and Schools for affirmation of accreditation
University of Minnesota	National Coordinating Center for (Minneapolis and St. Paul, MN) Interprofessional Education and Collaborative Practice (sponsored by the Health Resources and Services Administration, HRSA)
Geisinger Health System (Danville, PA)	Focus on communication around problem-solving
University of Missouri (Columbia, MO)	
Rosalind Franklin University (Chicago, IL)	Distinctive top university administrative support
Western University of Health Sciences (Pomona, CA)	
Pennsylvannia State University (University Park, PA)	Generic care
University of Missouri (Columbia, MO)	Focus on interprofessional faculty development
University of Washington Seattle, WA	
Texas Women's College/Baylor (Waco, TX)	Care delivery encounters delivered via high fidelity simulations and standardized patients
University of Washington (Seattle, WA)	
Duke University (Raleigh, NC)	Online, interactive virtual IPE curriculum options

New York University (New York)	
University of Virginia (Charlottesville, VA)	Four-year curricular plan integrating medical and nursing students
Case Western Reserve (Cleveland, OH)	
University of Colorado (Aurora, CO)	New campus places all professions' physical spaces in close proximity to catalyze a "health professions culture shift"

APPENDIX C: METHODOLOGY FOR LITERATURE REVIEW

The review of literature identified approximately 700 possible sources, in health care education, delivery, and communication, and in general communication and listening studies; approximately 350 sources were reviewed. Sources are full text, peer-reviewed U.S. and Canadian academic journals, websites of federal government agencies, not-for-profit health care organizations, foundations, and conference proceedings. One Swedish and one Danish medical journal were sourced for their studies of provider-provider communication.

Eligible sources were found using various combinations of keywords, "medical education", "medical errors", "patient safety", "nurses and physicians", "health care communication", "listening", "listening studies", "direct observation methods for human behavior", "observational studies and health care" and "communication studies." Eligible sources were found using electronic databases available from libraries at CSU, RU, and UC/AMC.

References from identified articles were examined for additional sources. Articles on communication and listening in health care were drawn from a variety of care delivery settings. Sources were used from earlier publication years than are specified in the following sections when the source supported study objectives.

Health professions (or providers) education and practice

Sources for health professions' education and practice include MEDLINE, CINAHL, PubMed, the Cochrane Database of Systematic Reviews, and ProQuest Dissertations and Theses. Databases were searched for sources published from January, 1990 through September, 2015. The date range begins in 1990 because attention to provider education reform began in earnest in part due to growing concerns about patient safety.

Communication in health care delivery

Sources for communication in health care include MEDLINE, CINAHL, PubMed, the Cochrane Database of Systematic Reviews, and ProQuest Dissertations and Theses. Databases were searched for sources published from January, 1990 through May, 2013. The date range begins in 1990 because substantive awareness of errors and communication in care delivery began to emerge from research and practice in the early 1990s.

Communication and listening

Sources for communication and for listening studies include Academic Source Premier, Communication & Mass Media Complete, Google Scholar, and resources available through the International Listening Association. Databases were searched for sources published from January, 1950 through May, 2013. The 1950 date parameter reflects the earliest point at which substantive research in listening begins and an acceptable point from which to date communication studies.

Observational literature

PsychINFO and ProQuest Dissertations and Theses were searched for sources on observational research. Databases were searched for sources published from January, 1960 through May, 2013. The year 1960 was chosen because the amount of substantive observation literature noticeably increases in the early 1960s.

