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**Determining the Efficacy of an Interprofessional Educational
Intervention for Teamwork Competencies with Nursing Students**

Committee:

<Supervisor's name, Degrees>,
Supervisor or Mentor

<Member's Name, Degrees >, or Co-
Supervisor, Chair

<Member's Name, Degrees >

<Member's Name, Degrees >

<Member's Name, Degrees >

<Member's Name, Degrees >

Dean, Graduate School

**Determining the Efficacy of an Interprofessional Educational
Intervention for Teamwork Competencies with Nursing Students**

by

Lee Ann Waltz, MSN, RN, CNE

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Dedication

I dedicate this dissertation to Cameron, Emily and Connor,
who have offered their constant support throughout this journey.

Thank you for believing in me. I believe in you too.

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Determining the Efficacy of an Interprofessional Educational Intervention for Teamwork Competencies with Nursing Students

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Interprofessional education (IPE) is recognized widely as an essential component to improving patient outcomes but little progress has been made toward understanding the impact of specific educational interventions on interprofessional competencies. To guide healthcare educators in the implementation of effective IPE strategies, additional research using rigorous methodology is necessary.

The purpose of this study was to assess the effectiveness of an educational intervention aimed at improving subjects' interprofessional teamwork competencies. A quasi-experimental, pre and posttest design was used to evaluate the effect of two approaches to an educational intervention. The first approach combined nursing (n = 16), physical therapy (n = 6), and pharmacy students (n = 3); the second approach involved only nursing students (n = 17). The Team Skills Scale was used before and after the intervention to measure interprofessional teamwork competencies. Open-ended questions were used following the intervention to elicit subjects' views.

Findings of the study indicate that both approaches were effective in improving interprofessional teamwork competencies. Statistically significant increases in Team Skills Scale posttest scores were noted for both the treatment and control groups. However, posttest scores were significantly higher in the treatment group than the control group, indicating that the face-to-face interaction that took place between students of different professions had a greater impact on achieving interprofessional teamwork competencies. Themes that emerged from the open-ended questions support the quantitative findings of the study, indicating that the exercise was beneficial in improving teamwork competencies.

The findings of this study suggest that more than one approach to an educational intervention can be effective in improving interprofessional teamwork competencies. Future research should continue to explore the effectiveness of different educational approaches and include longitudinal studies to assess effects over time.

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List of Abbreviations

BJA	Below-the-knee amputation
IOM	Institute of Medicine
IPE	Interprofessional Education
IPEC	Interprofessional Education Collaborative
PA	Physician Assistant
PI	Principle Investigator
PT	Physical Therapy
TSS	Team Skills Scale
UTMB	University of Texas Medical Branch
WHO	World Health Organization

Chapter 1: INTRODUCTION

BACKGROUND

Recognition of the need to discover best practices for improving patient outcomes has gained increasing attention in recent decades. In the 1999 landmark report *To Err is Human*, the Institute of Medicine (IOM) estimated that up to one million people were injured and 98,000 deaths occurred each year in the United States as a result of medical errors (IOM, 1999). The Joint Commission identified breakdowns in communication as the root cause for nearly 66 percent of all sentinel events occurring from 1995 to 2005 (The Joint Commission, 2007). Additionally, authors of the 2008 RAND report identified the link between teamwork behaviors (i.e. coordination, mutual respect, role clarity, shared goals, and debriefing) and patient outcomes including mortality, cardiac arrests, nosocomial infections, adverse events, adverse drug events, and complications (Sorbero, Mattke, & Lovejoy, 2008). By 2000, the IOM had called for an intensive national effort to reduce medical errors by 50% within five years (IOM, 1999).

Despite much effort, little progress has been made toward improving patient safety (Leape et al., 2009). Since 1997, the National Patient Safety Foundation has worked with stakeholder groups to develop new solutions. The Agency for Healthcare Research and Quality developed the Patient Safety Improvement Corps to measure safety. The Joint Commission created patient safety goals that require hospital compliance. The Institute for Healthcare Improvement introduced major campaigns to motivate use of evidence-based safety practices. Despite these efforts, safety remains at the forefront of challenges that healthcare organizations must address. The Lucian Leape

Institute, which was established by the United States National Patient Safety Foundation, identified that improving safety will require major cultural changes. Institute members emphasize that healthcare organizations must move beyond measurement and rules to establishing a culture of trust and transparency. Achieving safety goals requires that healthcare professionals and all associated parties no longer function in silos. The focus must shift from individual performance and fragmented, inefficient communication to care that is delivered by multidisciplinary teams working in integrated care platforms, and involve patients as full partners (Leape et al., 2009).

The role of teamwork as a key component to improving quality and safety in healthcare must be addressed at two levels. The first is in healthcare institutions where healthcare professionals are currently employed, and the second is in academic settings where the future work force can be prepared to work effectively in teams. By providing educational opportunities for students of various health care professions to interact collaboratively with one another, teamwork can be facilitated before providers enter the workforce.

Interprofessional education (IPE) is not a new concept. For the past five decades, discussion has occurred identifying IPE as an essential component for improving the health care delivery system, both nationally and globally. In 1972 the IOM convened 120 leaders from allied health, dentistry, medicine, nursing, and pharmacy to discuss issues pertaining to interprofessional education. In the report released from this conference, *Educating for the Health Team*, the authors emphasized that educational institutions are responsible for preparing health professionals to work cooperatively in teams, and that this cooperation would improve care. The authors also noted that the current educational

system has not prepared health professionals to work effectively in teams. Unfortunately, efforts in team training have remained largely unchanged. The IOM convened another summit on health professions education in 2003. Again, the summit members identified interdisciplinary teamwork as a core competency that should be addressed in the education of future health professionals. Summit members noted that while many successful examples of interprofessional education exist, it had not yet become the norm in health professions education (Interprofessional Education Collaborative [IPEC], 2011). The IOM formed an expert panel in 2010 named the Interprofessional Education Collaborative (IPEC) that was comprised of leaders from the American Association of Colleges of Nursing, the American Association of Colleges of Osteopathic Medicine, the American Association of Colleges of Pharmacy, the American Dental Education Association, the Association of American Medical Colleges, and the Association of Schools of Public Health. The 2011 report titled *Core Competencies for Interprofessional Collaborative Practice* identified four domains of core competencies: values/ethics for interprofessional practice; roles/responsibilities; interprofessional communication; and teams and teamwork (IPEC, 2011).

The World Health Organization (WHO) also has long-recognized IPE and collaborative practice as an essential component for the delivery of quality health care globally. A WHO Expert Committee projected that the future of health care would benefit from a worldwide trend toward teamwork, where a coordinated delivery of health care could most effectively serve communities (WHO, 1988). The authors of the 1988 WHO report, *Learning Together to Work Together for Health*, emphasized team competencies and the importance of beginning multiprofessional (a term synonymous

with interprofessional) education in undergraduate or basic education. The WHO has continued to promote IPE, and the authors of the 2010 report, *Framework for Action on Interprofessional Education and Collaborative Practice*, note that nearly 50 years of investigation have demonstrated that interprofessional education “enables effective collaborative practice which in turn optimizes health services, strengthens health systems and improves health outcomes” (World Health Organization, 2010, p. 18).

STATEMENT OF THE PROBLEM

Despite widespread recognition of the need for IPE, there are a multitude of barriers that inhibit progress. The Interprofessional Education Expert Panel (IPEC) summarized key challenges faced by many educators in a 2011 landmark report. These include: 1) lack of administrative leadership support to provide the necessary resources for successful implementation of IPE; 2) lack of partners within institutions willing to engage in an interprofessional agenda; 3) scheduling conflicts; 4) the need for faculty development in IPE; 5) lack of assessment instruments to evaluate interprofessional competencies; and 6) lack of recognition by some accrediting bodies of the necessity for developing interprofessional competencies (IPEC, 2011). The authors of the Lancet Report (Frenk et al., 2010) also addressed challenges that affect educational systems worldwide including a tendency for the health professions to act independently of one another or even in competition with each other. The authors cited barriers to IPE that include divisions among faculty and curricula of various professions, and strict accreditation standards that limit opportunities to collaborate.

As educators have struggled to overcome barriers, a growing number of research studies have been conducted in an attempt to discover the best methods for conducting

IPE in academic settings. Although some progress has been made, many questions remain regarding the impact and effectiveness of IPE (IOM, 2015). Recommendations for future studies include: more rigorous designs; assessment of the effectiveness of educational interventions that compare interprofessional interventions to separate, profession-specific interventions (Reeves, Perrier, Goldman, Freeth, & Zwarenstein, 2013); and measurement of the impact of IPE on student performance and their ability to deliver collaborative care (Kahaleh, Danielson, Franson, Nuffer, & Umland, 2015).

STATEMENT OF PURPOSE

The purpose of this study was to assess the efficacy of an educational intervention aimed at improving subjects' interprofessional teamwork competencies. Two approaches to an educational intervention were compared by using a treatment group that combined nursing, physical therapy, and pharmacy students, and a control group that consisted of nursing students only.

RESEARCH QUESTIONS

The following research questions were addressed:

Research Question 1: Are there significant differences between the treatment and control groups for pre and posttest scores of interprofessional teamwork competencies?

Research Question 2: Are there significant differences between nursing students in the treatment and control groups for pre and posttest scores of interprofessional teamwork competencies?

Research Question 3: Are there significant within-group differences for pre and posttest scores of interprofessional competencies?

Research Question 4: Do self-reported teamwork competencies vary between nursing and other health professions within the treatment group?

Research Question 5: What are the subjects' views regarding the value of the educational intervention?

SIGNIFICANCE

The findings of this study contribute to the body of knowledge regarding the evaluation of educational methods aimed at improving interprofessional competencies. The study fills a gap in the current knowledge base by incorporating recommendations for IPE research including: 1) a controlled design; 2) a comparison of an interprofessional approach to an intraprofessional approach to an educational intervention; and 3) measurement of the impact on team skills using a validated instrument (Kahaleh, Danielson, Franson, Nuffer, & Umland, 2015; Reeves, Perrier, Goldman, Freeth, & Zwarenstein, 2013).

Subsequent research can expand the findings of this study, including examining additional educational interventions that are applicable to preparing future health professionals with competencies that will facilitate effective interprofessional collaborative practice. The research findings have the potential for use with other healthcare disciplines, and for use in other healthcare educational settings and work environments.

SUMMARY OF METHODOLOGY

A quasi-experimental, pre and posttest design was used to test an intervention for improving the interprofessional teamwork competencies of baccalaureate nursing,

doctoral physical therapy, and doctoral pharmacy students. The educational intervention used an interprofessional simulation-based exercise involving a treatment group that included a combination of nursing, physical therapy, and pharmacy students, and a virtual intraprofessional simulation-based exercise involving a control group that included only nursing students. The Team Skills Scale (Hepburn, Tsukuda, & Fasser, 1998) was used before and after the intervention to quantitatively measure the effectiveness of the educational intervention used in the treatment and control group. Open-ended questions were used following the intervention to elicit subjects' views regarding the impact of the activity.

Mann-Whitney U test, independent-samples *t*-test, and Wilcoxon Signed Rank Test were used to analyze pre to posttest differences within and across groups. Thematic content analysis was used to categorize responses to open-ended questions.

DELIMITATIONS

Study enrollment was limited to baccalaureate nursing students enrolled in a Community Health Nursing course, doctoral physical therapy students, and doctoral pharmacy students from a private university in the southwest region of the United States, which affected generalizability to other settings. The study took place in the fall semester of 2016, which limited sample size.

DEFINITIONS OF TERMS

The following terms are operationally defined for the context of this study:

Interprofessional refers to activities involving members of more than one profession.

Interprofessional Education (IPE) is defined by the WHO (2010) as “when students from two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes” (p. 7).

Interprofessional teamwork is “the levels of cooperation, coordination and collaboration characterizing the relationships between professions in delivering patient-centered care” (IPEC, 2011, p. 2).

Intraprofessional refers to activities involving members of a single profession.

Simulation is “a situation in which a particular set of conditions is created artificially in order to study or experience something that is possible in real life; or a generic term that refers to the artificial representation of a real world process to achieve educational goals via experimental learning” (Flanagan, Nestel, & Joseph, 2004).

VARIABLES

Independent variables

The independent variable of *intraprofessional simulation* was completed by the control group of nursing students. The independent variable of *interprofessional simulation* was completed by the treatment group that included nursing, PT, and pharmacy students. The disciplines of 1) nursing; and 2) other health professions (comprised of PT and pharmacy) also were independent variables.

Dependent variables

The dependent variable of *teamwork competencies* was measured using the Team Skills Scale before and after the intervention.

SUMMARY

Despite increased recognition of the essential role that effective teamwork plays in the delivery of safe, high-quality patient care, academic institutions have yet to achieve the educational reforms necessary to prepare health professionals to work together collaboratively (Josiah Macy Jr Foundation, ABIM Foundation, & Robert Wood Johnson Foundation, 2011). The Health and Medicine Division (HMD) of the National Academies of Sciences, Engineering, and Medicine (formerly known as the Institute of Medicine) and the World Health Organization have endorsed IPE as an essential approach to improve collaborative practice with the end goal of improving health care outcomes. While interest in transforming health professions education has been increasing, advancements in IPE have been slow (IPEC, 2011). Educational institutions struggle to overcome a multitude of barriers to implementing IPE, indicating a need for more research to guide the design, implementation, and evaluation of IPE interventions.

The purpose of this pilot study was to assess the efficacy of an educational intervention aimed at improving subjects' interprofessional teamwork competencies. The study addressed current gaps in the literature by using a controlled design that compared two approaches to an educational intervention with a psychometrically developed instrument. Findings of the study can be used to further advance the development of effective interprofessional educational methods.

Chapter 2: LITERATURE REVIEW

LITERATURE REVIEW

A scholarly review of the literature was conducted to critically evaluate existing knowledge regarding interprofessional education in areas relevant to this current study. Databases used in the search included Cumulative Index for Nursing and Allied Health (CINAHL) Complete, ProQuest, Google Scholar, PubMed, MEDLINEplus, ERIC (EBSCO), Cochrane Library, and PsycINFO. Search terms used to locate relevant literature included interprofessional education, interdisciplinary education, interprofessional competencies, collaboration, teamwork, team building, team skills, team training, communication, simulation, discharge planning, care planning, care plan, attitudes, patient safety, self-efficacy, nursing education, education, and frameworks. The search strategy was limited to the English language and focused primarily on the past five to ten years. Seminal works prior to 2005 also were included.

The findings of the literature review will be presented in three major sections: 1) the status of instruments used in IPE research; 2) commonly measured outcomes; and 3) IPE research evaluating teamwork.

STATUS OF INSTRUMENTS USED IN IPE RESEARCH

Despite a substantial increase in IPE studies in recent years, the usefulness of much of the research has been limited by the instruments used to measure outcomes. The foremost concern is a lack of IPE instruments available with established psychometric properties (IOM, 2015; Khan, Shahnaz, & Gornathi, 2016; Thannhauser, Russell-Mayhew, & Scott, 2010). An additional concern is that the limited number of instruments

available with established reliability and validity often measure lower levels of learning such as attitudes and perceptions regarding IPE. In order to advance the field of IPE research, more studies are needed that use psychometrically validated instruments and measure the impact of IPE initiatives on higher levels of learning such as improvements in interprofessional skills and behaviors.

Lack of Instruments with Established Psychometric Properties

An essential component to establishing the credibility of a quantitative study is accurate measurement of the variables of interest (DeVellis, 2012; Portney & Watkins, 2009). The first prerequisite to accurate measurement is reliability, which refers to the consistency of an instrument and the extent to which it is free from error. The second prerequisite is validity, which refers to the whether an instrument is measuring what it is intended to measure. The development and testing of an instrument should include proper protocols of analysis to ensure adequate standards of reliability and validity (Portney & Watkins, 2009). Absent establishment of these two psychometric properties, the accuracy of data cannot be assumed (DeVellis, 2012).

Despite the accepted standards for ensuring accurate measurement, reviews of the IPE literature have noted widespread use of instruments lacking evidence of sound psychometric properties. The Canadian Interprofessional Health Collaborative (CIHC) reviewed the literature addressing available instruments designed to measure IPE and collaborative practice and found 119 differently named evaluation instruments/methods in 20 projects (CIHC, 2009). The CIHC also noted that most of the instruments were newly developed and not validated.

Gillan, Lovrics, Halperin, Wiljer, and Harnett (2011) reviewed 163 articles that contained IPE evaluation tools and found 33 articles with relevant IPE instruments. Findings regarding reliability were not addressed in 13 of the articles (41.9%), validity was not addressed in 15 (48.4%), and neither reliability nor validity was addressed in ten (32.3%) of the articles. The remaining articles lacked comprehensive information about the reliability and/or validity of the instruments used. Thannhauser et al. (2010) reviewed 23 instruments that measured attitudes, readiness, or interactional factors needed for interprofessional collaboration. The authors noted that despite the availability of numerous tools for measuring different aspects of IPE and interprofessional collaboration, few exist with sufficient time spent on development.