APPENDIX D: IRB APPROVALS

Colorado State University

Colorado State University
Knowledge to Go Places

Research Integrity & Compliance Review Office
Office of the Vice President for Research
321 General Services Building - Campus Delivery 2011 Fort Collins, CO
TEL: (970) 491-1553
FAX: (970) 491-2293

NOTICE OF APPROVAL FOR HUMAN RESEARCH

DATE:	September 17, 2014
TO:	Makela, Carole, 1588 School of Education
	Kamberelis, George, 1588 School of Education, Rosser, Paul, School of Education
FROM:	Swiss, Evelyn, Coordinator, CSU IRB 1
PROTOCOL TITLE:	Characterizing Nursing and Medical Student Verbal Listening Behaviors and Closed Loop Communication During Simulated Health Care Delivery
FUNDING SOURCE:	NONE
PROTOCOL NUMBER:	13-4745H
APPROVAL PERIOD:	Approval Date: September 11, 2014 Expiration Date: September 10, 2015

The CSU Institutional Review Board (IRB) for the protection of human subjects has reviewed the protocol entitled: Characterizing Nursing and Medical Student Verbal Listening Behaviors and Closed Loop Communication During Simulated Health Care Delivery. The project has been approved for the procedures and subjects described in the protocol. This protocol must be reviewed for renewal on a yearly basis for as long as the research remains active. Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.

If approval did not accompany a proposal when it was submitted to a sponsor, it is the PI's responsibility to provide the sponsor with the approval notice.

This approval is issued under Colorado State University's Federal Wide Assurance 00000647 with the Office for Human Research Protections (OHRP). If you have any questions regarding your obligations under CSU's Assurance, please do not hesitate to contact us.

Please direct any questions about the IRB's actions on this project to:

IRB Office - (970) 491-1553; RICRO_IRB@mail.Colostate.edu
Ehrelyn Swiss, IRB Coordinator - (970) 491-1381; Ehrelyn.Swiss@Colostate.edu

Swiss, Evelyn

Evelyn Swiss

Swiss, Evelyn

Approval is to recruit CAPE participants in up to 30 encounters with the approved recruitment and consent materials. The above-referenced project was approved by the Institutional Review Board with the condition that the approved consent form is signed by the subjects and each subject is given a copy of the form. NO changes

COMIRB

From: Capell, Warren [mailto:Warren.Capell@ucdenver.edu]
Sent: Thursday, August 14, 2014 3:59 PM
To: Rosser, Paul
Subject: RE: WC-RE: Request for COMIRB Waiver

Paul –

Thanks for the reply. With this new information, I do not think UCD is engaged in your research. This is said, provided that no employee or agent of UCD is the primary recipient of funding to carry out this work, consenting subjects, interacting with subjects for research purposes, analyzing identifiable data, or serving as a mentor to you on this project.

It sounds like Dr. Earnest was only peripherally involved in connecting you with this campus, but is not serving as a mentor that would merit professional/academic recognition or publication credit.

If you will only be performing your research in UCD facilities (e.g., CAPE), with appropriate permissions to conduct research from those facilities, UCD would not be engaged in the research per OHRP guidance. If UCD or its affiliate institutions are not engaged in research, COMIRB review is not required.

Please share this communication with your IRB. Also, please let me know if you have any further questions or clarifications.

Thanks,

Cappy

Warren Capell, MD
Director, Colorado Multiple Institutional Review Board
Associate Professor of Medicine
Division of Endocrinology, Metabolism, and Diabetes
University of Colorado Denver
(303) 724-1058

Regis University

Dear Mr. Rosser…

The Institutional Review Board has completed a thorough evaluation of your submitted proposal, *Characterizing Medical and nursing Student Verbal Listening Behaviors and Closed Loop Communication During Simulation Health Care Delivery.* I am pleased to inform you that the proposal has been fully approved as an Exempt study per Categories #1 and #2. You may begin study implementation and data collection upon receipt of this email. An official letter of approval for your study files will be forthcoming. Having spent quite a bit of time at the CAPE Center, I will be most interested in the results of your investigation!

Patsy McGuire Cullen, PhD, PNP-BC
Chair, Institutional Review Board
irb@regis.edu

Arapahoe Community College
Institutional Review Board

EXEMPT PROTOCOL SUMMARY FORM

ACTIVITIES EXEMPT FROM COMMITTEE REVIEW

Research activities involving human subjects in the following categories may be exempt from review by ACC's Institutional Review Board. The principal investigator/project director is authorized to make the first determination of eligibility for exemption; however, the College bears the responsibility for concurring in that determination based on notice provided by the principal investigator to the Institutional Review Board.

*The following exemptions do NOT apply when (a) deception of subjects may be an element of the research; (b) subjects are **under the age of eighteen; (c) the activity may expose the subject to discomfort or harassment** beyond levels encountered in daily life; or (d) **fetuses, pregnant women, human in vitro fertilization, children, or individuals involuntarily confined or detained in penal institutions** are subjects of the activity.*

EXCEPT FOR THE ABOVE EXCLUSIONS, the federally-approved Categories of Exemption are:

1. Research conducted in established or commonly accepted educational settings involving normal educational practices, such as: (a) research on regular and special education instructional strategies; (b) research on the effectiveness of or the comparison among instructional techniques curricula, or classroom management methods.

2. Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (a) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; **and** (b) any disclosure of the human subjects' responses outside the research reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

3. Research involving the use of educational tests (cognitive, diagnostic, aptitude, or achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under Category 2 if: (a) the human subjects are elected or appointed public officials, or candidates for public office, **or** (b) federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

4. Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified directly or through identifiers linked to the subjects.

5. Research and demonstration projects which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (a) public benefit or service programs; (b) procedures for obtaining benefits or services under those programs; (c) possible changes in or alternatives to those programs or procedures; or (d) possible changes in methods or levels of payment for benefits or services under those programs.

6. Taste and food quality evaluation and consumer acceptance studies: (a) if wholesome foods without additives are consumed, or (b) if a food is consumed that contains a food ingredient or at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe by the U.S. Food and Drug Administration or approved by the U.S. Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture.

Exempting an activity from review does not absolve the investigator(s) of the activity from ensuring that the welfare of subjects in the activity is protected and that methods used and information provided to gain subject consent are appropriate to the activity.

Questions about whether a research activity may be exempt from human subjects review can be directed to the Director of Institutional Research or to the Grant Writer.

APPENDIX E: STUDY CONSENT FORM

November 14, 2014

Dear Participant,

My name is Paul Rosser and I am a Ph.D. Candidate and researcher from Colorado State University in the School of Education. We are conducting a research study on closed loop communication among medical and nursing students during care delivery.

The study will use verbal listening behaviors obtained via observations of videotaped EM encounters to note when communication loops close or do not close. The purpose of the study is to demonstrate a research design that allows observers to identify which verbal behaviors, or lack of behaviors, interfere with exchanges of information: the closing of communication loops.

The title of our project is Characterizing Medical and nursing Student Verbal Listening Behaviors and Closed Loop Communication During Simulated Health Care Delivery. The Principal Investigator is Carole Makela, Ph.D. and the Co-Principal Investigator is Paul Rosser.

We would like your consent that the researchers may conduct observations of the videotape of the Emergency Medicine (EM) encounters in which you are a participant. The EM encounters will take place in the Center for Advancing Professional Excellence (CAPE) at the University of Colorado Denver Anschutz Medical Campus. Your participation in this research is voluntary; videotaping of EM encounters is an ongoing activity for educational purposes.

<u>If you are willing to be part of the study please select Option 1 on the third page. If you do not wish to be part of the study please select Option 2. Please choose one or the other of the options.</u>

The researchers' observations of videotape will be conducted at the CAPE; no videotape of EM encounters will be allowed to leave the CAPE. The researchers will record only the following information during each observed encounter:

1. The date and time of the encounters observed
2. Patient chief complaint
3. Identity of encounter participants as medical student, nursing student, patient, or family member

4. Verbal listening behaviors demonstrated by encounter participants

Researchers, CAPE staff, and faculty from students' training program can access the encounters, but only by permission of appropriate CAPE staff. While there are no direct benefits to you, we hope to gain more knowledge about study designs that improve researchers' ability to identify the causes for communication failures among providers that lead to medical errors.