Barr, Koppel, Reeves, Hammick, and Freeth (2005) noted that the scarcity of validated instruments and a lack of instruments relevant to the purpose of individual studies caused many researchers to resort to developing “homemade” (p. 142) instruments. Thistlewaite, Kumar, Moran, Saunders, and Carr (2015) reviewed 90 IPE studies and noted the need to move away from the use of ad hoc scales and questionnaires; instead, they recommended the use of psychometrically developed instruments as a means of improving evaluation methods. The 2015 IOM report, *Measuring the Impact of Interprofessional Education*, stated that “given the numerous IPE studies that have been conducted using instruments that lack documented reliability and validity, it is apparent that much confusion remains over appropriate instruments for measuring IPE” (p. 46).

Use of Validated Instruments

While instruments with established validity and reliability do exist, many of them focus on lower levels of learning by measuring learner reactions, attitudes, and perceptions as presented in the Kirkpatrick framework of learning (Kirkpatrick, 1996). Kirkpatrick originally developed a framework to evaluate learner outcomes based on four levels of learning that are conceptualized as a hierarchy ranging from: 1) reaction; 2) learning; 3) behavior; and 4) results (Thistlethwaite, Kumar, Moran, Saunders, & Carr, 2015). The modified Kirkpatrick framework developed by Barr, Koppel, Reeves, Hammick, & Freeth (2005) is intended for use in IPE and provides a structure for assessing the level of learning outcomes that an instrument is intended to measure. Barr et al.'s modification of the Kirkpatrick framework has been used increasingly in IPE (Reeves, Boet, Zierter, & Kittu, 2015). Level one is reactionary and includes learners' views regarding the learning experience and can be linked to learners' satisfaction with an IPE activity. The second level includes changes in attitudes and perceptions (2a), and the acquisition of knowledge and skills (2b). The third level identifies behavioral changes that take place as individuals transfer interprofessional learning to practice, and the fourth level encompasses changes in organizational practice (4a), and benefits to patients/clients (4b) (Barr et al., 2005). This framework is incorporated in the IOM's Interprofessional Learning Continuum Model (IOM, 2015).

Evidence of the use of validated instruments that predominately measure level 2a (attitudes and perceptions) are commonly found in IPE literature. Thannhauser et al.'s (2010) review of 23 IPE instruments identified the Readiness for Interprofessional Learning Scale (RIPLS), and the Interdisciplinary Education Perception Scale (IEPS) as

the two most commonly used psychometrically validated instruments. The RIPLS is a 19-item tool that uses a 5-point scale to assess the attitudes and perceptions of students to determine readiness for interprofessional learning and (National Center for Interprofessional Practice and Education, 2013). The RIPLS has demonstrated a strong reliability with Cronbach's alpha of 0.90, and demonstrated high content validity (Parsell & Bligh, 1999). The IEPS is an 18-item tool with a 5-point scale used to assess student perceptions of IPE experiences (National Center for Interprofessional Practice and Education, 2013). The IEPS demonstrated strong reliability with an overall alpha of 0.87, and has established content validity via faculty experts and factor analysis (Luecht, Madsen, Taugher, & Petterson, 1990).

Gillan et al. (2011) reviewed 184 articles and identified the Attitudes Towards Healthcare Teams Scale (Hyer, Fairchild, Abraham, Mezey, & Fulmer, 2000), the University of West England Interprofessional Questionnaire (Pollard et al. 2004), and the IEPS, as the most frequently used instruments in their review of 33 instruments. The Attitudes Towards Healthcare Teams Scale (ATHCTS) has demonstrated strong reliability with an overall Cronbach's alpha of 0.87 (Hyer et al., 2000), and demonstrated construct validity (Heinemann, Schmitt, Farrell, & Brallier, 1999). The ATHCTS is a 20-item tool using a 4-point scale that assesses team members' perceptions of the quality of care delivered by the health care team (National Center for Interprofessional Practice and Education, 2013). The University of West England Interprofessional Questionnaire (UWE- IPQ) is designed to assess changes in the attitudes and perceptions of students regarding interprofessional learning over the course of their training (National Center for Interprofessional Practice and Education, 2013). Cronbach's alpha for the instrument's

three core scales ranged from 0.76 to 0.84, and concurrent validity was established using existing instruments from the field (Pollard, Meirs, & Gilchrist, 2004). No instrument was identified that could stand alone to assess learner outcomes across the levels of the modified Kirkpatrick framework, and none of the instruments assessed included items that assessed the higher levels of learning (levels three or four) (Gillan et al. 2011).

Gillan et al. (2011) concluded that given the restraints of existing instruments, the development of a toolkit to assist researchers in the development of sound evaluations would be beneficial. Responding to the recognition of the need to gather and disseminate information on available IPE evaluation tools, the National Center for Interprofessional Practice and Education (Nexus) website began providing a repository of existing measurements including available psychometric properties to the public in 2012 (National Center for Interprofessional Practice and Education, n.d.; Schmitz & Brandt, n.d.). By providing a resource center, the aim of Nexus is to support IPE research efforts, including improved evaluation methods (National Center for Interprofessional Practice and Education, n.d.).

Conclusion

The lack of quality assessment instruments has been a barrier to the successful design and implementation of IPE programs (Khan et al., 2016). In order to adequately evaluate the impact IPE interventions, the use of assessment instruments that accurately measure higher levels of learning such as students' ability to deliver collaborative care are required (Kahaleh et al., 2015).

MEASUREMENT OF OUTCOMES

A review of the literature confirms that much of the existing research lacks measurement of higher level learning outcomes such as knowledge, skills, competencies, and behavioral change, thereby inhibiting the development of evidence-based practice for IPE. Numerous researchers have evaluated lower levels of learning such as student satisfaction following IPE interventions (level one), perceptions regarding the value of IPE (level 2a), and attitudes toward IPE (level 2a). A systematic review evaluating the state of IPE research from 1966 to 1998 by Barr, Hammick, Koppel, and Reeves (1999) revealed that the rigor of studies varied widely, and measurement of outcomes had yet to produce evidence regarding the effectiveness of IPE. By 2010, in spite of a growing body of research, empirical evidence remained insufficient to identify the learning processes that occur within IPE (Reeves, 2010). Research continued to be largely restricted to surveys of individuals' perceptions of one another, resulting in limited understanding of the complexities involved in collaborative practice (Reeves, 2010). While research has continued to progress since 2010, Reeves (2016) concluded that there has been a continued tendency to conduct research that is based on perceptions only, rather than more accurate measures of interprofessional interactions.

Measurement of Readiness for IPE

One commonly measured concept is student readiness for learning interprofessional skills using the Readiness for Interprofessional Learning Scale (RIPLS) (Dacey, Murphy, Anderson, & McCloskey, 2010; Hanyok, Walton-Moss, Tanner, Stewart, & Becker, 2013; Hertweck et al., 2012; Reilly et al., 2014; Ruebling et al., 2014). A number of researchers have found that participation in an IPE activity improves

student readiness for IPE (Dacey et al., 2010; Reilly et al., 2014; Sullivan et al., 2015; Wang, Shi, Bai, Zheng, & Zhao, 2015). Dacey et al. (2010) used the RIPLS to compare student readiness for learning before and after an interprofessional service-learning course in a sample of baccalaureate nursing, health psychology, premedical, and pharmacy students. Two sample *t*-tests were used to compare RIPLS scores of students who took the IPE course to those who did not take the IPE course. The findings reflected that attitudes toward team collaboration were significantly higher ($p < 0.001$) in students who took the IPE course, indicating positive effects gained from participation in an IPE course. Reilly et al. (2014) adapted the RIPLS to compare readiness among seven health professions programs before and after an educational intervention in geriatric home care. In the sample of 67 students from the disciplines of medicine, dentistry, pharmacy, physician assistant, social work, occupational therapy, and physical therapy, each of the disciplines improved overall scores of readiness following the intervention. However, only one item (regarding their understanding of their role in an interprofessional health care team) demonstrated a statistically significant change ($p < .001$) across all disciplines in the posttest. Using a community fall prevention event as an IPE activity, Sullivan et al. (2015) used the RIPLS to compare pre- and posttest scores of 46 students from pharmacy, physical therapy, nursing, and physician assistant programs. Statistical significance was noted on six items ($p < .05$) when comparing pre- and posttest mean scores, revealing increased readiness as a result of the intervention. Students' written reflections also indicated receptiveness to IPE and interprofessional teamwork following the activity.

Some studies have compared the readiness for IPE of students from various health professions (Hertweck et al., 2012; Sullivan et al., 2015). Hertweck et al. (2012) compared the attitudes toward IPE of physician assistant (PA) students to occupational therapy, physical therapy, and counseling students using the RIPLS. The findings showed that the PA students had lower readiness scores than each of the other disciplines. PA students scored significantly lower on the three of the four subscales (Roles and Responsibilities, Negative Professional Identity, and Teamwork and Collaboration), as well as the RIPLS total score. The authors noted that the findings were consistent with studies by Curren, Sharpe, Forristal, and Flynn (2008), and Horsburgh, Lamdin, and Williamson (2001) that compared medical students to other health professions students and found similar differences. The authors speculated that the lower scores of the PA and medical students might be from an attraction of individuals to these professions who may not value working as a team with other health care professions. Sullivan et al. (2015) also noted that the physical therapy students demonstrated the greatest improvement in RIPLS scores compared to the pharmacy, nursing, and physician assistant students. The difference in levels of experience of the physical therapy students (who were newly enrolled at the time of the IPE activity) as compared to the other disciplines (who were closer to completion of their degree) was suggested as a potential reason for this finding.

Other studies have compared groups without an IPE intervention to treatment groups with an IPE intervention to determine the effects on readiness. Ruebling et al. (2014) evaluated questionnaires that included items from University of West England Interprofessional Questionnaire (UWE-IPQ) and the RIPLS to determine attitudes and perceptions toward IPE. The comparison group consisted of 202 graduating health

professional students with no IPE experience. The treatment group consisted of 305 first year students from the same health professions as the comparison group who participated in an introductory IPE course. Results of independent samples t tests demonstrated significant changes before and after the introductory IPE course ($p \leq .05$). The authors noted that both the pre- and posttest attitudes of the treatment group were higher than the comparison group, supporting previous findings that students have more positive attitudes toward IPE at the beginning of their programs than at the end of their programs when they have not had any IPE courses. The findings support the importance of beginning IPE activities early in health professions curricula, and continuing IPE experiences as students matriculate through their programs. Wang et al. (2015) used the RIPLS to detect differences in readiness among nursing students using a randomized controlled trial to assess the effects of a simulation-based IPE program. The control group consisted of 27 nursing students who completed a traditional course in which they practiced operating room nursing skills under the supervision of an experienced instructor. The treatment group consisted of 28 nursing students and 46 medical students who were arranged into small groups consisting of one to two nursing students and three to four medical students to perform surgical procedures as a team. The pretests showed no significant differences on the RIPLS between the control and treatment group. However, the posttests of the nursing students in the treatment group demonstrated a significant difference ($p < .05$) on three items pertaining to attitudes toward teamwork and collaboration, and professional identity. Responses to open-ended questions also revealed that the students in the treatment group valued the IPE experience and desired future IPE activities.

Satisfaction with IPE

Another perception in multiple studies was participant satisfaction with IPE experiences. Studies in this category range from simple surveys using Likert type questions to qualitative studies exploring student perspectives regarding IPE activities. Of the IPE research conducted prior to 1999, Barr et al. (1999) noted that of the few published articles on IPE initiatives, “some were little more than feedback on student satisfaction” (p. 537). Studies to date have continued to assess student satisfaction using a variety of methods.

Some researchers used survey questions and open-ended written comments to evaluate satisfaction. Kowitlawakul et al. (2014) used the Satisfaction with Simulation Experience Scale (SSES) following an IPE intervention with 15 advanced practice nurses and 21 internal medicine residents. On a Likert scale ranging from one to five, the median score for overall satisfaction with the program was high at 4.21 among all participants. No significant differences were noted in satisfaction scores based on age, gender, race, or profession. Responses to open-ended questions of 27 participants also revealed satisfaction with the IPE program, including enjoyment of the collaborative experience and satisfaction with the simulation experience. Curran, Sharpe, Flynn, and Button (2010) examined the effect of a new IPE curriculum on overall student satisfaction. Students from medicine, nursing, pharmacy, and social work were invited to complete a satisfaction survey following their participation in nine different IPE modules. Mean satisfaction scores for medical students were lower than the other professions in eight of the nine modules. Using ANOVA to test for differences in the mean satisfaction ratings of the different professions, significant findings ($p < .05$) were noted across the

majority of the IPE modules. Open-ended comments on the satisfaction survey were also analyzed using a constant comparison approach. Of the 502 comments, three themes emerged: 1) satisfaction with meeting students from the other professions and learning more about their roles during the learning activities; 2) positive experiences with panel discussion activities; and 3) satisfaction with an activity involving a Simulated Patient. Three themes also emerged from 619 comments regarding learning experiences that could be improved: 1) redundancy between online small-group learning discussion and face-to-face small-group discussion; 2) dissatisfaction with the scheduling of evening activities; and 3) a desire for greater participation of students from other health professions.

Qualitative studies have been used to assess satisfaction with IPE. Mellor, Cottrell, and Moran (2013) used interpretative phenomenological analysis to explore what aspects of the learning environment students perceived to be important factors that contributed to the success of the program. The IPE program included third- or fourth-year undergraduate students from the disciplines of physiotherapy, occupational therapy, pharmacy and nursing. Interprofessional groups of six to eight students participated in learning activities that included case conferences, role-play simulations, and simulated ward rounds. Of the 107 students who participated in the program, 40 students from each of the five professions were randomly selected and invited to participate in an interview. Eight volunteers participated in semi-structured interviews that elicited the perspectives and thoughts of the students regarding their experiences in the program. Three broad themes were identified that outlined how students gained from the IPE experience. The first theme, *environment and participation*, included that the students felt that a warm and

friendly atmosphere facilitated their willingness to participate without fear of being judged. The second theme, *communication and teamwork*, encompassed increased value of interprofessional communication skills, increased confidence with communication skills, and respect for other people's contributions to the team. The third theme, *role identification and context*, involved increased understanding of the roles and responsibilities of other professions, and recognition of how this would contribute to the quality of care delivered to patients. Overall, the students revealed a high level of satisfaction with the program and appreciated the guidance of the facilitators who made the learning experience enjoyable. Limitations of the study included a lack of saturation due to the small number of participants, an imbalanced representation of students from each profession, and self-selection bias (i.e. students with more interest in IPE may have been more likely to participate).

In a qualitative study by Rosenfield, Oandasan, and Reeves (2011), findings regarding satisfaction with an IPE experience were mixed. An exploratory case study approach was used to describe how students from various health care programs experienced their initial exposure to IPE. The IPE activity included approximately 1200 first year students from the disciplines of dentistry, medical radiation sciences, medicine, nursing, occupational therapy, pharmacy, physical education and health, physical therapy, social work, and speech and language pathology. The three-hour IPE seminar included an introduction to IPE, scenarios of positive and negative interprofessional interactions, and group discussions regarding the scenarios. Eight focus groups that included 35 students were conducted over a two year period, and an inductive thematic approach was used to analyze the data. The three themes that emerged included general perceptions of IPE,

perceptions of first-time exposure, and effective IPE. General perceptions included that although students recognized value and merit in IPE, many of them had negative views of the initial three-hour IPE seminar that was attended by nearly 1200 students in a large auditorium. Students expressed that the event was too large to facilitate meaningful interaction with students from other professions, and that the scenarios presented were not realistic or relevant to their future professional practice. Suggestions that emerged from student concerns about the event included: 1) the use of more small-group sessions to create a more interactive and engaging learning environment; 2) decreased reliance on lecture-based learning; 3) events held throughout the year to establish meaningful relationships; and 4) integration of IPE into the existing curricula. The authors highlighted the importance of educators eliciting in-depth feedback from students beyond those collected from responses to attitudinal questionnaires in order to inform future directions of IPE. Limitations of the study included an inability to generalize the findings as the study took place within a single institution, and the focus groups were conducted a year apart with students from separate programs.

Attitudes toward Interprofessional Practice

The assessment of attitudes toward interprofessional practice has been the focus of numerous studies. While the majority of researchers found positive attitudes toward interprofessional practice, some revealed mixed results, and others found either no improvement in attitudes or negative attitudes.

A number of researchers reported positive student attitudes toward interprofessional practice (Brock et al., 2013; Ruebling et al., 2014; Shrader et al., 2016; Sok, Siau, Wen, & Tang, 2014; Wamsley et al., 2012). The Attitudes Toward Health

Care Teams Scale (ATHCTS) was used by Wamsley et al. (2012) and Shrader et al. (2016) to assess attitudes prior to and following an IPE intervention. The ATHCTS is a 20-item validated instrument that measures perceptions regarding quality of care delivered by health care teams and attitudes toward physicians' authority in teams (National Center for Interprofessional Practice and Education, 2013). Wamsley et al. (2012) used a quasi-experimental design to compare the attitudes of 101 students from dentistry, medicine, nursing, and physical therapy before and after a four-hour interprofessional standardized patient exercise. A comparison group of 152 students who did not participate in the exercise also completed the ATHCTS. Comparable scores were noted between pretest scores of the treatment and the comparison group within professions, demonstrating that the two groups were similar prior to the exercise. Significant increases in team value scores were noted from pre- to posttest scores in the treatment group for all professions ($p < 0.0001$). Comparison of ATHCTS posttest scores of the treatment group with the scores of the non-participants showed significant differences in team value scores, indicating that the intervention had a positive impact on attitudes. Shrader et al. (2016) used the ATHCTS to evaluate the impact of communication simulations on pharmacy student attitudes. Students were randomly assigned to one of three simulations. The first simulation included a Telephone SBAR (acronym for informing the provider with the patient *situation, background, assessment, and recommendation*) in which nursing and pharmacy students collaborated on a variety of patient scenarios ($n = 76$ pharmacy students). The second simulation included a Medication Therapy Management simulation in which medical and pharmacy students ($n = 43$ pharmacy students) communicated through e-mail to develop an interprofessional

care plan for a patient in a community setting. The third simulation included an Online Transition of Care simulation involving dietetic, nurse practitioner, occupational therapy, and pharmacy students ($n = 43$ pharmacy students). The simulation involved a case study in which students conducted a synchronous video conference to develop an interprofessional care plan. Data were analyzed of 132 participants who completed both the pre and posttest ATHCTS. Analysis using Mann-Whitney U revealed significant positive changes for five out of the 20 items ($p < .05$), each pertaining to the factor of quality of care.