There are no known risks your participation in the study.

If you have any questions, please contact Paul Rosser at his home institution, Regis University, at 303.964.5332. If you have any questions about your rights as a volunteer in this research, contact the CSU IRB at 970-491-1553 or RICRO_IRB@mail.colostate.edu.

Sincerely,

Carole Makela, Ph.D.
Professor
School of Education
Colorado State University

Paul M. Rosser
Ph.D. Candidate
School of Education
Colorado State University

Assistant Professor
School of Management
Regis University

APPENDIX F: STUDY OBSERVATION FORM

Date/Time Stamp of Encounter

Month __, 2015 Day ___ Time ___:___ AM

Observation # _____

Camera ____

Date of Actual Observation **Month __, 2015 Day ___**

Setting: All encounters are Emergency Medicine **(ER)** or Intensive Care **(ICU)**

Participants (#): MD __ RN __ Family __

Patient Complaint/Condition* (Circle one): ASA SS NAT

Other Information:

_____

_____

_____

_____

_____

_____

_____

*** ASA - young adult with an aspirin overdose**
SS - a nine-month baby in septic shock
NAT – a nine month old in hemorrhagic shock

ENCOUNTER OBSERVATION FORM: __ - __ - __ Time __:__ AM

Exchange	1		2		3	
Behavior	MD	RN	MD	RN	MD	RN
Agree A						
Confirm C						
Disagree D						
Inquire I						
State S						
Request R						

Exchange	4		5		6	
Behavior	MD	RN	MD	RN	MD	RN
Agree A						
Confirm C						
Disagree D						
Inquire I						
State S						
Request R						

Exchange	7		8		9	
Behavior	MD	RN	MD	RN	MD	RN
Agree A						
Confirm C						
Disagree D						
Inquire I						
State S						
Request R						

APPENDIX G: INSTRUCTIONS FOR OBSERVERS

1) Listening Behaviors to be Coded

Verbal Behaviors	*Observation code*
Agree	A
Confirm	C
Disagree	D
Inquire	I
State	S
Request	R

2) Encounter*:

a. Encounter Pre-briefing: Complete 1st page of Encounter Observation instrument

b. Exchanges

i. Situations that catalyze an exchange of information can include a request for an action/behavior (e.g., order an x-ray, physician consult, or procedure), an inquiry suggesting an action or asking for information (e.g., about the patient's vital signs), or questions and statements directed by any participant in the encounter to another participant.

ii. An exchange of information is initiated or concluded by a verbal behavior from either a medical or nursing student.

iii. An exchange may appear to end without resolution as a new exchange is initiated because the patient's condition changes or new information is contributed spontaneously by any participant.

c. Coding

i. The initial observed behavior is designated by a"**1**" placed in the exchange box next to the corresponding code for the behavior, in the MD or RN column.

Subsequent verbal behaviors are designated with ascending numbers--"**2**", "**3**", etc—placed in either the MD or RN column as appropriate.

Initiating and concluding verbal behavior with be designated by the lowest

and highest numbers, respectively.

ii. Nonverbal behaviors will be noted in the exchange box by the appropriate number per i. and the letters "NV."

iii. A check mark is placed in the top right corner of the exchange box to indicate the exchange ends with a “Confirm” behavior. A “Confirm” behavior includes an action. A “State” behavior does not include an action.

d. Encounter De-briefing

i. Verify student disciplines

ii. Review recorded data for clarity

iii. Note any additional information that appears relevant to the observation

* **ASA** - young adult with an aspirin overdose
SS - a nine-month baby in septic shock
NAT - a nine month old in hemorrhagic shock

APPENDIX H: MD/RN STUDENT BEHAVIORS BY ENCOUNTER

TOP 10

Date/ Encounter	**Agree**	**Confirm**	**Inquire**	**State**	**Request**	**MD/RN Total/ MD [1] Percentage of Total**	**NV**
Mar 13 10.13/ NAT	4/1	15/6	25/6	88/4	27/0	159/17/176 90	12/5
Apr 10 10.17/ NAT	9/0	23/6	36/0	75/7	29/0	172/13/185 93	3/17
Jan 30 09.42/ ASA	11/0	**12/7**	33/9	50/5	11/1	117/22/139 84	5/5
Mar 13 09.43/ NAT	4/3	**5/7**	**28/16**	71/29	23/2	131/57/188 70	4/6
Apr 10 11.18/ ASA	5/1	38/5	**20/8**	28/7	**11/6**	102/27/129 79	7/3
Jan 16 11.14/ SS	8/0	**12/8**	28/6	71/2	19/1	138/17/155 89	4/7
Apr 24 11.12/ ASA	3/1	**15/20**	**18/9**	**37/17**	13/4	**85/51/137** **62**	1/5
Jan 30 10.08/ ASA[2]	9/0	14/6	26/6	25/11	**15/11**	89/34/123 72	4/6
Mar 13 10.42/ ASA	4/1	**10/12**	19/2	59/10	22/4	114/29/144 79	4/6
Feb 27 09.43/ SS	7/0	**13/12**	14/5	36/4	22/1	92/22/114 81	2/5
	64/7/ 71 89%	**157/89/ 246** **45%**	247/65/ 312 74%	540/96/ 636 82%	192/30/ 222 84%	1200/287/ 1487 81	46/65/ 111 41

MIDDLE 10

Date/ Encounter	Agree	Confirm	Inquire	State	Request	MD/RN Total/ MD [1] Percentage of Total	NV
Apr 24 09.42/ SS	2/0	**8/14**	24/6	40/15	22/4	96/39/135 71	5/7
Jan 16 09.47/ ASA	5/0	**13/8**	24/3	13/3	14/3	69/17/86 80	1/8
Jan 16 10.10/ ASA	5/0	23/3	17/3	35/0	19/0	99/6/105 94	2/5
Jan 30 11.09/ SS	8/0	**6/8**	22/7	42/3	13/1	91/19/110 83	5/1
Apr 10 09.50/ NAT	6/0	17/3	16/2	32/8	29/3	100/16/117 85	9/2
Feb 27 11.12/ ASA	6/1	**7/7**	24/4	42/10	16/2	95/24/119 80	3/13
Apr 24 10.43/ ASA	6/0	**8/8**	10/4	36/6	19/4	79/22/101 78	7/5
Apr 24 10.12/ SS	1/0	**16/16**	**14/7**	**44/22**	18/4	**93/49/142** **65**	2/8
Feb 13 09.43/ SS	6/0	13/3	22/1	40/4	16/1	97/9/106 91	14/0
Apr 10 10.47/ ASA	7/0	13/2	12/4	24/4	16/1	72/11/83 87	6/4
	52/1/ 53 98%	**124/72/ 196** **63%**	185/41/ 226 82%	348/75 /423 82%	182/23/ 205 90%	891/212/ 1103 81%	54/53/ 107 50%

BOTTOM 10

Date/ Encounter	Agree	Confirm	Inquire	State	Request	MD/RN Total/ MD [1] Percentage of Total	NV
Feb 27 10.46/ ASA	8/0	**3/12**	**19/12**	36/10	16/4	**82/38/121** **68**	3/5
Feb 13 10.46/ ASA	5/0	**17/8**	17/5	37/5	17/0	93/18/111 84	6/2
Mar 27 09.13/ SS	7/0	**1/8**	**14/12**	**37/20**	18/6	**77/46/123** **62**	0/17
Feb 27 10.10/ SS	4/0	**3/5**	13/4	29/1	29/1	78/11/89 88	8/18
Mar 27 10.44/ ASA	1/0	**0/9**	**10/12**	**18/22**	**10/6**	**39/49/88** **44**	3/8
Jan 30 10.41/ SS	4/0	13/3	12/2	29/3	7/1	65/9/74 88	6/2
Feb 13 10.10/ SS	6/0	**8/9**	11/4	31/6	17/1	73/20/93 78	1/9
Mar 13 11.14/ ASA	3/0	**0/12**	18/7	46/6	20/3	87/28/115 76	1/12
Feb 13 11.14/ ASA	5/0	**5/11**	10/4	25/1	13/3	58/19/78 74	2/5
Jan 16 10.46/ SS	7/0	**6/5**	21/4	40/2	15/0	89/11/100 89	6/7
	50/0/ 50 100	**56/82/ 138** **41**	**145/66/ 211** **69**	328/76/ 404 81	162/25/ 187 86	741/249/ 990 75	36/85/ 121 30