Brock et al. (2013) observed positive changes in attitude using two validated instruments: the TeamSTEPPS® Teamwork Attitudes Questionnaire (T-TAQ) and the Attitudes, Motivation, Utility and Self-Efficacy (AMUSE) instrument. Both instruments were administered before and after a four-hour intervention that included a 40 minute training session that included TeamSTEPPS® teamwork principles followed by participation in an interprofessional simulation session. Data were analyzed from 149 students from the disciplines of medicine, nursing, pharmacy, and physician assistants who completed both the pre and posttests. Within group differences were analyzed using paired *t*-test and analysis of variance (ANOVA) was used to assess differences between groups. Significant positive changes were noted in the AMUSE total score ($p < .001$), and each of the four subscales ($p < .001$ to $p = .005$), with effect sizes ranging from 0.40 to 0.70. Significant positive changes were also noted on the TAQ total score ($p < .001$) and three of the four subscales for Situation Monitoring ($p < .001$), Team Structure ($p = .002$), Communication ($p = .002$), and Mutual Support ($p = .003$). Effect sizes for the T-TAQ ranged from 0.26 to 0.35.

As previously discussed in the findings regarding readiness for IPE, the study conducted by Ruebling et al. (2014) also detected positive changes in attitude. Independent sample *t*-tests that compared students that participated in an introductory IPE course to a control group found that the introductory course had a significant effect on improving attitudes ($p < .001$). The control group, which consisted of graduating health professional students, did not participate in any IPE courses during their academic preparation. Control group scores reflecting attitudes toward interprofessional practice were significantly lower than students who participated in the introductory course ($p < .001$). Although the pretests of the students who participated in the introductory course already reflected positive attitudes, posttest scores regarding attitude became even higher following the course. The study demonstrated some evidence that introduction of IPE early in the curricula may have an effect in maintaining a positive attitude.

Other studies have revealed mixed findings regarding attitudes toward interprofessional practice (Maguire, Bremner, Bennett, & VanBrackle, 2015; McCaffrey, Tappen, Lichtstein, & Friedland, 2013; Robben et al., 2012). In a mixed methods study that evaluated the efficacy of a nine-hour IPE program, Robben et al. (2012) measured changes in attitudes using the Attitudes Toward Health Care Teams (ATHCT) scale, the Interprofessional Attitudes Questionnaire (IAQ), and semi-structured interviews. The intervention included three interactive interprofessional workshops that involved seven health care professionals including general practitioners, pharmacists, nurses, physiotherapists, occupational therapists, dieticians, and gerontological social workers. The ATHCT scale scores did not change significantly following the educational program ($n = 78, p = .317$). However, for the IAQ scale, overall mean scores did improve

significantly following the educational program ($n = 80$, $p < .001$). Mixed responses were also noted in the ten interviews that were conducted to evaluate changes in attitudes. Some of the participants stated that their attitudes had not changed, while others reported an improved view of other disciplines and their contribution toward improving the care provided to patients. Maguire et al. (2015) used a quasi-experimental time series nonequivalent control group design to evaluate the effect of TeamSTEPPS® training with undergraduate nursing students. The TeamSTEPPS® Teamwork Attitude Questionnaire (T-TAQ) was used to measure attitudes initially and three times throughout the curriculum. The intervention included a total of ten hours of TeamSTEPPS® curriculum training combined with simulations that incorporated teamwork principles over the course of four semesters. The comparison group completed the T-TAQ and was comprised of final semester students that did not complete the formal team training. A comparison of attitudes between the comparison group with no formal training and the treatment group prior to formal team training revealed no significant differences, indicating similar attitudes prior to the intervention. To evaluate the effect of the TeamSTEPPS® training across the curriculum, a repeated measures Analysis of Variance was used to assess for differences in mean scores for the five subscales across the three time periods. Significant differences were noted across the three time periods for the subscales for Team Structure ($p = .022$) and Situation Monitoring ($p = .021$). Two-sample t -tests were used to assess differences in attitudes toward teamwork of the final semester students without formal TeamSTEPPS® training to first semester students with formal TeamSTEPPS® training. The Team Structure and Situation Monitoring subscale means were significantly larger for the first semester students with the training, but no

significant findings were noted for the subscales of Leadership, Situation Monitoring, or Communication. Overall, the data analysis revealed that the greatest gain in attitudes occurred in the first semester when the initial six hours of TeamSTEPPS® training occurred. An unexpected finding was that the Mutual Support subscale was significantly higher for final semester students without formal TeamSTEPPS® training when compared to the first semester students with formal TeamSTEPPS® training. A study limitation that may have influenced findings is that changes in attitude could be influenced by exposure to formal or informal teamwork training occurring in work place settings since students often work in local health systems during nursing school. Mixed findings were also noted by McCaffrey et al. (2013) in a two-group treatment/control pre and posttest design to measure changes in attitudes. A convenience sample of second-year medical and family nurse practitioner students were recruited for the study, and the participants chose to be in the trainee or non-trainee group. Of the 120 students who completed the project, 91 were trainees (58 medical and 33 nurse practitioner students) and 29 were non-trainees (16 medical and 13 nurse practitioner students). The Attitudes Toward Interdisciplinary Teams Scale and Attitudes Toward Collaboration Scale were used at baseline and following the intervention. At baseline, the trainee group had more positive attitudes, and nurse practitioner students had more favorable attitudes than medical students. No significant improvements were observed for either scale from pre to post measures. However, open-ended questions about the experience from the trainee responses noted improved attitudes toward interprofessional teamwork and collaboration.

Other studies have observed either no improvement in attitudes or negative attitudes following an IPE intervention. Curran et al. (2010) used the Attitudes towards

Interprofessional Health Care Teams scale and the Attitudes towards Interprofessional Education scale to evaluate students' attitudes towards teamwork and IPE. Undergraduate students from the disciplines of nursing, medicine, pharmacy, and social work completed up to nine IPE modules over a three year period. Each module lasted two weeks and incorporated case-based asynchronous e-learning, panel discussions with an interprofessional healthcare team, and face-to-face small group learning. The researchers collected data annually for three consecutive years to assess the longitudinal effect of introducing IPE in the undergraduate curriculum. Comparison of mean values across professions of both scales showed no significant changes in students' attitudes over time. Students exposed to a greater number of modules did not display any significant changes in attitudes in comparison to students exposed to less modules, indicating that the level of exposure to the IPE curriculum also appeared to have no impact on attitudes. Limitations of the study included the absence of a control group to compare the actual effect of the intervention on attitudes toward teamwork or IPE.

Delunas and Rouse (2014) found that negative attitudes toward interprofessional communication and collaboration persisted despite a three semester IPE program. A quasi-experimental pre and posttest design was used to assess the attitudes of medical and nursing students using the Jefferson Scale of Attitudes Toward Physician-Nurse Collaboration scale and the Collaboration and Satisfaction About Care Decisions (CSACD) scale. The control group consisted of second-year medical students ($n = 18$) and junior nursing students ($n = 21$), and the participant group consisted of first-year medical students ($n = 18$) and junior nursing students ($n = 17$). Students in the treatment group were placed in Health Care Teams and followed a patient at a long-term care

facility for three semesters. Medical students had significantly less positive attitudes than the nursing students at the beginning of the study. At the end of the study, the attitudes of both medical and nursing students became less positive. Significant negative changes in attitude were noted among medical students from both the control and treatment group. Limitations of the study include that the researchers were unable to collect data for the medical student control group at the beginning of the study, so it is unknown if the less positive attitudes of medical students at the end of the study were related to the IPE experience or normal maturation. The researchers noted that social interaction between the first and second-year medical students likely threatened the internal validity of the study. Furthermore, time constraints for studying for national board examinations placed on second-year medical students may have impacted attitudes.

In a study exploring the relationship between exposure to clinical practice and attitudes toward interprofessional health care teams, Makino et al. (2013) compared the attitudes of undergraduate students to alumni who participated in the same IPE program. A modified Attitudes Toward Health Care Teams Scale (ATHCTS) was used to compare the attitudes of undergraduate students to the alumni. The sample of undergraduate students consisted of nursing ($n = 257$), laboratory sciences ($n = 121$), physical therapy ($n = 64$), and occupational therapy ($n = 59$), and the alumni sample consisted of nursing ($n = 101$), laboratory sciences ($n = 47$), physical therapy ($n = 39$), and occupational therapy ($n = 26$). An overall Cronbach's alpha for the modified ATHCTS for the study was 0.782. A comparison of overall mean scores of the modified ATHCTS between undergraduate students using Mann-Whitney U revealed that the attitudes of alumni were significantly lower than the undergraduate students ($p < .001$). The results suggest that exposure to

clinical practice after graduation may result in more negative attitudes toward interprofessional teamwork, and that continued IPE training in workplace settings may be necessary to maintain positive attitudes.

Conclusion

The continued tendency to conduct research focused on student readiness for IPE, satisfaction with IPE, and attitudes toward interprofessional practice has hindered progress toward establishing practical guidelines for healthcare educators to plan and implement effective IPE activities. However, a growing recognition of the need to establish an evidence base for IPE has led to some studies that have evaluated students' ability to deliver collaborative care, including teamwork competencies.

IPE RESEARCH EVALUATING TEAMWORK

With increasing attention on the role of teamwork and communication failures on adverse patient events in recent years, a growing number of interventions aimed at improving teamwork have emerged (Salas & Rosen, 2012). A number of approaches have been assessed for their impact on teamwork competencies, including the incorporation of TeamSTEPPS® training in curricula, interprofessional simulations, and interprofessional clinical experiences. Despite some initial progress in the science of team training in healthcare, many questions remain about how team training is best integrated into the educational experience (Salas & Rosen, 2012).

Use of TeamSTEPPS® Training in Curricula

Several studies have used the Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS®) framework to improve teamwork competencies. Developed with funding by the Agency for Healthcare Research and Quality (AHRQ)

and through partnership with team experts including the Department of Defense (DOD), the TeamSTEPPS® program is designed to improve patient safety by improving teamwork skills among health care professionals (AHRQ, 2014). While the TeamSTEPPS® program has proven to be effective in improving teamwork and outcomes in health care settings, research has yet to determine the most effective way to incorporate this training in the health education continuum (Hobgood et al., 2010).

Seeking the most effective and cost-efficient approach to delivering the TeamSTEPPS® training to pre-licensure nursing and medical students, Hobgood et al. (2010) compared four pedagogical methods for delivering the TeamSTEPPS® content. Fourth-year medical students (n = 235) and final-semester nursing students (n = 203) were randomized to one of the four educational intervention groups, with proportionate representation of student disciplines in each group. All participants began the full-day teamwork training by attending a 90-minute didactic lecture that focused on three core components of the TeamSTEPPS® program: Situational Awareness, Shared Mental Model, and Leadership. Participants were then separated into their assigned cohort for the remaining training which began with an additional 60 minutes of teamwork training. Students in cohort A (n = 80) participated in a two-hour, high-fidelity human patient simulation involving two interactive patient care scenarios that incorporated the core concepts of the didactic training. Debriefing focused on team cooperation and behaviors that were encouraged in the didactic training. Cohort B (n = 79) participated in the same two patient scenarios used in Cohort A using low-fidelity methods. The scenarios were paper-based and were performed using role play with cue cards and visual prompts but no mannequin. Debriefing was conducted using the same approach as Cohort A. Cohort C (n

= 140) attended a lecture that incorporated videotaped scenarios from the TeamSTEPPS[®] curriculum. An Audience Response System (ARS) was used to display anonymous participant responses to questions in order to facilitate group discussion aimed at improving student understanding of key teamwork behaviors. Cohort D (n = 138) served as the control group for the study. Participants in Cohort D watched the same lecture slides and TeamSTEPPS[®] video as Cohort C participants. However, the ARS was not used, and the faculty presenter did not initiate questions or facilitate group discussion. The last activity for the day for all participants included a videotaped 20 minute standardized patient exercise designed to elicit teamwork skills. Teamwork knowledge, skills and attitudes were measured using four instruments: a 36-item CHIRP-Teamwork Attitudes instrument, a 12-item Teamwork Knowledge test, a 10-item Standardized Patient Evaluation, and a 20-item modified Mayo High Performance Scale. The findings revealed no substantial differences between the four educational methods, suggesting that a variety of educational methods may yield substantial increases in basic learner competencies in core teamwork knowledge and attitudes. An inter-rater reliability between clinician raters and standardized patient scores ranged from 0.683 to 0.968 for the standardized patient evaluation of teamwork skills, and the modified Mayo High Performance Teamwork Scale inter-rater reliabilities with Interclass Correlation Coefficients ranged from 0.83 to 1.0 on 19 of the 20 items. No information was given regarding the reliability or validity of the remaining instruments, leaving the accuracy of the study conclusions in question. An additional limitation of the study cited by the authors was that the participants were not observed longitudinally to compare the lasting impact of the four educational methods.

Brock et al. (2013) used the TeamSTEPPS[®] program as the educational framework for an IPE activity aimed at improving team communication skills among fourth-year medical (n = 73), third-year nursing (n = 46), second-year pharmacy (n = 23), and second-year physician assistant (n = 7) students. The intervention took place during an Interprofessional Team Capstone experience that began with an icebreaker activity designed to introduce interprofessional teamwork followed by 40 minutes of didactic instruction on patient safety and TeamSTEPPS[®] communication skills. The participants were then divided into interprofessional teams to complete three simulated exercises (lasting approximately 15 minutes each) involving an asthma exacerbation of a teenager, congestive heart failure in an elderly male, and supraventricular tachycardia in a male post-surgery. Debriefings were conducted to review what had been learned in the simulations. Significant positive changes in attitudes toward teamwork were detected using the TeamSTEPPS[®] Teamwork Attitudes Questionnaire (T-TAQ) and the Attitudes, Motivation, Utility and Self-Efficacy (AMUSE) instrument. The aggregate T-TAQ achieved acceptable internal consistency with a Cronbach's alpha of 0.93. The AMUSE also achieved acceptable internal consistency with a Cronbach's alpha of 0.90. Participants were asked to describe their most valuable learning experience from the training. Three themes emerged including: 1) the value in the opportunity to work with students from other disciplines; 2) the value of learning and practicing communication skills in a supportive environment; and 3) the value of practicing skills within an interprofessional team. Strengths of the study include a large sample size (n = 149) and the use of instruments that demonstrated strong internal consistency. Limitations of the

study include the lack of a control group and the measurement of attitudes rather than skill attainment.

Maguire et al. (2015) used a longitudinal approach to measure the effects of TeamSTEPPS® training on undergraduate nursing students across four semesters. The T-TAQ was completed initially and repeated three times throughout the curriculum. A comparison group of final semester nursing students who had not received formal team training also completed the T-TAQ. The intervention involved a total of 10 hours of TeamSTEPPS® training combined with simulations that incorporated teamwork principles at selected times over the course of the curriculum. During the first semester, the students completed six hours of TeamSTEPPS® training divided over two days as well as the completion of a low fidelity simulation scenario focused on reducing the risk of health care associated infections. In the second semester, students reviewed specific tools from the TeamSTEPPS® principles and completed a one hour, low fidelity simulation appropriate for an adult health nursing clinical course. Students also viewed video vignettes provided in the TeamSTEPPS® curriculum regarding a patient in a hypothyroid crisis, and were asked to role-play the introduced communication techniques within a simulated medical unit. In the third semester, a high fidelity simulation was included in the parent and child clinical nursing course. A two-hour TeamSTEPPS® module included discussion regarding their unique experiences regarding the teamwork principles learned to date, and specific tools that were highlighted including briefs, huddles, and debriefs. Following the discussion, the students completed a simulation regarding the care of a patient with Postpartum Hemorrhage. Students observing the simulation were asked to document the TeamSTEPPS® strategies demonstrated by the

students involved in the simulation. In the final semester, students participated in a one hour TeamSTEPPS® training that consisted of a brief review of previous sessions, followed by application of the TeamSTEPPS® concepts to team error disclosure. Low fidelity scenarios were used for students to plan a team disclosure for the disclosure of errors of commission, omission, communication, context and diagnostic categories. Following this activity, students completed the final T-TAQ.