[1] Nonverbal behaviors not included in totals

[2] Rating is misleading: despite high number of closed loops the team mismanaged treatment to the point of a fatality

APPENDIX I: EXCHANGES: HIGHEST TO LOWEST RANKING

TOP 10

Encounter	Dx	Call Out	Call Out + Call Back	Closed Loop by Non verbal	Closed Loop by Verbal (inc NV)	Closed Loop by Verbal	Total	Total Closed Loops	Rating
Mar 13 10.13	NAT	16	7	4	11 (2/9)	24 (18/6)	62	35	5.00
Apr 10 10.17	NAT	3	4	5	8 (3/5)	27 (11/16)	47	35	5.00
Jan 30 09.42	ASA	3	2	2	6 (0/6)	27 (19/8)	40	33	5.00
Mar 13 09.43	NAT	7	4	4	3 (0/3)	29 (17/12)	47	32	5.00
Apr 10 11.18	ASA	0	1	5	3 (0/0)	28 (7/21)	37	31	5.00
Jan 16 11.14	SS	5	3	5	1 (0/1)	30 (12/18)	44	31	5.00
Apr 24 11.12	ASA	1	1	1	7 (0/0)	24 (8/16)	34	31	5.00
Jan 30 10.08	ASA	4	2	3	4 (1/3)	26 (14/12)	39	30	5.00
Mar 13 10.42	ASA	3	3	6	2 (2/0)	26 (17/9)	40	28	4.80
Feb 27 09.43	SS	3	1	3	1 (0/0)	26 (5/19)	34	27	4.75
		45	28	38	46 (8/27)	267 (128/137)	424	311	

MIDDLE 10

Encounter	Dx	Call Out	Call Out + Call Back	Closed Loop by Non verbal	Closed Loop by Verbal (inc NV)	Closed Loop by Verbal	Total	Total Closed Loops	Rating
Apr 24 09.42	SS	5	3	6	4 (0/0)	23 (5/18)	41	27	4.75
Jan 16 09.47	ASA	5	1	7	2 (0/2)	24 (17/7)	39	26	4.60
Jan 16 10.10	ASA	4	1	2	4 (4/0)	22 (11/11)	33	26	4.60
Jan 30 11.09	SS	5	5	2	3 (0/3)	22 (6/16)	37	25	4.50
Apr 10 09.50	NAT	3	2	3	4 (1/0)	21 (9/11)	33	25	4.50
Feb 27 11.12	ASA	2	0	7	7 (1/6)	17 (4/13)	33	24	4.40
Apr 24 10.43	ASA	2	1	5	8 (2/6)	15 (7/8)	31	23	4.35
Apr 24 10.12	SS	3	5	1	8 (0/0)	15 (3/12)	32	23	4.35
Feb 13 09.43	SS	6	4	6	6 (2/4)	16 (12/4)	38	22	4.25
Apr 10 10.47	ASA	3	2	3	6 (2/4)	16 (9/7)	30	22	4.25
		39	24	42	52 (12/25)	191 (83/107)	348	243	