Several important findings were noted by Maguire et al. (2015). First, a repeated measures ANOVA was used to assess the mean scores for the five subscales of the T-TAQ. Significant differences across the three time periods on Team Structure ($p = .022$) and Situation Monitoring ($p = .021$) were noted. Second, two-sample *t*-tests were used to assess the differences in teamwork attitudes between the control group and treatment group following the TeamSTEPPS® training. The Team Structure and Situation Monitoring subscale means were significantly larger in the treatment group with TeamSTEPPS® training (Team Structure $p < .001$ and Mutual Support $p = .002$). However, the Mutual Support subscale mean was significantly larger for the control group (mean of 4.54 control group versus 4.24 treatment group), and the means for the Leadership and Communication subscales were not significantly different between the two groups. Additionally, two-sample *t*-tests revealed no significant differences between the differences in teamwork attitudes between the treatment group prior to TeamSTEPPS® training and the control group without TeamSTEPPS® training. The authors also noted that the largest gain in improved attitudes toward teamwork were noted after the initial six hours of content, while the remaining four hours helped to maintain the initial improvement in attitudes. Strengths of the study include the

evaluation of teamwork attitudes over time after the introduction of the TeamSTEPPS® principles, and the use of a validated instrument. Limitations of the study included voluntary student involvement in the course under study versus it being part of required coursework. Another limitation of the study was the possible confounding variable of students working in local health systems as employees where they may have had formal or informal training in TeamSTEPPS® or other types of patient safety initiatives. Additionally, no findings were presented regarding a power analysis, or the effect sizes of the findings.

Use of Simulation to Develop Teamwork Competencies

Recognizing the teaching opportunities that simulation can provide students in both clinical and interpersonal skills, some researchers have utilized simulation as a means of developing interprofessional teamwork skills. A variety of simulation interventions have been incorporated including mock codes, standardized patients, case studies, and interprofessional care planning.

Studies have demonstrated that mock codes are effective methods for improving the teamwork skills of health care professions students (Dillon, Noble, & Kaplan, 2009; Garbee et al. 2013). Dillon et al. (2009) developed a mock code simulation for fourth-year baccalaureate nursing and third-year medical students that was conducted as part of their scheduled course work. The simulated codes were videotaped, and debriefing followed the exercise. Using a pretest/posttest design and open-ended questions, both quantitative and qualitative data were collected from 82 participants to measure the students' perceptions of collaboration. The Jefferson Scale of Attitudes Toward Physician-Nurse Collaboration and four open-ended questions were used. Reliabilities for

the Jefferson scale were established for the study, with Cronbach's alpha coefficients ranging between 0.84 and 0.96. Using analysis of variance (ANOVA) to detect differences between the pre and posttest scores on the Jefferson scale, statistically significant changes were noted in medical students' scores on two factors: collaboration ($p = .013$), and nursing autonomy ($p = .025$), reflecting a more positive attitude toward collaboration and an improved understanding of the autonomous role of nurses following the intervention. The nursing students had higher pretest Jefferson scale scores than the medical students, indicating a more positive attitude toward collaboration before the intervention. Qualitative data analysis identified common themes of communication and teamwork as essential components of the nurse-physician relationship. The researchers concluded that simulation can be an effective place to integrate interprofessional collaboration in the curriculum.

Garbee et al. (2013) used simulations involving emergency room code scenarios to develop teamwork skills in a convenience sample of students from the disciplines of undergraduate nursing, respiratory therapy, graduate-level nurse anesthesia, and medical students. A quasi-experimental design was used to assess teamwork and communication skills of the students on an interprofessional team using high-fidelity simulation over two consecutive semesters. In the fall semester, 52 students participated in two simulations (Scenario 1, unstable atrial fibrillation; Scenario 2, tension pneumothorax). In the spring semester, 40 of the students returned and the same procedure was followed. The Communication and Teamwork Skills (CATS) assessment instrument, the Teamwork Assessment Scale (TAS), and the Mayo High Performance Teamwork Scale (MHPTS) were used to measure team performance. The CATS has a reported inter-rater reliability

scores of 0.84 for global Team Performance Assessment, and 0.73 for total CATS score intraclass correlation for four judges. Cronbach's alpha for the MHPTS was reported as .85. No psychometric properties were reported for the Teamwork Assessment Scale. During the simulations, trained observers scored team performance using the CATS and the TAS. Following participation in the simulations, participants also rated overall team performance using the TAS and the MHPTS. Paired *t*-tests were used to assess the mean scores of the scales. Findings included significant increases in participant and observer scores in the areas of team-based behaviors, shared mental model, and adaptive communication and response (paired *t*-tests demonstrated $p < .05$). Significant findings were also noted in observer mean scores in the CAT subscales of Communication, Cooperation, Coordination, and Situational Awareness ($p < .05$). Paired *t*-tests were also used to assess skill retention from the fall to spring semester, and demonstrated only slight decreases in scores from the fall to the spring. Limitations of the study included small sample size, attrition due to scheduling conflicts, and use of the TAS scale which has no reported psychometric properties.

Barnett, Hollister and Hall (2011) developed an educational experience designed to introduce students to the role and scope of practice of other health professions, and to participate in an interprofessional team to develop a plan of care. Participants included 100 fourth year medical students, 90 doctoral pharmacy students, 30 students from the occupational, physical therapy, and audiology doctoral programs, and 140 nursing students. The participants were combined into teams of four to six students that included a member from each profession. Each student individually interviewed a standardized patient for approximately ten minutes, while the other team members watched each

interview by live audio-video feed to observe how other health professions students conducted the interview. Each team then spent 30 to 40 minutes developing a plan of care for the patient. Faculty facilitators assisted with debriefings designed to assist students in exploring roles, teamwork, and interprofessional communication. Following the sessions, participants were asked to complete an evaluation of the experience, rating their experience using a Likert-type scale from 4 (strongly agree) to 0 (strongly disagree) and written comments. Student ratings regarding the questions ranged from a mean of 3.26 to 3.59, indicating that the overall experience was valuable. Written comments were overwhelmingly positive, indicating that students found the opportunity to interact with other disciplines useful and that IPE experiences should be offered more frequently.

New et al. (2015) used a full-day simulation in which IP teams to practice interprofessional communication, teamwork, and assigning roles and responsibilities for collaborative practice. A total of 69 students from nursing, pharmacy, and medicine participated in a full-day simulation that incorporated an unfolding case study regarding an 80 year-old man with diabetes who lived alone. IPE teams included eight to ten nursing students, one to two medical students, and two to three pharmacy students. Nursing students presented their assessment findings from a visit to the patient's home to the medical and pharmacy students, and participants then developed a plan of care for the patient. The IP teams then participated in a simulation with the patient and daughter (portrayed by a standardized patient and another actor). Following the simulation, the patient and family member shared their perspectives of the care received. Participants were asked to complete a 10 question survey based on a five-point Likert scale that ranged from strongly agree to strongly disagree. The mean scores for nursing were 4.7

and for medicine/pharmacy were 4.5. Written reflections from the nursing students indicated an increased sense of empowerment when interacting with other disciplines, the importance of providing accurate, timely patient data, and working in teams as a means of improving patient outcomes. Students from medicine and pharmacy also provided feedback that the simulation was an enriching educational experience.

Recognizing a lack of IPE opportunities in the curriculum, Ellman et al. (2012) developed an IPE program that focused on the spiritual and cultural aspects of palliative care for the disciplines of medicine, nursing, chaplaincy, and social work. One of the five learning objectives for the program included that students would “recognize the contributions of all health care professionals and understand the importance of the interdisciplinary team” (Ellman et al., 2012, p. 1241). The program included two components: an online interactive, multimedia case module, and a 90-minute interprofessional workshop. The online module was designed to expose the students to the details of the case study to be used in the 90-minute workshop. Questions at the end of the online module asked the students to reflect on the accomplishments of having an interdisciplinary family meeting that may have not been accomplished otherwise, and the benefits of input from each team member for the care of the patient. The 90-minute workshop utilized small group, interactive, problem-based learning to discuss the case and their profession’s approach to palliative care of patients. A faculty facilitator assisted each group to discuss palliative care challenges and the value of input from each profession in providing care. Each group also conducted a 20-minute simulation of a team meeting in which students developed a plan of care for a different palliative care case. Following the activity, each group presented a summary of their discussions and

completed a written evaluation of the program. The analysis of 309 student responses (205 medical, 65 nursing, and 39 divinity) to nine Likert-scale items indicated a mean response to the five learning objectives greater than 4 on a scale of 1-5, with no statistically significant difference between professions. Content analysis of 211 student reflections indicated that students in each profession recognized the value of the roles of other professionals, and the value of team collaboration. Limitations of the study included that higher level learning outcomes were not assessed, such as acquisition of knowledge and skills or changes in behavior.

Teamwork Training in Clinical Settings

Other studies have evaluated the effects of interprofessional clinical experiences on team skills (Bahnsen, Braad, Lisby, & Sorensen, 2013; Grymonpre et al., 2010); Nisbet, Hendry, Rolls, & Field, 2008). Bahnsen et al. (2013) used a hermeneutic phenomenological approach to explore nursing students' perceptions of a clinical experience in an Interprofessional Clinical Study Unit (ICSU). The ICSU was designed to create a clinical practice setting for nursing, physiotherapy, and occupational therapy students that would promote interprofessional work with a patient-centered focus. Participants completed a two week clinical placement in the ICSU with a focus on caring for patients with complex, acute, and chronic diseases. Students expressed that they benefited from learning more about the other professions, and grew in their understanding of how nurses contributed to the treatment and care of the patient. Students also reported increased understanding of the importance of collaborative sharing from each profession's perspective.

Using a mixed methods design, Nisbet et al. (2008) evaluated the effects of an interprofessional learning program that took place in three large metropolitan teaching hospitals and involved 41 senior year students from medicine, nursing, nutrition, dietetics, occupational therapy, physiotherapy, social work, and speech pathology. The program consisted of a total of ten hours of learning activities over a four-week time period. Students first participated in an interactive team building workshop that emphasized concepts related to effective teamwork and its relevance to health care. Other activities included patient case discussions, participation in ward meetings, observation and participation in the assessment/treatment procedures conducted by other professions, and reflection on team performance. A pre and posttest design was used to evaluate whether the students met three learning outcomes: 1) to explain the roles of other health care workers; 2) value and respect the contributions and expertise of other health professions; and 3) demonstrate positive attitudes to patient-centered, collaborative care. The Biggs' SOLO (Structure of the Observed Learning Outcomes) taxonomy was used to evaluate students' understanding of roles, with responses scored for a written case scenario that were completed both before and after completion of the program. Pre and posttest scores were compared using Wilcoxon Signed Ranks Test. Data on 16 students demonstrated an overall increase in understanding the roles of other health professions ($p < .01$). Qualitative data were collected with audio-taped semi-structured individual interviews conducted before and after the program to assess changes in attitudes towards teamwork and patient-centered collaborative care. One theme that emerged from pre and post program interviews regarded the role of doctors within teams. Some students viewed the doctors as the leader of the team with higher status, while others described a shared

leadership model that included equal status among team members. Other students reported increased recognition of their individual responsibility in speaking up as a member of the health care team. Both pre and post interviews reflected positive attitudes toward interprofessional teamwork and its positive impact on patient care. Themes that emerged on the post program interviews included: 1) recognition of barriers to effective health care teams; and 2) models of teamwork. Specifically, the role of communication related to patient safety became more apparent to many students. Interpersonal conflict was also identified as a barrier to team performance. Overall, the results suggest improved understanding of the roles of other health care team members, and improved ability to apply knowledge related to interprofessional teamwork.

Grymonpre et al. (2010) conducted a controlled mixed methods, longitudinal study to evaluate the impact of the Interprofessional Education in Geriatric Care (IEGC) project, an interprofessional clinical program. Senior students from the disciplines of medicine, nursing, occupational therapy, pharmacy, and physical therapy participated in the project that included 15 hours of IPE-specific experiences included within a traditional clinical placement that took place in a geriatric day hospital setting. Students were assigned to participate in the IEGC educational experience, or to participate in their standard uni-professional clinical placement that took place in the same setting. The intervention group included 32 students (nine pharmacy, seven medicine, seven nursing, six physical therapy, and three occupational therapy) and the control group included 11 students (no breakdown of student numbers by discipline provided by authors). Features specific to the IEGC educational program included activities that reinforced social connection between team members, self-reflection exercises, the collaborative

development and implementation of interdisciplinary care plans, and reading assignments followed by small group discussions regarding interprofessional competencies.

Quantitative data were collected using the Geriatric Interdisciplinary Team Training (GITT) questionnaire, which is a combination of the Attitudes Toward Health Care Teams Scale (ATHCT), the Team Skills Scale (TSS), and five questions specific to recruitment and retention of students in geriatric settings. The IEGC Knowledge Questionnaire was also used to evaluate participants' knowledge of interprofessional core competencies. The instruments were administered pre-, post-, and 6 months post-program for both the intervention and control group. Qualitative data included field notes, open-ended responses, and journal entries. Thematic coding was used to identify general categories or themes. Results showed a significant increase in ATHCT scores for the intervention group over time compared to the control group after controlling for prior IPE experience ($p = .031$). Knowledge scores revealed significant increases over time for the combined groups ($p = .002$) and in the average scores between groups ($p = .024$). While both intervention and control groups showed a significant improvement in TSS scores over time ($p = .000$), no significant difference was noted in TSS scores over time in the magnitude of change between the intervention and control participants ($p = .112$). Overall results suggest that the IEGC intervention improved knowledge of collaborative competencies, and that knowledge was retained six months after completion of the program. Qualitative themes indicated increased knowledge in leadership, communication, team dynamics, and disciplinary articulation. Furthermore, this knowledge was incorporated in the professional practice of participants in the

intervention group. Limitations of the study included a small sample size and the lack of a randomized sample.

Conclusion

Much of the IPE research evaluating teamwork has lacked the rigor necessary to guide health care educators in the best methods for improving interprofessional teamwork competencies. Of the existing research, common limitations have included: 1) studies that are descriptive only; 2) the use of instruments without established reliability or validity; 3) measurement of attitudes rather than higher levels of learning; 4) small sample sizes that may contribute to the likelihood of a Type II error; and 5) a lack of controlled studies to allow a comparison of variables.

SUMMARY

In spite of a universal call to prepare the future health care work force to work together collaboratively, the progress of development in interprofessional education within academic settings has been slow. With increasing attention being given for improved patient safety and outcomes through better communication among health care team members, an increasing amount of IPE research has been conducted in the past decade. However, much remains unknown about the best methods for implementing IPE due to major limitations in existing research.

The lack of useful instruments designed to measure IPE competencies has been a major factor inhibiting the progress of research. Many studies have used instruments that have not been psychometrically developed, thereby limiting the reliability of the conclusions. Studies that have used psychometrically validated instruments are often

limited to the measurement of learner reactions, attitudes, and perceptions rather than higher levels of learning.

Some studies have evaluated interprofessional teamwork in an attempt to determine best practices for improving collaboration. A number of IPE interventions have been evaluated for their impact on teamwork, including the use of TeamSTEPPS[®] training, simulation, and clinical experiences. While limited progress has been made in this field of research, promising opportunities exist for uncovering effective methods to integrate interprofessional teamwork into curricula. The current study aimed to add to the existing literature on the effectiveness of IPE interventions by assessing interprofessional teamwork competencies using a validated instrument and a randomized sample of nursing students.

Chapter 3: METHODS

This chapter includes a discussion of the research methods and procedures used in this study. Discussion of the methodology includes a description of the objectives, design, setting, sample, instruments, procedures for data collection, and the educational intervention. The statistical procedures used in data analysis are also described, followed by a review of the protection of human subjects.

OBJECTIVES

The overall objective of this study was to evaluate the effect of two approaches to an educational intervention aimed at improving interprofessional teamwork competencies. A comparison was conducted between the subjects in the treatment group who completed an interprofessional simulation, and the control group that completed an intraprofessional simulation.

METHODS

Research Design

The study employed a quasi-experimental, pre and posttest design to assess the effect of a six-hour educational intervention. Both the treatment and control groups being compared in this study completed the same simulation-based exercise that involved developing interprofessional care plans for a geriatric patient with complex medical, psychological, and social needs. The treatment group was comprised of a combination of nursing, physical therapy, and pharmacy students, and the control group was comprised of only nursing students. The following research questions were addressed:

Research Question 1: Are there significant differences between the treatment and control groups for pre and posttest scores of interprofessional teamwork competencies?

Research Question 2: Are there significant differences between nursing students in the treatment and control groups for pre and posttest scores of interprofessional teamwork competencies?

Research Question 3: Are there significant within-group differences for pre and posttest scores of interprofessional competencies?

Research Question 4: Do self-reported teamwork competencies vary between nursing, and other health professions within the treatment group?

Research Question 5: What are the subjects' views regarding the value of the educational intervention?

Strengths of the pre and posttest design using a treatment and control group included being able to assess the equality of groups prior to the intervention, and the impact of the interaction of individuals from multiple professions (the intervention for the treatment group) on study outcomes. An additional strength of the methodology was the use of random assignment of the nursing students to the treatment and control groups, promoting internal validity.

Weaknesses of the pre and posttest design include possible sensitization to the Team Skills Scale instrument, which may affect posttest results. In order to minimize this risk, the pretest was collected from subjects immediately following its administration so that subjects would not review it when completing the posttest. However, testing effects, or the potential of improving performance or skills due to familiarity with measurements, may affect subject responses on the posttest (Portney & Watkins, 2009).

Setting and Sample

Convenience and purposive sampling was used to recruit baccalaureate nursing, doctoral physical therapy (PT), and doctoral pharmacy students from a private university in the southwest region of the United States in the fall semester of 2016. Prior to recruitment of subjects, approval for the study was obtained from the University of Texas Medical Branch Institutional Board and the University of the Incarnate Word Institutional Review Board.

Inclusion and Exclusion Criteria

The inclusion criteria for the study included individuals who were: 1) male and female students attending the University of the Incarnate Word; 2) enrolled in the NURS 4562 Community Health Nursing course, or the Doctor of Physical Therapy program, or the Doctor of Pharmacy program; 3) English speaking; 4) willing to complete the entire simulation exercise; and 5) complete all demographic and survey questionnaires.

Exclusion criteria were: 1) individuals not enrolled at the University of the Incarnate Word; and 2) individuals not enrolled in NURS 4562 Community Health Nursing, Doctor of Physical Therapy, or Doctor of Pharmacy programs. Students who did not sign the informed consent, complete the demographic questionnaire, survey, and simulation exercise in its entirety were excluded from the study.

INSTRUMENTS

Demographic Data Sheet

Data collected from the demographic data sheet included information regarding subjects' program of study, gender, age, ethnicity, employment status, prior healthcare experience, and prior interprofessional education experience (Appendix A).

Team Skills Scale

The Team Skills Scale (Hepburn, Tsukuda, & Fasser, 1998) was used to quantitatively measure the effectiveness of the educational intervention in the treatment and control group (Appendix B). This 17-item questionnaire was designed to measure self-reported team skills (Hepburn, Tsukuda, & Fasser, 1998). The items of the instrument are rated using a 5-point adjectival scale: Poor (1); Fair (2); Good (3); Very Good (4); and Excellent (5). Summing the scores results in a range of 17 to 85, with higher scores reflecting more positive estimates of team skills. In 2000, Hyer, Fairchild, Abraham, Mezey, and Fulmer reported a Cronbach's alpha of .94 (as cited by Hepburn, Tsukuda, & Fasser, 2002). Miller and Ishler (2001) reported a Cronbach's alpha of 0.95 for the Team Skills Scale in an IPE study involving 25 occupational therapy, physical therapy, physician assistant, and public health students (National Center for Interprofessional Practice and Education, 2013). Content and face validity were established by clinical experts and educators (Hepburn et al., 2002). Permission to use the Team Skills Scale, and permission to replace the term *interdisciplinary* with the term *interprofessional* in the scale was granted by Kenneth Hepburn, PhD (personal communication, June 21, 2016 [Appendix C]). The term interprofessional rather than interdisciplinary was used in order to comply with the verbiage of the Interprofessional Education Collaborative (IPEC, 2011).

Open-Ended Questions

Open-ended questions in written format were used to ascertain views regarding the intervention and how it might impact their future professional practice (Appendix D).

PROCEDURES

Recruitment Strategies

Nursing students were recruited from NURS 4562 Community Health Nursing, a requisite senior level course. Students were introduced to the project during a class period at the beginning of the semester. All students enrolled in the course were invited to participate in the study by the Principle Investigator (PI) prior to the educational intervention. Any nursing students enrolled in the Community Health Nursing course who chose not to participate in the study were still included in the educational intervention because the activity was part of the requisite coursework. The PI explained to the nursing students enrolled in the course that participation in the project would not impact their course grade. Analysis of the data for the study included only the nursing students who signed the consent form. Physical therapy and pharmacy students were recruited to participate in the study by the physical therapy and pharmacy faculty who assisted in the educational activity and institutionally approved flyers posted in the University of the Incarnate Word physical therapy and pharmacy buildings (Appendix E).

Random Assignment of Nursing Students

A randomization table was computer-generated prior to the beginning of the study. Nursing students were assigned by drawing numbers from a container that corresponded to the randomization table that placed half of the subjects in the treatment group and half in the control group. Randomization of the nursing student subjects took place immediately following the collection of informed consents and prior to the educational activity. All PT and pharmacy students were assigned exclusively to the treatment group.

Data Collection Procedures

Informed consent was obtained prior to the collection of any data (Appendix F). Informed consents and all data were collected on November 12, 2016. Each subject was assigned an ID number, and this ID number was placed on each of the instruments issued to individual subjects, including the demographic data sheet, the pretest Team Skills Scale, the posttest Team Skills Scale, and the open-ended questions. The demographic data sheet and the pretest Team Skills Scale were completed and returned to the PI or assisting faculty prior to the educational intervention. Following completion of the educational intervention, subjects immediately completed the posttest Team Skills Scale and open-ended questions. Upon completion of the intervention and submission of all instruments, each subject received a \$20 gift card.

Intervention

The treatment group and control group participated in the research activities at the same date and time, but in different geographical locations. In addition, students were asked to not communicate with individuals from the other group by text or any other methods for the duration of the study, including breaks and lunch. The rationale for preventing communication between the two groups was to protect internal validity, since interaction between subjects of the two groups might affect responses to the intervention.

The faculty facilitating the educational intervention included two nursing instructors from the Community Health Nursing course (one instructor facilitated the treatment group, and the other facilitated the control group), one PT faculty member, and one pharmacy faculty member. The PT and pharmacy faculty members assisted in the facilitation of the treatment group. All faculty members involved in the educational

intervention received training on the entire educational activity by the Principal Investigator (PI) prior to the day of the study.

Both the treatment and control groups participated in a simulation-based exercise that involved developing interprofessional care plans for a geriatric patient who has recently undergone a below the knee amputation (BKA). The simulation incorporated an educational case study that was developed by the Center for Interdisciplinary Geriatric Assessment at the University of Missouri-Columbia titled Interdisciplinary Geriatric Assessment: Mr. Ames (Weston et al., 2012), and can be accessed in its entirety at http://shp.missouri.edu/vhct/CIGA_Ames/index.htm. Permission for use of the case study was granted by Richard E. Oliver, Ph.D., FASAHP from the University of Missouri (personal communication, August 16, 2016 [Appendix G]). The purpose of the case study was to promote an interprofessional approach for planning and managing treatment of older adults with complex medical, psychological, and social needs. A packet of information with details regarding the patient was provided to students for each stage of the simulation, and included assessment information from the disciplines of nursing, occupational therapy, physical therapy, social services, psychological services, podiatry, and respiratory therapy. An initial medical and social history were provided at the beginning of the simulation, including details such as Mr. Ames's 20-year history of type 2 diabetes mellitus, retinopathy, neuropathy, history of a four-vessel coronary artery bypass, kidney transplant due to chronic renal failure, and history of smoking. The simulation involved students developing a total of five interdisciplinary plans of care at various stages of treatment (Table 3.1).

Table 3.1. Interprofessional Care Plans Developed During Educational Intervention

Care Plan Number	Settings for Care Plan Development
1	Discharge planning from inpatient hospital following patient's BKA
2	During admission to inpatient rehabilitation unit
3	Discharge planning from inpatient rehabilitation unit
4	Admission to home health services
5	Transition back to family and community

At each stage of the simulation, additional updated information about the patient was given to the students, and students were instructed when to develop the next care plan. A document titled *Interdisciplinary Geriatric Assessment* was used for the students to record relevant information regarding the assessment, immediate concerns/suggestions, patient/family/stated outcome main concerns/suggestions, proposed action plan, and person responsible (Appendix H). When the individual teams completed each care plan, the team had an opportunity to compare their recommendations to an answer key. Between each transition of care, the faculty facilitated a debriefing among all groups. The total time to complete the entire simulation for both the treatment and control groups was approximately six hours. Hourly breaks, refreshments and lunch were provided in order to prevent fatigue.

Group assignment. The treatment group consisted of 16 nursing, 6 PT, and 3 pharmacy students for a total of 25 in the group. Subjects were placed in groups of 5-6 students to collectively discuss the case study and develop the plans of care. Five groups contained a combination of 2-3 nursing, 1-2 PT, and 0-1 pharmacy students. The 3 pharmacy students were rotated to a different table following each round of care plan development so that by the end of the intervention, all nursing students in the treatment group had similar amounts of interaction time with the pharmacy students. One of the PT

students was also rotated to a different table after each round in order to equalize the amount of exposure nursing students had to the PT students (at all times, each group had 1-2 PT students present).

The control group consisted of 17 nursing students. The control group participated in the same simulation, and were placed in three groups of 5-6 students to work together on the case study and develop the plans of care.

DATA ANALYSIS

SPSS version 22 was used to perform all statistical analyses. Data entry was verified twice, and all data were reviewed and cleaned. All assumptions for each analysis were tested. The data were assessed for significant outliers. The normality of the data were assessed using the Shapiro-Wilk test of normality and Levene's test for homogeneity of variance. The Shapiro-Wilk test indicated that data for the pretest were not normally distributed and that the data for the posttest were normally distributed. Levene's test indicated equality of differences for both pretest and posttest data. Descriptive statistics were used to analyze the demographic data and the treatment and control groups were compared for differences. The reliability coefficient for the Team Skills Scale was determined using Cronbach's alpha. The dependent variable was assessed as a continuous variable and the independent variable was the comparison of two groups having independence of observation. To answer the first and second research questions, in which group differences (treatment and control) for scores on the Team Skills Scale were compared, a Mann-Whitney U test was used for the pretest analysis and an independent *t*-test was used for the posttest analysis. For research question three, in which differences for within group scores on pre and posttest measures of the Team

Skills Scale were compared, a Wilcoxon Signed Rank Test was used. For research question four, in which Team Skills Scale scores were compared for the treatment group between nursing, and other health professions students, a Mann-Whitney U test was used for the pretest analysis and an independent *t*-test was used for the posttest analysis to assess differences in mean scores between these groups of students on both pre and posttest scores. All analyses were interpreted as significant for $p \leq .05$. Eta squared was calculated to determine effect size for the independent *t*-test. Cohen's classification system was used to interpret the effect size of eta squared as follows: 0.01 = small, 0.06 = moderate, and 0.14 = large effect (Pallant, 2007). The effect size for the Mann-Whitney U test and Wilcoxon Signed Rank Test was calculated using $r = \frac{z}{\sqrt{N}}$ where N = total number of cases, with Cohen's criteria used to interpret the effect size of *r*: .1 = small effect, .3 = medium effect, and .5 = large effect (Pallant, 2007). Priori power analysis were not conducted given the sampling design of the study. Post hoc analyses were conducted to determine sufficient power for all statistical tests. For research question five, thematic content analysis was used to categorize responses to open-ended questions in both the control and treatment group. Comparisons were made between the themes determined from both groups.

HUMAN SUBJECTS

The study posed minimal to no risk to subjects. The greatest risk to subjects was loss of confidentiality. Fatigue was a potential risk to subjects due to the six hour length of the educational intervention. Data were collected by the PI, and then stored in a locked file cabinet within the PI's office which was secured and accessible only by the PI. Names and other identifying information were removed from the data. An I.D. number

was assigned to each subject, eliminating the use of subject names on study materials. A codebook with subject names and numbers was kept in a locked file cabinet inside the PI's office.

Potential benefits to subjects for participation in the study were improved knowledge and skills related to interprofessional teamwork competencies that could be applied in the healthcare work setting. Additional benefits included the potential to improve patient outcomes as a result of improved interprofessional teamwork competencies.

SUMMARY

The primary objective of this study was to evaluate the effect of two approaches to an educational intervention aimed at improving the interprofessional teamwork competencies of baccalaureate nursing, doctoral PT, and doctoral pharmacy students. A quasi-experimental, pre and posttest design was used to compare a treatment group that participated in an interprofessional simulation exercise, and a control group that participated in an intraprofessional simulation exercise. Both groups used the same case study involving a patient with complex medical, psychological, and social needs to develop interprofessional care plans at five stages of treatment.

The sample included 42 subjects (33 baccalaureate nursing, 6 doctoral PT, and 3 doctoral pharmacy students). Nursing students were randomized to either the treatment or control group. The treatment group was comprised of 25 students (16 nursing, 6 PT, and 3 pharmacy students), and the control group was comprised of 17 nursing students.

The Team Skills Scale was administered before and after the educational intervention. A demographic data sheet and open-ended questions were also utilized.

Descriptive statistics were used to analyze the demographic data. Wilcoxon Signed Rank Test, paired *t*-test, Mann-Whitney U test, and independent-samples *t*-test was used to analyze pre to posttest differences within and between groups. Thematic content analysis was used to categorize responses to open-ended questions. The results are expected to inform healthcare professional educators by providing quantitative evidence of the impact of the educational intervention used in this study.

Chapter 4: FINDINGS

This study evaluated the effect of an interprofessional simulation exercise with an intraprofessional simulation exercise on interprofessional teamwork competencies. Data analysis was performed using the Statistical Social Sciences (SPSS version 22). The chapter consists of a description of the sample, the psychometric properties of the Team Skills Scale (TSS), and findings for the research questions presented in Chapter 1.

SAMPLE CHARACTERISTICS

Forty-two subjects completed the study. The original projection of the sample size was anticipated to be 35 nursing, 20 physical therapy (PT), and 20 pharmacy students. However, unanticipated scheduling conflicts for the PT and pharmacy students limited the number of subjects. The final sample consisted of 33 nursing, 6 PT, and 3 pharmacy students. Of the 36 students enrolled in NURS 4562 Community Health Nursing, 33 participated in the study.

All subjects completed the demographic questionnaire, the Team Skills Scale (TSS) pretest and posttest, and open-ended questions. The subjects ranged in age from 21-36, with a mean of 24.3 (Table 4.1). Table 4.2 presents demographic characteristics by discipline (nursing, PT, and pharmacy students) for ethnicity, gender, employment status, healthcare experience, and interprofessional education experience. Ethnically, there were similar numbers of Hispanics (45.2%) and Caucasians (40.5%). The majority of subjects were female (83.3%), had prior healthcare experience (54.8%), and prior interprofessional education (IPE) experience (59.5%). Fifty percent were employed part-time.

The treatment and control groups had similar characteristics (Table 4.3). A Shapiro-Wilk test revealed that age was not normally distributed in the treatment and control groups ($p < .05$), indicating the need to utilize a non-parametric test. Levene's test for equality of variances indicated homogeneity of variances ($p = .095$). Due to violations of normality, a Mann-Whitney U test was run to determine if there were significant differences in the age distributions between the treatment and control groups. There were no significant differences in the ages between the treatment ($Md = 23$, $n = 25$) and control groups ($Md = 23$, $n = 17$), $U = 207$, $z = -.145$, $p = .885$.

A chi-square test for association was conducted to compare the treatment and control groups for characteristics of ethnicity, gender, employment status, healthcare experience, and IPE experience. Due to expected cell frequencies less than five for the variables of ethnicity, the categories were collapsed to three groups: Caucasian, Hispanic, and African American/Asian. Employment status also was collapsed to two categories of Not Employed and Employed due to expected cell frequencies less than five. The analyses indicated that there was not a statistically significant difference between groups for ethnicity ($\chi^2 = 1.464(2)$, $p = .481$), gender ($\chi^2 = .020(1)$, $p = .888$), employment status ($\chi^2 = .004(1)$, $p = .952$), healthcare experience ($\chi^2 = 2.128(1)$, $p = .145$), or IPE experience ($\chi^2 = .006(1)$, $p = .939$).

Analyses were conducted to assess relationships between pre and posttest TSS scores with demographic characteristics. Due to violations of normality, a Mann-Whitney U test was run to compare pretest scores based on gender, employment status, healthcare experience, and IPE experience. There was a statistically significant difference between TSS pretest scores and gender ($U = 58.5$, $z = -2.167$, $p = .03$) and healthcare experience

($U = 111.5$, $z = -2.713$, $p = .007$). In the case of gender, males scored significantly higher on the pretest than females. Subjects without healthcare experience scored significantly higher on the pretest than those with experience. Independent t -tests run to compare TSS posttest scores and gender, employment status, healthcare experience, and IPE experience showed no statistically significant differences. Pearson's correlations and Spearman's rho were run to assess relationships between pretest and posttest scores, with age, program of study, ethnicity, and employment status (employed, employed part-time, employed full time). No significant findings were noted except for a moderate, positive correlation between pretest scores and age (Pearson's $r = .496$, $p = .001$; Spearman's rho $r = .316$, $p = .042$), indicating that higher pretest scores were associated with increased age of subjects.