BOTTOM 10

Encounter	Dx	Call Out	Call Out + Call Back	Closed Loop by Non verbal	Closed Loop by Verbal (inc NV)	Closed Loop by Verbal	Total	Total Closed Loops	Rating
Mar 27 09.13	SS	2	4	9	2 (2/0)	19 (14/5)	36	21	4.15
Feb 13 10.46	ASA	3	6	5	2 (1/1)	19 (5/14)	35	21	4.15
Feb 27 10.46	ASA	3	0	3	6 (2/4)	15 (7/8)	27	21	4.15
Feb 27 10.10	SS	4	2	15	11 (0/0)	9 (2/9)	41	20	4.00
Mar 27 10.44	ASA	2	4	4	6 (4/2)	13 (11/2)	29	19	3.90
Jan 30 10.41	SS	1	3	5	2 (1/1)	17 (7/10)	28	19	3.90
Feb 13 10.10	SS	6	9	3	5 (0/0)	12 (5/7)	35	17	3.75
Mar 13 11.14	ASA	9	8	7	4 (0/0)	12. (11/1)	40	16	3.75
Feb 13 11.14	ASA	4	0	1	5 (1/4)	11 (5/6)	21	16	3.60
Jan 16 10.46	SS	4	2	10	1 (0/1)	13 (4/9)	30	14	3.49
		38	38	62	44 (11/13)	140 (71/71)	322	184	

APPENDIX J: EXCHANGES/BEHAVIORS PATTERNS

TOP 10

Date (Dx)		MD/RN Total Behaviors/ MD Percentage of Total	CO-CO/CB	CL-NV	CL(NV)/CL	Rating	NVs
Mar 13 10.13 (NAT)		159/17/176 90	23	4	11/24	5.00	17
Apr 10 10.17 (NAT)		172/13/185 93	7	5	8/27	5.00	20
Jan 30 09.40 (ASA)		117/22/139 84	5	2	6/27	5.00	10
Mar 13 09.43 (NAT)		131/57/188 70	11	4	3/29	5.00	10
Apr 10 11.18 (ASA)		102/27/129 79	1	5	3/28	5.00	10
Jan 16 11.14 (SS)		138/17/155 89	8	5	1/30	5.00	11
Apr 24 11.11 (SS)		**85/51/137** **62**	1	1	7/24	5.00	6
Jan 30 10.08 (SS)		89/34/123 72	6	3	4/26	5.00	10
Mar 13 10.42 (ASA)		114/29/144 79	6	6	2/26	4.80	10
Feb 27 09.43 (SS)		92/22/114 81	4	3	1/26	4.75	7

MIDDLE 10

Date (Dx)		MD/RN Total/ MD Percentage of Total	CO-CO/CB	CL-NV	CL(NV)/CL	Rating	NVs
Apr 24 09.42 (SS)		96/39/135 71	8	6	4/23	4.75	12
Jan 16 09.47 (ASA)		69/17/86 80	6	7	2/24	4.60	9
Jan 16 10.10 (ASA)		99/6/105 94	5	2	4/22	4.60	7
Jan 30 11.09 (SS)		91/19/110 83	10	2	3/22	4.50	6
Apr 10 09.50 (NAT)		100/16/117 85	5	3	4/21	4.50	11
Feb 27 11.12 (ASA)		95/24/119 80	2	7	7/17	4.40	16
Apr 24 10.43 (ASA)		79/22/101 78	3	5	8/15	4.35	12
Apr 24 10.12 (SS)		**93/49/142** **65**	8	1	8/15	4.35	10
Feb 13 09.43 (SS)		97/9/106 91	10	6	6/16	4.25	14
Apr 10 10.47 (ASA		72/11/83 87	5	3	6/16	4.25	10