Table 4.1. Age of Subjects by Discipline

Ages by Discipline	M	SD	Range
Nursing	24.12	4.068	21-36
Physical Therapy	25.00	1.265	24-27
Pharmacy	24.67	3.512	21-28

Table 4.2. Number and Percentage for All Subjects by Ethnicity, Gender, Employment Status, Healthcare Experience, and IPE Experience

Variable	Nursing (n = 33) (%)	PT (n = 6) (%)	Pharmacy (n = 3) (%)	Total (N = 42) (%)
Ethnicity				
Caucasian	13 (39.4)	3 (50.0)	1 (33.3)	17 (40.5)
Hispanic	16 (48.8)	2 (33.3)	1 (33.3)	19 (45.2)
African American	2 (6.1)	0 (0.0)	0 (0.0)	2 (4.8)
Asian	2 (6.1)	1 (16.7)	1 (33.3)	4 (9.5)
Gender				
Male	4 (12.1)	3 (50.0)	0 (0.0)	7 (16.7)
Female	29 (87.9)	3 (50.0)	3(100.0)	35 (83.3)
Employment Status				
Not employed	15 (45.5)	4 (66.7)	1 (33.3)	20 (47.6)
Part-time employment	17 (51.5)	2 (33.3)	2 (66.7)	21 (50.0)
Full-time employment	1 (3.0)	0 (0.0)	0 (0.0)	1 (2.4)
Healthcare Experience				
Yes	15 (45.5)	5 (83.3)	3(100.0)	23 (54.8)
No	18 (54.5)	1 (16.7)	0 (0.0)	19 (45.2)
IPE Experience				
Yes	17 (51.5)	6 (100.0)	2 (66.7)	25 (59.5)
No	16 (48.5)	0 (0.0)	1 (33.3)	17 (40.5)

Table 4.3. Number and Percentage for Subjects in Treatment and Control Group by Ethnicity, Gender, Employment Status, Healthcare Experience, and IPE Experience

Variable	Treatment (n = 25) (%)	Control (n = 17) (%)	Total (N = 42) (%)
Ethnicity			
Caucasian	12 (48.0)	5 (29.4)	17 (40.5)
Hispanic	10 (40.0)	9 (52.9)	19 (45.2)
African American	1 (4.0)	1 (5.9)	2 (4.8)
Asian	2 (8.0)	2 (11.8)	4 (9.5)
Gender			
Male	4 (16.0)	3 (17.6)	7 (16.7)
Female	21 (84.0)	14 (82.4)	35 (83.3)
Employment Status			
Not employed	12 (48.0)	8 (47.1)	20 (47.6)
Part-time employment	13 (52.0)	8 (47.1)	21 (50.0)
Full-time employment	0 (0.0)	1 (5.9)	1 (2.4)
Healthcare Experience			
Yes	16 (64.0)	7 (41.2)	23 (54.8)
No	9 (36.0)	10 (58.8)	19 (45.2)
IPE Experience			
Yes	15 (60.0)	10 (58.8)	25 (59.5)
No	10 (40.0)	7 (41.2)	17 (40.5)

PSYCHOMETRIC PROPERTIES OF THE TEAM SKILLS SCALE

Data for interprofessional teamwork competencies were collected using the Team Skills Scale (TSS). Pretest measures were collected immediately prior to the intervention, and posttest measures were collected immediately following the intervention (approximately six hours later). Cronbach's alpha was computed for the TSS pretest and posttest. Internal consistency for the TSS was determined to be $\alpha = .89$ (pretest) and $\alpha = .94$ (posttest). The reliability coefficients for this study are consistent with previous studies including a Cronbach's alpha of .94 by Hyer, Fairchild, Abraham, Mezey and Fulmer (2000), and .95 by Miller and Ishler (2001).

RESEARCH QUESTION FINDINGS

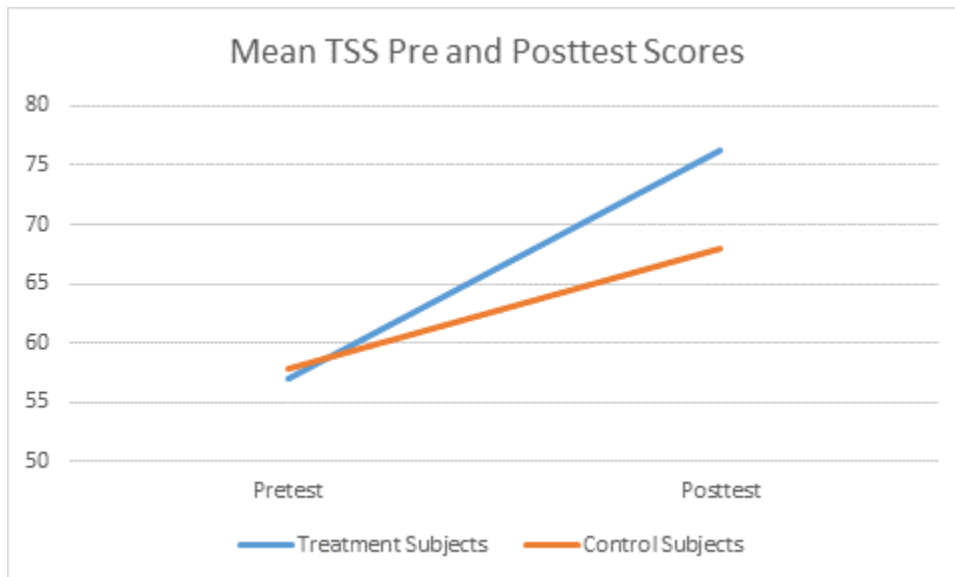
Research Question 1

The first research question asked if there were significant differences between the treatment and control groups for pre and posttest scores of interprofessional teamwork competencies. TSS pretest scores met the criteria for homogeneity of variances as assessed by Levene's test ($p = .341$), but were not normally distributed, as assessed by Shapiro-Wilk's test ($p = .014$). Therefore, the Mann-Whitney U test for nonparametric data was used to analyze differences between the pretest scores of the treatment and control groups. There were no statistically significant differences in pretest scores for the treatment and control groups ($U = 205$, $z = -.193$, $p = .847$). TSS posttest scores met the criteria for homogeneity of variances as assessed by Levene's test ($p = .265$), and were normally distributed as assessed by Shapiro-Wilk's test ($p = .061$). An independent t -test was conducted and revealed a significant difference in the posttest scores for the treatment and control groups, $t(40) = -.3847$, $p < .001$. The magnitude of the differences in the means (mean difference = -8.339 , 95% CI: -12.720 to -3.958) was large (eta squared = $.27$). Table 4.4 and Figure 4.1 present post hoc analysis findings for the pre and posttest scores of the TSS for the treatment and control groups.

Table 4.4. TSS Pre and Posttest Scores for Treatment and Control Groups

	Treatment (n = 25)			Control (n = 17)			p	Effect Size
	M	SD	Range	M	SD	Range		
Pretest	57.04	6.01	43-66	57.88	9.38	44-85	0.85	-0.03
Posttest	76.28	7.2	64-85	67.94	6.41	58-82	< .001	0.27

Figure 4.1. Comparison of Mean Pre and Posttest Scores of Treatment and Control Groups



Research Question 2

Research Question 2 asked if there were significant differences between nursing students assigned to the treatment and control groups for pre and posttest scores of interprofessional teamwork competencies. A Mann-Whitney U test was conducted to analyze differences between the TSS pretest scores of nursing students for interprofessional teamwork competencies in the treatment and control groups. There were no statistically significant differences for pretest scores between the two groups, $U = 134.5$, $z = .054$, $p = .957$. An independent t -test to compare differences between the pre and posttest scores on the interprofessional team competencies for nursing students in the treatment and control groups found a statistically significant difference, $t(31) = -.4048$, $p < .001$. The magnitude of the differences in the means (mean difference = -9.809 , 95% CI: -14.750 to -4.867) was large (eta squared = $.35$). Nursing students within the treatment group had significantly higher scores (Table 4.5).

Table 4.5. TSS Pre and Posttest Scores for Nursing Students in Treatment and Control Groups

	Nursing Treatment (n = 16)			Nursing Control (n = 17)			p	Effect Size
	M	SD	Range	M	SD	Range		
Pretest	57.25	5.09	50-66	57.88	9.38	44-85	0.957	0.009
Posttest	77.75	7.5	64-85	67.94	6.41	58-82	< .001	0.35

Research Question 3

Research question 3 asked whether there were significant within-group differences for pre and posttest scores for interprofessional competencies. Due to violations in assumptions of normal distribution (Shapiro-Wilk's test $p < .05$), a Wilcoxon Signed Rank Test was conducted to evaluate the difference in median scores for the nursing students ($n = 16$) versus other health professions ($n = 9$) within the treatment and control groups ($n = 17$). The results indicated a statistically significant increase in TSS scores for each group, with the largest effect sizes occurring within the treatment group subjects (Table 4.6).

Table 4.6. Within Group Differences of TSS Pre and Posttest Scores

Group		Z	p-value	r
Treatment (n = 25)	Nursing Treatment (n = 16)	-3.52	<.001	0.62
	Other Health Professions Treatment (n = 9)	-2.675	0.007	0.63
Control (n = 17)		-3.026	0.002	0.52

Research Question 4

Research question 4 asked if self-reported interprofessional teamwork competencies varied between nursing and other health professions within the treatment group. Due to a significant Shapiro-Wilk's test ($p = .014$), a Mann-Whitney U test was conducted to analyze differences between the pretest scores of the nursing students and other health professions in the treatment group. There were no statistically significant differences in pretest scores between the nursing students and other health professions, $U = 71.00$, $z = -.057$, $p = .955$. An independent t -test was conducted to analyze differences between the pre and posttest scores for nursing students and other health professions, and there were no statistically significant differences, $t(23) = 1.387$, $p = .179$. The magnitude of the differences in the means (mean difference = 4.083, 95% CI: -2.009 to 10.176) was moderate (eta squared = .08). Table 4.7 presents findings for the pre and posttest scores of the nursing students and other health professions within the treatment group.

Table 4.7. TSS Pre and Posttest Scores for Nursing Students and Other Health Professions in Treatment Group

	Nursing Treatment (n = 16)			Other Health Professions Treatment (n = 9)			p	Effect Size
	M	SD	Range	M	SD	Range		
Pretest	57.25	5.09	50-66	56.67	7.71	43-69	0.995	0.01
Posttest	77.75	7.5	64-85	73.67	6.19	65-85	0.179	0.08

Research Question 5

The fifth research question asked about subjects' views regarding the value of the educational intervention. To evaluate this research question, subjects responded to the following open-ended questions at the conclusion of the educational intervention:

- 1) Please describe the most useful aspects of this interprofessional education experience;
- 2) Please describe the least useful aspects of this interprofessional education experience;
- 3) Please list up to three specific skills or knowledge areas that you gained from today's experience;
- 4) How has today's interprofessional activity changed the way you think about people in other healthcare disciplines; and
- 5) How will today's interprofessional experience impact your future collaboration with other health care team members?

An analysis of open-ended questions was conducted and reoccurring themes were identified in both the control and treatment group. Comparisons were made between the themes of both groups. Four themes were shared by both groups: 1) understanding the roles of other health professions; 2) importance of working as a team; 3) importance of communication; and 4) increased appreciation of other health professions. An additional theme of increased confidence was noted in the treatment group.

Understanding the roles of other health professions. A majority of students in the treatment and control group commented that one of the benefits of the educational activity was learning more about the roles of other health professions. Students in the treatment group reflected on their interactions with the other professions. A pharmacy student stated that one of the most useful aspects of the experience was *“going through the case study in depth as a group with different professions. Seeing their points of views was cool. I learned new things and learned things I never thought about.”* A PT student stated that a benefit was *“listening to other health care professionals to gain information about their profession. Also, how they view the case and what they feel is the most important aspect to target first.”* A nursing student in the treatment group stated *“It was helpful getting to know the other disciplines and it was good to be introduced to their knowledge.”* Nursing students in the control group also commented that the case study helped to improve their understanding of the roles of other health care professions. In contrast to the treatment group, students in the control group did not discuss the experience as an interactive, participative activity. For example, useful aspects of the experience cited by students in the control group included *“learning what the interprofessional groups do and how they work with the patients,”* and *“learning how other members of the health care team work and contribute to patient care.”*

Importance of working as a team. Statements from both groups reflected an appreciation of the importance of interprofessional teamwork. Responses from nursing students in the treatment group included: *“It helped me realize that when interdisciplinary teams work together we get different perspectives and ideas about interventions and creating a plan of care,”* and *“Know your resources! It’s so important*

to be able to rely on others to holistically care for your client. No one can do it alone.”

Students also reflected on the contribution of their own profession to the team. For example, a PT student noted that the experience has *“given me a better idea of how to interact on an interprofessional team, and allowed me to advocate for the importance of my profession in the overall care and management of patient.”* Statements from nursing students in the control group regarding teamwork included: *“Every health care profession has their specialties, but it is important to work together to provide patients with the best quality of care,” “Shared knowledge and team effort provides the best quality care,”* and *“It takes a team to heal a patient.”*

Importance of communication. Students reflected on the importance of communication with other health care professions. A student in the control group stated that the activity *“helps me understand the need for communication due to the many skills each performs.”* Nursing students in the treatment group reflected on the impact of interacting with the PT and pharmacy students on future collaboration. One student commented *“I will pick the brain of the PT on my floor whenever I see them with my patient. I will also not be timid about calling the pharmacist because they can give a whole new insight on the meds and how they affect the patient.”* Another student stated *“I will be more willing to speak to PT and ask them questions and run observations by them. Also asking about concerns and getting other professional opinions.”*

Other students related communication to improved quality care. A nursing student in the treatment group stated *“It helped me see that if we all work together we truly would care for the patient better. Communication is a must,”* she added *“I will be more proactive in collaborating with other disciplines.”* A PT student reflected *“It helped me*

understand the importance of establishing good relationships with other professions because it has a direct impact with patient care management and will bring about better outcomes for the patient.”

Increased appreciation of other health professions. The final theme shared by both groups was an increased appreciation of individuals in other health professions. Statements from students in the control group included: *“It will definitely make me more appreciative of having them there as a resource,” “Today made me realize that I need to use more resources to help my future patients. I cannot help the patient alone,”* and *“Don’t take them for granted! The other health professions have a lot to offer!”* Nursing students in the treatment group stated: *“I knew their point of view was important but did not realize until now how helpful they can be to the nursing side of treatment as well,”* and *“I have an increased appreciation for all of the perspectives that they bring to the table as well as alternate therapy options. It was interesting to see what their priorities were.”* One of the PT students reflected that they now had *“more respect than I had [previously] for their views/thoughts”* adding that the experience *“positively impacted me and I look forward to interprofessional communication in the future.”* A pharmacy student stated *“This was great! In school we assume the other professional’s roles are being filled during case studies. However, we don’t get to see how important they really are. This made me want to always work with other professionals in my career.”*

Increased confidence. Statements from the students in the treatment group reflected an additional theme of increased confidence about future collaboration with other health professions. The following statements reflect this theme: *“I feel more confident to ask [other professions] questions and get them involved with patient care,”*

“I am not as scared or nervous, we are all professionals. I will be excited to work with others,” “It was a positive experience and I look forward to future experiences to be just as positive and productive,” and “I will be more likely to ask for help from others when I need help!” Another student added that the positive experience gained from the educational activity *“will allow me to more comfortably interact with other health care providers. It also increased the confidence I had in interprofessional teams and feeling valued within the team.”*

Least useful aspects of the educational activity. The second open-ended question asked students to describe the least useful aspects of the educational experience. The two most commonly cited items from both groups was the opinion that the activity was too long, and that filling out the care plan form for each of the five iterations was overly repetitious. Additionally, a number of students in the control group commented that it would have been preferable to interact with students from the other health care professions.

Comparison of treatment and control groups. A comparison of the comments from the two groups indicated that the learning that occurred in the treatment group was experiential, while the control group was more academic in nature. Statements from the treatment group included verbiage such as *“it helped me see,” “listening to others,”* and *“good to hear thoughts and perceptions from other professions,”* while statements from the control group included verbiage such as *“learning what others do”* and *“able to understand.”* These differences of language between the two groups suggest that the treatment group may have developed a deeper level of appreciation regarding the value of input from other team members.

Alignment of Themes with IPEC Core Competencies

Interestingly, the themes identified in the study closely align with the core competencies for interprofessional collaborative practice outlined by the Interprofessional Education Collaborative (Table 4.8). This finding provides evidence that the educational activity effectively targeted the development of these core competencies.

Table 4.8. Alignment of Themes with IPEC Core Competencies for Interprofessional Collaborative Practice

Emerging Themes	IPEC Core Competencies
Increased appreciation of other health professions	Work with individuals of other professions to maintain a climate of mutual respect and shared values. (Values/Ethics for Interprofessional Practice)
Understanding the roles of other health professions	Use the knowledge of one's own role and those of other professions to appropriately assess and address the health care needs of patients and to promote and advance the health of populations. (Roles/Responsibilities)
Importance of communication Increased confidence	Communicate with patients, families, communities, and professionals in health and other fields in a responsive and responsible manner that supports a team approach to the promotion and maintenance of health and the prevention and treatment of disease. (Interprofessional Communication)
Importance of working as a team	Apply relationship-building values and the principles of team dynamics to perform effectively in different team roles to plan, deliver, and evaluate patient/population-centered care and population health programs and policies that are safe, timely, efficient, effective, and equitable. (Teams and Teamwork)
IPEC (2016)	

SUMMARY

Study results indicated that interprofessional teamwork competencies increased for both the students completing the interprofessional simulation exercise (treatment group) and the students completing the intraprofessional simulation exercise (control group). Pretest scores on the Team Skills Scale were not significantly different between the treatment and control groups ($p = .847$). Group differences for the TSS posttest scores for the treatment and control groups were significantly different ($p < .001$, eta squared = .27), with a mean TSS posttest score of 76.28 for the treatment group, and 67.94 for the control group. Comparison of the mean scores for nursing students in the treatment and control groups indicated no significant differences on pretest scores ($p = .957$), and significant differences on posttest scores ($p < .001$, eta squared = .35) with nursing students in the treatment group having higher scores. There was a statistically significant increase in TSS scores from pre to posttest for each group (nursing students in treatment group, other health professions students in treatment group, and nursing students in control group), with the largest effect size occurring in the treatment group subjects: nursing students in treatment group ($p < .001$, $r = .62$); other health professions in treatment group ($p = .007$, $r = .63$); and control group ($p = .002$, $r = .52$). There were no significant differences between nursing and other health professions within the treatment group on pretest scores ($p = .955$) or posttest scores ($p = .179$). The final research question was to determine subjects' views regarding the value of the educational intervention. Thematic analysis supported the quantitative data findings which indicated improved interprofessional teamwork competencies. Four themes were identified for both the treatment and control groups: understanding the roles of other health professions;

importance of working as a team; importance of communication; and increased appreciation of other health professions. For the treatment group, an additional theme of increased confidence was noted. The findings are discussed further in Chapter 5.

Chapter 5: DISCUSSION AND SUMMARY

INTRODUCTION

Interprofessional education (IPE) is widely endorsed as a means of improving collaboration and the quality of patient care. However, healthcare educators struggle to find effective, viable methods for implementing IPE within their institutions. While notable progress has been achieved in the field of interprofessional research, further advancement is necessary to appropriately guide educators.

The purpose of this pilot study was to evaluate the effectiveness of an educational intervention aimed at improving interprofessional teamwork competencies. The treatment group utilized an interprofessional approach by combining nursing, physical therapy (PT), and pharmacy students, with the control group utilizing an intraprofessional approach by using only nursing students. Subjects in both groups participated in a simulation exercise that involved developing five interprofessional care plans for a patient with complex needs at various transitions of care. The study addressed gaps in existing literature by using a psychometrically established instrument and comparing the effectiveness of an interprofessional educational approach to an intraprofessional educational approach. The research questions addressed were:

1) Are there significant differences between the treatment and control groups for pre and posttest scores of interprofessional teamwork competencies?

2) Are there significant differences between nursing students in the treatment and control groups for pre and posttest scores of interprofessional teamwork competencies?

3) Are there significant within-group differences for pre and posttest scores of interprofessional competencies?

4) Do self-reported teamwork competencies vary between nursing and other health professions within the treatment group?

5) What are the subjects' views regarding the value of the educational intervention?

This chapter provides a discussion of the results as they relate to the research questions and extant literature. Limitations of the study, implications for healthcare educators, and recommendations for future studies are also presented.

DISCUSSION OF FINDINGS

Sample Characteristics

Subjects in the treatment and control groups had similar characteristics including age, ethnicity, gender, employment status, healthcare experience, and IPE experience. Males scored significantly higher than females on the Team Skills Scale (TSS) pretest, indicating that males had a higher estimation of their interprofessional teamwork competencies than females prior to the educational intervention. No statistically significant difference was noted between males and females on the TSS posttest, suggesting that both genders had similar estimations of interprofessional teamwork competencies following the intervention. While a number of reasons could account for this finding, it may be that the activity was helpful to males in being able to accurately identify their strengths and weaknesses in interprofessional teamwork competencies. Subjects with no healthcare experience scored significantly higher on the TSS pretest scores than subjects with healthcare experience. A possible reason for this finding might be that subjects with healthcare experience may be more aware of the challenges involved in interprofessional teamwork and gave greater weight to the challenges than

those without healthcare experience. Older students also scored significantly higher on the TSS pretest, suggesting that life experience may have positively influenced students' interprofessional teamwork competencies. The findings of this study were interesting regarding the differences in pretest scores for gender, healthcare experience, and age, given the lack of similar findings within the literature.

Pretest Findings

Prior to the educational intervention, pretest Team Skills Scale (TSS) scores reflected similar interprofessional teamwork competencies among subjects. No significant differences were noted in pretest scores between: 1) students in the treatment and control groups; 2) nursing students in the treatment group and the control group; or 3) nursing students and other health professions students within the treatment group. This finding is important as it provides a baseline for interpreting posttest findings, particularly in the randomized nursing sample.

Posttest Findings

Treatment versus control groups. Following the intervention, posttest TSS scores revealed significantly higher interprofessional teamwork competencies in the treatment group than the control group. A comparison of nursing students in the treatment and control groups also reflected significantly higher posttest scores in the treatment group. These findings suggest that interaction with students from other health professions during the exercise resulted in greater achievement of interprofessional teamwork competencies.

This study supports the findings of other researchers who also detected significant improvement in subjects exposed to an IPE intervention compared to a control group

(Ruebling et al., 2014; Wamsley et al., 2012; Wang et al., 2015). Wamsley et al. (2012) reported significant increases in team value and team efficiency scores for subjects participating in an interprofessional standardized patient exercise compared to nonparticipants. Similarly, Ruebling et al. (2014) and Wang et al. (2015) found significant positive changes in attitudes toward interprofessional practice of students who participated in an IPE course compared to students who completed traditional coursework. In contrast, other researchers have reported nonsignificant differences or mixed results in post-intervention measures of treatment and control groups (Grymonpre et al., 2010; Maguire et al., 2015). Grymonpre et al. (2010) found no significant changes in attitudes over time between treatment and control groups. While subjects in both the treatment and control groups demonstrated increased TSS scores over time, there was no significant difference in the magnitude of scores. Maguire et al. (2015) reported significantly higher TeamSTEPPS® Teamwork Attitudes Questionnaire (T-TAQ) scores of undergraduate nursing students in an intervention group who received TeamSTEPPS® training for the subscales of Team Structure and Situation Monitoring, but not for the subscales of Leadership, Mutual Support, or Communication. In fact, the subscale for Mutual Support was significantly larger for the control group. However, because the intervention group was comprised of first semester students and the control group was comprised of final semester students, subjects in the control group might have attained the skills measured in the Leadership, Mutual Support, and Communication subscales through professional maturation. The findings of Maguire et al.'s study may have differed from the findings of the current study due to the disparities in the educational levels of the treatment and control groups. Unlike the current study in which the treatment and

control groups had comparable levels of education, Maguire et al's findings may be due to group differences in educational levels.

Within group differences. In this study, an analysis of within group differences for TSS pre and posttest scores indicated significant increases in teamwork competencies for each group: nursing students in the treatment group, other health professions students in the treatment group, and students in the control group. However, the largest effect sizes occurred in the treatment group subjects ($r = .62$ for nursing students in treatment group, $r = .63$ for other health professions in treatment group, and $r = .52$ in the control group). These findings reflect that while the educational intervention resulted in significant increases of teamwork competencies for each group, subjects in the treatment group appear to have achieved greater benefit than the subjects in the control group. The large effect size seen in the control group, similar to the treatment group subjects, suggests that this approach was also valuable.

Researchers have begun to “think outside the box” to explore the effectiveness of alternate methods of implementing IPE, and there is growing evidence that some of these methods are, in fact, beneficial. Hobgood et al. (2010) used four educational methods: traditional didactic, audience response didactic, role play, and high-fidelity human patient simulation, to evaluate the effectiveness of each method on the acquisition of student teamwork knowledge, skills, and attitudes. Prior to randomization to one of the four cohorts, all participants received a 90-minute lecture on key components of the TeamSTEPPS® curriculum. Posttest scores showed significant increases in attitudes, knowledge, and teamwork for subjects in each of the four cohorts. The authors speculated that for basic teamwork training perhaps “any fidelity of training environment or

educational pedagogy can provide substantial increases in basic learner competency in core teamwork knowledge and attitudes” (Hobgood et al., 2010, p. 4). Likewise, Shrader et al. (2016) conducted a study that randomized pharmacy students to three different simulation methods using: 1) telephone to communicate recommendations to nursing students using the SBAR format; 2) email to communicate recommendations to medical students; and 3) synchronous video conference technology to interact with dietetics, nurse practitioner, and occupational therapy students to develop an interprofessional care plan in the electronic health record. The authors reported strong satisfaction ratings and significant increases in the Attitude Toward Healthcare Teams Scale for the group as a whole. While no statistical analyses were provided regarding differences between each of the methods, the authors reported that written reflections indicated that each of the methods positively affected attitudes toward healthcare teams and perceptions regarding the importance of interprofessional communication.

Nursing and other health profession students within the treatment group. A comparison of the posttest scores among nursing and other health professions students in the treatment group demonstrated no significant differences. Given that pretest scores were also similar, this finding suggests that subjects within the treatment group from the disciplines of nursing, PT, and pharmacy experienced similar gains in interprofessional teamwork competencies from the educational activity.

Similar responses to IPE interventions among students of different health professions have been described in the literature (Brashers et al., 2016; Ellman et al., 2012; Liaw et al., 2014; New et al., 2015). Following TeamSTEPPS® training and a simulation exercise, Liaw et al. (2014) found that both nursing and medical students

demonstrated significant improvement in perceptions of other health professions.

Brashers et al. (2016) reported no significant differences in posttest scores of medical and nursing students on the TSS or Collaborative Behaviors Observational Assessment Tool following four IPE workshops. Following an intervention that combined online learning with live interactive simulation for medical, nursing, divinity, and social work students, Ellman et al. (2012) found similar increases in scores among each of the disciplines regarding understanding of the roles of other professions and value of team collaboration.

Conversely, a number of researchers have detected differences in response to IPE interventions among professions (Delunas & Rouse, 2014; Dillon et al., 2009; Hertweck et al., 2012; Sullivan et al., 2015; Wamsley et al., 2012). In a study involving physician assistant (PA), counseling psychology, occupational therapy (OT), and physical therapy (PT), Hertweck et al. (2012) found that the PA students scored significantly lower than the other professions on the Readiness for Interprofessional Learning Scale (RIPLS), indicating less positive attitudes toward interprofessional collaboration. Wamsley et al. (2012) found that participants from dentistry and medicine had significantly lower scores on the Attitudes Towards Healthcare Teams Scale (ATHCT) posttest scores than nurse practitioner, pharmacy and PT. In a study that used the Jefferson Scale of Attitudes Toward Physician-Nurse Collaboration to measure changes of medical and nursing students following a mock code exercise, Dillon et al. (2009) found significantly higher posttest scores of medical students for attitudes toward collaboration and improved understanding of the autonomous role of the nurse. Sullivan et al. (2015) found that PT students experienced the most significant changes in attitudes towards teamwork and the roles of other professions compared to the physician assistant (PA), nursing, or pharmacy

students. The authors noted that the difference may have been due to the discrepancy in educational levels of the students, with the PT students being newly enrolled and the other disciplines being closer to graduation.

Themes of open-ended questions. Themes that emerged from responses to open-ended questions support the quantitative findings of the study which indicate that the intervention improved interprofessional teamwork competencies.

The first theme, *understanding the roles of other health professionals*, is consistent with themes identified by other researchers (Bahnsen et al., 2013; Curran et al., 2010; Ellman et al., 2012; King, Conrad, & Ahmed, 2013; Mellor et al., 2013; Nisbet et al., 2008; Robben et al., 2012; Suter et al., 2009; Wang et al., 2015). This theme highlights a problem examined in the literature that a long-standing tradition of teaching health professions in silos inhibits students from learning about the roles of the other members of the healthcare teams (Robertson & Bandali, 2008). Responses to open-ended questions in the study reflect this issue. For example, the nursing students in the sample were in their final semester of the program, yet their responses reflected that the exercise helped improve their understanding of the roles of PTs and pharmacists. Likewise, comments from the PT and pharmacy students indicated that the exercise helped them better understand nurses' scope of practice. A comment from a student in the study by Robben et al. (2012) echoes this finding: "For a number of disciplines, I am more aware of what they do exactly, and what they contribute, I thought that was positive" (p. 201). Mellor and colleagues (2013)) also described that prior to participation in an IPE program students knew little about the roles and responsibilities of other professions, and that the

experience helped them recognize how input from each profession has the capacity to improve the quality of healthcare.

Importance of working as a team was a theme that indicated subjects' progress toward understanding the relationship between teamwork and quality of patient care. Themes regarding teamwork have been a recurrent finding by other researchers (Bahnsen et al., 2013; Dillon et al., 2009; Matthews, Parker, & Drake, 2012; McCaffrey et al. 2013; Mellor et al., 2013; New et al., 2015; Nisbet et al., 2008; Rosenfield et al., 2011). In this study, multiple students reflected on the importance of each team member giving input from the unique perspective of their discipline in order to provide optimal care to patients. This finding is consistent with the findings of New et al. (2015) who reported that reflective notes of nursing students indicated improved understanding of the importance of working in teams as a means of improving patient outcomes. Nisbet et al. (2008) also discussed findings related to a teamwork theme, including common barriers to effective teams such as poor communication and not valuing the opinions of other team members. Furthermore, Nisbet and colleagues also noted that students were able to link these concerns to compromises in patient safety.

Importance of communication has been a theme identified by numerous other researchers (Dillon et al., 2009; King et al., 2013; Matthews et al., 2012; Mellor et al., 2013; Nisbet et al., 2008; Suter et al., 2009; Wang et al., 2015). In this study, responses related to this theme included that one of the benefits of communication is getting the professional opinion of others. Dillon et al. (2009) found a similar theme noting that medical students became more aware of the need to improve collaboration with nurses in order to achieve positive patient outcomes. Mellor et al. (2013) stated that students

recognized how an IPE experience helped them to develop interprofessional communication skills, and recognized how these skills translate to improved patient outcomes.

The theme, *increased appreciation of other health professions*, indicated that the intervention improved students' opinions regarding the value of other professions.

Responses from students in the treatment and control groups indicated that students both recognized and respected the expertise offered by other professions. Mellor et al. (2013) described similar findings regarding students' improved appreciation of other health professions. Moreover, the authors stated that as students became more aware of different aspects of patient care, they developed a more holistic approach to caring for patients.

The final theme, *increased confidence*, emerged only in the treatment group. This theme provides further evidence that perhaps the greatest impact on students comes from the opportunity to interact with students from other professions. Likewise in the literature, both King et al. (2013) and Nisbet et al. (2008) detected that practicing communication skills with other professions resulted in improved confidence and decreased fear in speaking up in interprofessional situations. Similarly, New et al. (2015) stated that students reported that an interprofessional activity led to an increased sense of empowerment when interacting with other professions.

LIMITATIONS OF THE STUDY

Limitations of the study relate to issues of external and internal validity. First, a small sample size inhibited the ability to generalize findings to other populations.

Although the projected sample size for this pilot study was achieved for the nursing students, unanticipated scheduling conflicts limited the recruitment of PT and pharmacy

students. Additionally, representation of students from only three health professions within one educational institution prevent generalization to other populations. Purposive sampling used in the recruitment of PT and pharmacy students may have introduced bias, as these individuals might have placed more value in IPE and been more interested in developing teamwork skills than the general population.

Differences in the faculty facilitating the activity might have introduced bias. The lead facilitators of both the treatment and control groups were master's prepared nurse educators. The treatment group, however, also had a PT and pharmacy faculty member assisting in facilitation of the debriefings that took place following the development of each care plan. While efforts were made to standardize the facilitation of both groups by training each faculty member prior to the study, the addition of these faculty members to the treatment group may have affected students' learning experience. Individual differences in the teaching styles of each faculty member might also have affected learning experiences.

Other limitations relate to methods of measurement. The Team Skills Scale measures individuals' self-reported team skills which may not be as accurate as observed team skills. In addition, a testing effect might have occurred through subjects' exposure to the pretest, resulting in subjects being more aware of teamwork skills during the activity and thereby affecting posttest scores. Finally, this study lacked longitudinal data to detect the impact of the intervention on interprofessional teamwork competencies in future practice.

IMPLICATIONS FOR HEALTHCARE EDUCATORS

While the findings of this study suggest that the greatest impact in achieving teamwork competencies is accomplished through face-to-face interaction of students from multiple health professions, other educational methods might also be beneficial. In this study, virtual feedback of other health professions in a simulation-based exercise also appeared to be effective in improving teamwork competencies. This finding might be particularly useful in educational institutions that contain only one health profession, or when other barriers such as scheduling conflicts make synchronous interaction difficult to achieve.

Other questions remain about the best methods for IPE regarding the configuration of educational levels of students in IPE activities. In this study, the variety of educational levels of students among the health profession programs did not appear to detrimentally affect the overall aim of improving teamwork competencies. The baccalaureate nursing students were near graduation, while the doctoral PT and pharmacy students were in varying levels of their respective programs. The IPE activity used in this study allowed each of the three professions to actively engage as members of the team and contribute their knowledge in the development of care plans. Results of this study suggest that IPE activities that balance involvement from each profession and allow each student to contribute discipline-specific skills may be more important than comparable educational levels.

Feedback from some students in the study indicated that the six-hour length of the activity was tiring. The case study used in the activity could be divided into two sessions on different days. However, doing so could result in cross-contamination between groups,

and be a hindrance for attendance. In addition to possibly being a preferred length by students, it might facilitate the coordination of various program schedules.

Accurately measuring the effectiveness of IPE activities is an important role of the educator, yet locating appropriate instruments to do so is challenging. The Team Skills Scale demonstrated strong internal reliability in this study. This instrument may be a useful for evaluating team skills in other IPE activities that incorporate care of the older adult and the development of interdisciplinary care plans. Additionally, the scale measures interprofessional teamwork competencies rather than being limited to readiness for IPE or attitudes toward IPE.