BOTTOM 10

Date (Dx)		MD/RN Total/ MD Percentage of Total	CO-CO/CB	CL-NV	CL(NV)/CL	Rating	NVs
Feb 27 10.46 (ASA)		**82/38/121 68**	3	3	6/15	4.15	8
Feb 13 10.46 (ASA)		93/18/111 84	9	5	2/19	4.15	8
Mar 27 09.13 (SS)		**77/46/123 62**	6	9	2/19	4.15	17
Feb 27 10.10 (SS)		78/11/89 88	6	15	11/9	4.00	26
Mar 27 10.44 (ASA)		**39/49/88 44**	6	4	6/13	3.90	11
Jan 30 10.41 (SS)		65/9/74 88	4	5	2/17	3.90	8
Feb 13 10.10 (SS)		73/20/93 78	15	3	5/12	3.75	10
Mar 13 11.14 (ASA)		87/28/115 76	17	7	4/12	3.75	13
Feb 13 11.11 (ASA)		58/19/78 74	4	1	5/11	3.60	17
Jan 16 10.46 (SS)		89/11/100 89	6	10	1/13	3.49	13

APPENDIX K: EXCHANGES HIGHEST TO LOWEST RANKED PAIRS

TOP AND BOTTOM 15

Date/Time Encounter		Call Out		Call Out + Call Back		Closed Loop by Nonverbal		Closed Loop by Verbal (inc NV)		Closed Loop by Verbal		Closed Loops/ Rating	
Mar 13/ 10.13 NAT	**Jan 16/ 10.46 SS**	16	4	7	2	4	**10**	11	1	24	13	**35/ 5.00**	**14/ 3.49**
Apr 10/ 10.17 NAT	**Feb 13/ 11.14 ASA**	3	4	4	0	5	1	8	5	27	11	**35/ 5.00**	**16/ 3.75**
Jan 30/ 09.42 ASA	**Mar 13/ 11.14 ASA**	3	9	2	8	2	7	6	4	27	12	**33/ 5.00**	**16/ 3.75**
Mar 13/ 09.43 NAT	**Feb 13/ 10.10 SS**	7	6	4	9	4	3	3	5	29	12	**32/ 5.00**	**17/ 3.75**
Apr 10/ 11.18 ASA	**Jan 30/ 10.41 SS**	0	1	1	3	5	5	3	2	28	17	**31/ 5.00**	**19/ 3.90**
Jan 16/ 11.14 SS	**Mar 27/ 10.44 ASA**	5	2	3	4	5	4	1	6	30	13	**31/ 5.00**	**19/ 3.90**
Apr 24/ 11.12 ASA	**Feb 27/ 10.10 SS**	1	4	1	2	1	15	7	11	24	9	**31/ 5.00**	**20/ 4.00**
Jan 30/ 10.08 ASA	**Feb 27/ 10.46 SS**	4	3	2	0	3	3	4	6	26	15	**30/ 5.00**	**21/ 4.15**

Date/Time Encounter		Call Out		Call Out + Call Back		Closed Loop by Nonverbal		Closed Loop by Verbal (inc NV)		Closed Loop by Verbal		Closed Loops/ Team Comm Rating/ Dx	
Mar 13/ 10.42 ASA	**Feb 13/ 10.46 ASA**	3	3	3	6	6	5	2	2	26	19	**28/ 4.80**	**21/ 4.15**
Feb 27 09.43/ SS	**Mar 27 09.13/ ASA**	3	2	1	4	3	9	1	2	26	19	**27/ 4.75**	**21/ 4.15**
Apr 24 09.42/ SS	**Apr 10 10.47/ ASA**	5	3	3	2	6	3	4	6	23	16	**27/ 4.75**	**22// 4.25**
Jan 16 09.47/ ASA	**Feb 13 09.43/ SS**	5	6	1	4	7	6	2	6	24	16	**26/ 4.60**	**22/ 4.25**
Jan 16 10.10/ ASA	**Apr 24 10.12/ SS**	4	3	1	5	2	1	4	8	22	15	**26/ 4.60**	**23/ 4.35**
Jan 30 11.09/ SS	**Apr 24 10.43/ ASA**	5	2	5	1	2	5	3	8	22	15	**25/ 4.50**	**23/ 4.35**
Apr 10 09.50/ NAT	**Feb 27 11.12/ ASA**	3	2	2	0	3	7	4	7	21	17	**25/ 4.50**	**24/ 4.40**