Designing activities that target the core competencies outlined by the Interprofessional Collaborative Expert Panel (IPEC, 2016) is essential. The findings of this study reveal that the educational activity assisted in the development of the IPEC core competencies. Assisting students to develop these competencies can be facilitated by planning activities that target higher levels of learning (levels 2b through 4b) outlined in the modified Kirkpatrick level previously discussed (Barr et al., 2005). Objectives for the levels described by Barr et al. (2005) would incorporate the acquisition of knowledge and skills (level 2b), behavioral changes (level 3), changes in organizational practice (level 4a), and benefits to patients (level 4b).

RECOMMENDATIONS FOR FUTURE STUDIES

Replication of the current study in different geographic locations, inclusion of more health professions, and larger sample sizes would enhance the ability to generalize results. Comparisons could also be conducted within and between sites to further explore the effectiveness of the two approaches of the simulation-based exercise.

Data should also be collected through objective measurement of team skills. Instruments with strong inter-rater reliability should be used for facilitators to measure students' abilities to communicate as members of a healthcare team. In addition to the observation of interaction between team members in planning care, incorporation of standardized patients and family members would allow facilitators to observe these interactions as well.

Future research should also include the collection of longitudinal data to evaluate the effectiveness of IPE interventions over time. More studies are needed that collect data over the course of a curriculum and extend beyond graduation into work settings. Ultimately, more research is needed to assess the impact of IPE in improving health and system outcomes (IOM, 2015).

SUMMARY AND CONCLUSION

Preparing our future healthcare workforce to work together collaboratively and improve patient outcomes is vital. Although interprofessional education has been identified as a means of accomplishing this task, healthcare educators must overcome a multitude of barriers to plan, implement, and evaluate IPE activities. While significant progress has been made in the area of IPE research, many questions remain about the effectiveness of various IPE approaches.

The findings of this study support that more than one approach to an educational intervention can be effective in improving interprofessional teamwork competencies. In this study, a simulation-based exercise that provided face-to-face interaction of students from multiple professions appeared to have a greater impact on achieving teamwork competencies than an approach that provided virtual input from other professions.

However, nursing students participating in the virtual exercise also appeared to gain significant improvements in teamwork competencies. Therefore, when interprofessional face-to-face interaction is not feasible, simulation-based exercises that provide virtual interprofessional input should be considered as an alternative method for developing teamwork competencies.

Exploring the effectiveness of a variety of IPE approaches must continue using rigorous methodology. Establishing best practices that include innovative ways of managing the obstacles to IPE will benefit students, and ultimately, the patients they serve.

Appendix A: Demographic Data Sheet

Participant Code: _____

Participant Demographic Data Questionnaire

Please complete the following information on yourself:

1. What is your program of study?

Nursing _____ Pharmacy _____ Physical Therapy _____

2. Age in Years: _____

3. Gender: Male _____ Female _____

4. Ethnicity:

Caucasian _____ Asian _____ American _____
Indian _____
Hispanic _____ Pacific Islander _____
African American _____ Alaskan _____

5. Employment Status:

Not currently employed _____

Employed Part Time _____ Employed Full Time _____

If employed, my current job is (briefly describe):

6. Do you have prior healthcare experience?

Yes _____ No _____

If yes, please list the type of experience:

7. Do you have prior experience with any interprofessional education experiences?

Yes _____ No _____

If yes, please briefly describe:

Appendix B: Team Skills Scale

Please rate **your ability to carry out each of the following tasks:**

	<i>Poor</i>	<i>Fair</i>	<i>Good</i>	<i>Very Good</i>	<i>Excellent</i>
1. Function effectively in an interprofessional team	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Treat team members as colleagues	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Identify contributions to patient care that different disciplines can offer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Apply your knowledge of geriatric principles for the care of older persons in a team care setting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Ensure that patient/family preferences/goals are considered when developing the team's care plan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Handle disagreements effectively	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Strengthen cooperation among disciplines	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Carry out responsibilities specific to your discipline's role on a team	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Address clinical issues succinctly in interprofessional meetings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Participate actively at team meetings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. Develop an interprofessional care plan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. Adjust your care to support the team goals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. Develop intervention strategies that help patients attain goals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. Raise appropriate issues at team meetings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. Recognize when the team is not functioning well	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. Intervene effectively to improve team functioning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. Help draw out team members who are not participating actively in meetings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Hepburn, Tsukuda, and Fasser (1996), Team Skills Scale, all rights reserved

Appendix C: Permission to Use Team Skills Scale

From: Hepburn, Kenneth
To: Waltz, Lee Ann
Subject: Re: Request to use the Team Skills Scale
Date: Tuesday, June 21, 2016 11:48:25 AM

Ms. Waltz
Interesting, isn't it, how nuanced changes occur in language.
Sure, go ahead and make the change -- nice catch
Ken Hepburn

Kenneth Hepburn, PhD
Professor
Nell Hodgson Woodruff School of Nursing
1520 Clifton Rd.
Atlanta, GA 30322
(404) 712-9286

From: Waltz, Lee Ann <waltz@uiwtx.edu>
Sent: Tuesday, June 21, 2016 12:38:12 PM
To: Hepburn, Kenneth
Subject: Request to use the Team Skills Scale

Hello Dr. Hepburn,
My name is Lee Ann Waltz and I am enrolled in the Nursing PhD Program at the University of Texas Medical Branch. I am also an instructor in the undergraduate nursing program at the University of the Incarnate Word in San Antonio, Texas. I am writing to request permission to use the Team Skills Scale (TSS) in my dissertation study. In my search for a validated instrument, I discovered the TSS on the National Center for Interprofessional Practice and Education website.

My dissertation study will utilize an interprofessional education (IPE) approach involving prelicensure nursing, pharmacy, and physical therapy students. A randomized, experimental, pre and posttest design will be used to assess the effectiveness of an IPE intervention. The intervention is a six-hour simulation-based exercise incorporating an interprofessional approach to developing comprehensive care plans at various transitions of care for an elderly patient with type 2 diabetes who has undergone a below the knee amputation.

If allowed to use the TSS, I would also like to request changing the word *interdisciplinary* on item 1 to *interprofessional* in order to use the term that students have been most exposed to in their program of study.

Please feel free to contact me by email or my personal cell phone at (210)-275-9426 for further discussion or questions.

Thank you for your consideration,
Lee Ann
Lee Ann Waltz MSN, RN, CNE
Instructor, Ila Faye Miller School of Nursing
University of the Incarnate Word
4301 Broadway
San Antonio, Texas 78209
210-832-2191

Appendix D: Open-Ended Questions

Post Activity Questions

1. Please describe the most useful aspects of this interprofessional education experience?
2. Please describe the least useful aspects of this interprofessional education experience?
3. Please list up to three specific skills or knowledge areas that you gained from today's experience.
4. How has today's interprofessional activity changed the way you think about people in other healthcare disciplines?
5. How will today's interprofessional experience impact your future collaboration with other health care team members?

Appendix E: Recruitment Flyer

Physical Therapy and Pharmacy Students

Your assistance is needed!

*Are you willing to participate in a research study
about interprofessional teamwork skills?*



Participants should be:

Currently enrolled in Physical Therapy or Pharmacy programs

**Willing to participate in a 6 hour
interprofessional activity**

on Saturday, November 12, 2016

\$20 Amazon Gift Cards will be given to all participants
who complete research study requirements

**For more information about this study or to volunteer,
please contact:**

**Lee Ann Waltz, MSN, RN, CNE
waltz@uiw.edu; 210-275-9426**

This study is under the direction of Carol Wiggs PhD, RN and will not commence until approved by
University of Texas Medical Branch (UTMB) IRB

Appendix F: Consent Form

The University of Texas Medical Branch at Galveston Minimal Risk Consent Form

Protocol Title: Determining the Efficacy of an Interprofessional Educational Intervention for Teamwork Competencies with Nursing Students

IRB Number: 16-0281

Principal Investigator: Lee Ann Waltz
2319 Brighton Oaks
San Antonio, TX 78231
Phone: (210) 275-9426
Fax: (210) 829-3174

Why am I being asked to take part in this research study?

You are being asked to take part in this study because you are either a nursing student enrolled in NURS 4562 Community Health Nursing, a physical therapy student, or a pharmacy student at the University of the Incarnate Word and can contribute valuable information about the usefulness of an educational intervention regarding interprofessional teamwork competencies.

What is the purpose of this research study?

The purpose of the study is to assess the effectiveness of an educational intervention aimed at improving participants' interprofessional competencies.

How many people will take part in this study?

About 75 people will take part in this study at the University of the Incarnate Word. Approximately 35 of the participants are anticipated to be from nursing, approximately 20 from physical therapy, and approximately 20 from pharmacy.

What procedures are involved as part of this research study?

If you agree to take part, you will be asked to sign this consent form and complete the following procedures. You will be asked to complete a demographic questionnaire that will include information regarding your program of study, gender, age, ethnicity, employment status, prior healthcare experience, and prior interprofessional education experience. You will be asked to complete a pretest regarding your perception of your current interprofessional teamwork competencies. You will then participate with other students in an interactive simulation case study regarding planning care for a patient at various stages of treatment following a below the knee amputation. The case study and associated interactive activities will take approximately six hours to complete. If you are a nursing student, you will be assigned to one of two groups: one group will consist of nursing students only, while the other group will consist of a mix of nursing, physical therapy, and pharmacy students. Each group will complete the same case study activities.

Following the completion of the case study activities, you will complete a posttest regarding your perceptions of your interprofessional teamwork competencies and answer some open-ended questions about your experience with the activity.

What are the possible risks for choosing to participate in this research study?

Any time information is collected; there is a potential risk for loss of confidentiality. Every effort will be made to keep your information confidential; however, this cannot be guaranteed.

What are the potential benefits for participating in this research study?

Potential benefits may include improved knowledge and skills related to interprofessional competencies that can be applied in the healthcare work setting. Additional benefits include the potential to improve patient outcomes as a result of improved interprofessional competencies. The knowledge gained by the proposed study will inform healthcare profession educators regarding the effect of the interprofessional education interventions used, may lead to additional ideas to incorporate interprofessional education into healthcare education curriculum, and may generate additional research ideas regarding interprofessional education.

Will I be reimbursed for participating in this research study?

Upon completion of all study activities, you will receive a gift card in the amount of \$20.00 for your participation in the study.

Is there an alternative treatment/procedure?

The alternative is not to participate in the study.

If I agree to take part in this research study, can I be removed from the study without my consent?

Yes. The researchers may decide to take you off this study if:

- The sponsor cancels the research.
- You are unable to attend the simulation exercise in its entirety.

How will my information be protected?

All results obtained in this study will be kept confidential and only available to the researcher and her dissertation committee members. Your individual information will not be reported, only the results of all participants as a group.

Who can I contact with questions about this research study?

If you have any questions, concerns or complaints before, during or after the research study, or if you need to report a research related injury or bad side effect, you should immediately contact Lee Ann Waltz at 210-832-2191 or, if after normal office hours, at 210-275-9426.

This study has been approved by the UTMB Institutional Review Board (IRB). If you have any complaints, concerns, input or questions regarding your rights as a subject participating in this research study or you would like more information about the protection of human subjects in research, you may contact the IRB Office, at (409) 266-9475 or irb@utmb.edu.

Do I have to participate?

Your participation in this study is completely voluntary. You may refuse to participate or stop your participation in this research study at any time without penalty or loss of benefits to which you are otherwise entitled.

CONSENT TO PARTICIPATE:

The purpose of this research study, procedures to be followed, risks and benefits have been explained to you. You have been given the opportunity to ask questions, and your questions have been answered to your satisfaction. You have been told whom to contact if you have additional questions. By signing this form, you are confirming that you have read this consent form and voluntarily agree to participate as a subject in this study.

Signature of Subject

Date

Signature of Person Obtaining Consent

Date

Appendix G: Permission to Use Interdisciplinary Geriatric Assessment

Case Study

From: Oliver, Richard E.
To: Waltz, Lee Ann
Cc: Brandt, Lea C.
Subject: Re: VHCT Permission Request
Date: Tuesday, August 16, 2016 6:51:21 AM

Lee Ann,

Permission certainly granted!

We are very excited you will be using the case again and also using it for your dissertation study!

Keep us posted on your progress.

Rich Oliver

On Aug 16, 2016, at 6:05 AM, Waltz, Lee Ann <waltz@uiwtx.edu> wrote:

Hello Dr. Oliver,

I am writing to request permission to use the VHCT case above for the school year 2016-2017 for Community Health Nursing (a senior level BSN course), doctoral physical therapy, and doctoral pharmacy students at the University of the Incarnate Word.

You had originally granted permission for our use of the Mr. Ames case study on October 4, 2015 for use with the nursing students in the Community Health Nursing Course (see below). Use of the case study has been very successful, and we would now like to extend its use to include students of other health professions at our institution.

We would also like to revise the list of medications at the various transitions of care in order to provide the students with the opportunity to practice the challenges involved with medication reconciliation.

The above request would also include my use of the case study for a dissertation study on the topic of interprofessional education. The research would use the case study as an educational intervention, and participants would complete the Team Skills Scale (permission has been granted for use of this scale) to measure self-reported team skills before and after the intervention.

I would be happy to answer any questions that you may have regarding this request.

You may contact me by email at this address, or by phone at 210-275-9426.

Very respectfully,

Lee Ann Waltz

Lee Ann Waltz MSN, RN, CNE
Instructor, Ila Faye Miller School of Nursing
University of the Incarnate Word
4301 Broadway
San Antonio, Texas 78209
210-832-2191

From: "Oliver, Richard E." <OliverR@health.missouri.edu>
Date: October 4, 2015 at 4:02:38 PM CDT
To: "ldpaul@uiwtx.edu" <ldpaul@uiwtx.edu>, "hook@uiwtx.edu" <hook@uiwtx.edu>

Cc: "Oliver, Richard E." <OliverR@health.missouri.edu>, "Gill, Megan L." <gillm@health.missouri.edu>
Subject: RE: VHCT Permission Request

Permission granted.

Thank you for your interest in this case and our site.
The following form is used in the case to foster interdisciplinary communication. This is a key concept in this case.
http://shp.missouri.edu/vhct/CIGA_Ames/documents/Asmt_form_hosp_tx.pdf
We do not have an evaluation tool/exam to test the case learner. You need to tailor the case to your own application.
Let me know how this goes for you and your students.

Best,
Rich Oliver
Richard E. Oliver, Ph.D., FASAHP
Dean Emeritus
CE716 CS & E Building
Center for Health Ethics
One Hospital Drive
University of Missouri
Columbia, MO 65212
Phone: 573-882-5086
Cell: 573-999-0759
President, Association of Schools of Allied Health Professions (ASAHP)
Scholar, Center for Health Ethics, University of Missouri

From: VHCT Permission Form [mailto:shp@pwe-tc1.missouri.edu]
Sent: Friday, October 02, 2015 9:22 AM
To: Gill, Megan L.; Oliver, Richard E.
Subject: VHCT Permission Request

Lorena Paul is requesting the following:
Case Study of Interest: Mr. Ames
Intended use: Academic research
Dear Virtual Health Care Team:
My colleague and I would like to facilitate the Interdisciplinary Geriatric Care Plan simulation and template with Senior level BSN Community Nursing students. The purpose is to assess the students' achievement of 6 traditional BSN program (terminal) objectives.

Also, we would be interested in any learner evaluation tool that you would permit to be included in our proposed research activity.
My colleague is Ms. Linda Hook and I would appreciate it if you would include her in follow-up correspondences: hook@uiwtx.edu
Thank you in advance for your consideration of these requests.

V/r
Lorena Paul, MSN, MEd, RN-BC
Adjunct Nursing Faculty
School of Nursing & Health Professions
University of the Incarnate Word
4301 Broadway St.
San Antonio, TX 78209

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Vita

Lee Ann Waltz was born in San Antonio, Texas, the daughter of Leo and Carolyn Nichols. She attended elementary school in San Antonio, Texas; Denver, Colorado; and Albuquerque, New Mexico. At the age of 13, her family moved to Waco, Texas, where she attended junior high school and graduated from Richfield High School in 1984. In 1986, she received her Associate's Degree in Nursing (ADN) from McLennan Community College in Waco, Texas. After working as a Registered Nurse (RN) for a year in Austin, Texas, she moved back to San Antonio, Texas. Lee Ann continued to work as an RN in a variety of settings including mental health, adult medical-surgical acute care, pediatric oncology, home health, and long-term care. In 2004, she returned to school to complete a Bachelor of Science in Nursing and Master of Science in Nursing at the University of Texas Health Science Center at San Antonio. In 2007, she began teaching nursing at the University of the Incarnate Word in San Antonio, where she continues to work today.

Lee Ann is a member of the American Nurses Association and Sigma Theta Tau International Honor Society of Nursing.

Education

ADN: May, 1986, McLennan Community College, Waco, Texas

BSN: December, 2006, University of Texas Health Science Center, San Antonio, Texas

MSN: December, 2006, University of Texas Health Science Center, San Antonio, Texas

PhD: May, 2017, University of Texas Medical Branch, Galveston, Texas

Permanent address: 2319 Brighton Oaks, San Antonio, Texas 78231

This dissertation was typed by Lee Ann Waltz.